GROUNDWATER REPLENISHMENT SYSTEM

2022 Annual Report

ORANGE COUNTY WATER DISTRICT

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Groundwater Replenishment System
2022 Annual Report

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and
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TABLE OF CONTENTS

PAGE

PAGE

FIGURES

PAGE

PAGE

PAGE

PAGE

PAGE

TABLES

PAGE

PAGE

ACRONYMS

REFERENCES

APPENDICES

EXECUTIVE SUMMARY

The Groundwater Replenishment System (GWRS) is a water supply project jointly sponsored by Orange County Water District (OCWD) and Orange County Sanitation District (OC San) that supplements existing water supplies by providing a reliable, high-quality source of water to recharge the Orange County Groundwater Basin (the Basin), to protect it from degradation due to seawater intrusion, and for limited non-potable uses.

This Annual Report examines the GWRS operation and performance for calendar year 2022. This Annual Report fulfills the GWRS permit requirements set forth by the California Regional Water Quality Control Board, Santa Ana Region (RWQCB):

- From January until December 2022, OCWD operated the GWRS in compliance with RWQCB Order No. R8-2004-0002 (RWQCB, 2004) and as amended by Order Nos. R8-2008-0058, R8-2014-0054, R8-2016-0051, and R8-2019-0007, and revised Monitoring and Reporting Program (RWQCB, 2008, 2014a, 2016, 2019, and 2020a).
- Beginning on December 2, 2022, OCWD operated the GWRS in compliance with the new permit, Order No. R8-2022-0050, which replaced the prior amended permit. (RWQCB 2022a).
- GWRS purified recycled water was used for non-potable purposes, as regulated by RWQCB Order No. R8-2021-0003 (RWQCB, 2021) until December 2022 and beginning on December 2, 2022, in the new GWRS permit (RWQCB, 2022a).
- Provisions for emergency discharges to the Santa Ana River (SAR) per RWQCB Order No. R8-2022-0002 (RWQCB, 2022b).

Introduction

The GWRS, which is operated by OCWD, consists of five major components:

- **Advanced Water Purification Facility (AWPF)**, which features treatment processes and pumping stations designed to produce purified recycled water:
  - Up to 100 million gallons per day (MGD) prior to December 2022, and
  - Up to 130 MGD beginning in December 2022 following completion of the GWRS Final Expansion (GWRSFE);
- **Talbert Seawater Intrusion Barrier (Talbert Barrier)** comprised of a series of injection wells that are supported by an extensive network of groundwater monitoring wells;
- **Kraemer-Miller-Miraloma-La Palma Basins (K-M-M-L Basins)**, along with other nearby spreading basins, all of which are supported by numerous groundwater monitoring wells;
- **Mid-Basin Injection (MBI) Project** consisting of the Demonstration Mid-Basin Injection (DMBI) Project and MBI Centennial Park Project, which are injection wells supported by downgradient monitoring wells; and

- **Three non-potable end users**: Anaheim Canyon Power Plant (Anaheim CPP), Anaheim Regional Transportation Intermodal Center (ARTIC), and Anaheim Adventure Park.

Figure ES-1 shows the location of the GWRS in central Orange County, California. The AWPF receives secondary-treated wastewater from OC San facilities and treats it to better than drinking water standards using full advanced treatment: membrane filtration (MF), reverse osmosis (RO), advanced oxidation/disinfection consisting of hydrogen peroxide addition and ultraviolet light exposure (UV/AOP), followed by partial decarbonation and lime stabilization. Pumping stations and pipelines convey purified recycled water from the AWPF to the Talbert Barrier, K-M-M-L Basins, MBI Project, and/or non-potable water users.

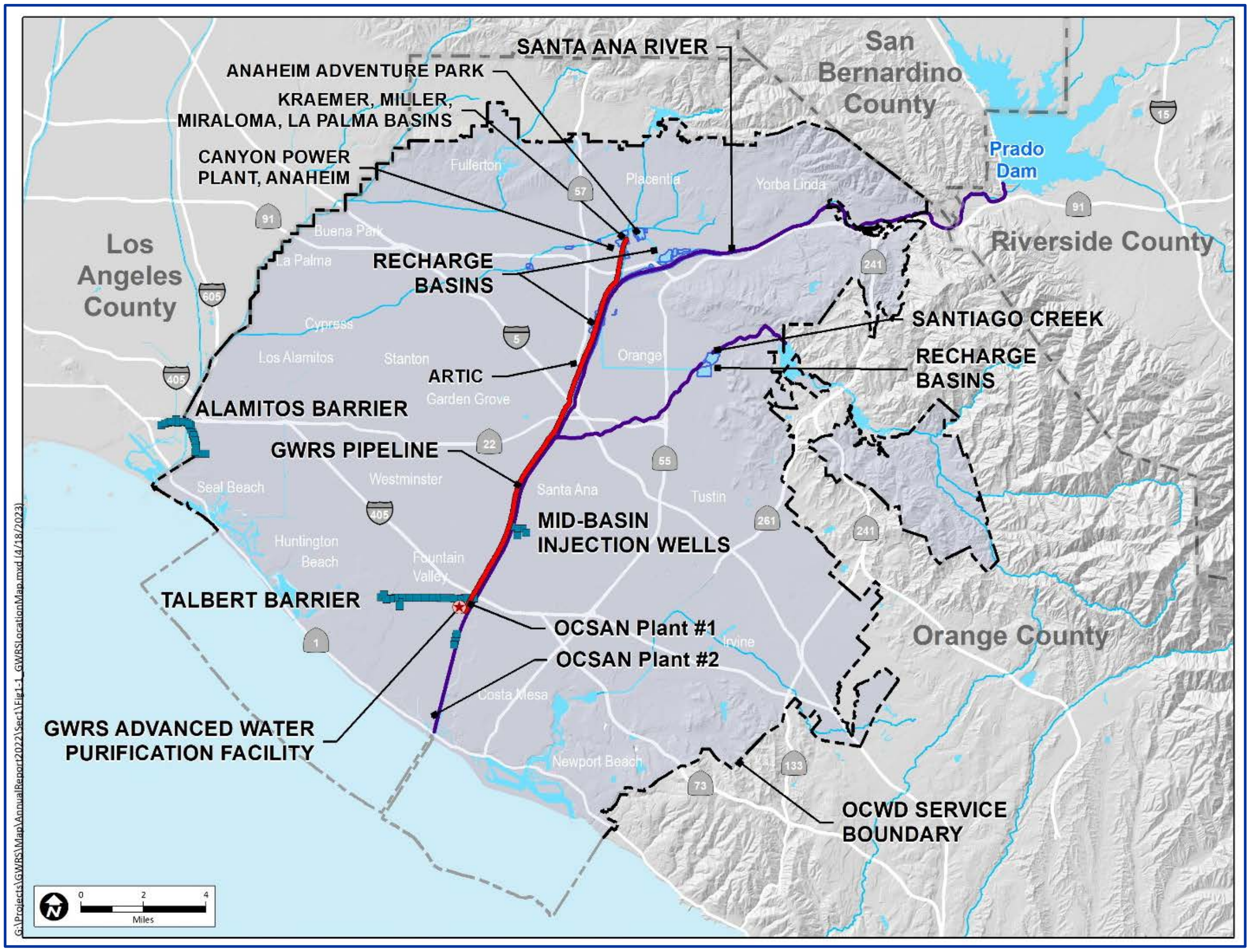


Figure ES-1. Groundwater Replenishment System Location Map

The original AWPF began operation in January 2008 and was designed to produce 70 MGD, or approximately 72,000 acre-feet per year (AFY) (243,000 cubic meters per day [m^3/day]), of purified recycled water based on a minimum on-line factor of 90%. The GWRS Initial Expansion (GWRSIE) began operation in May 2015, increasing the AWPF design production up to 100 MGD, or approximately 103,000 AFY (348,000 m^3/day), of purified recycled water based on a minimum on-line factor of 90%. The GWRSFE began operation on December 12, 2022, increasing the AWPF design production up to 130 MGD, or approximately 145,600 AFY (452,000 m^3/day) based on a minimum on-line factor of 90%.

During 2022, most of the purified recycled water produced by the AWPF was injected at the Talbert Barrier and percolated at K-M-M-L Basins; a lesser volume was injected at the MBI Project and supplied to non-potable water customers.

The Talbert Barrier consists of a series of 36 injection well sites, I1 through I36, that are supplied by pipelines from the AWPF Barrier Pump Station. OCWD constructed the injection barrier to form an underground hydraulic mound, or pressure ridge, that helps prevent seawater intrusion near the coast in the Talbert Gap area. Without the Talbert Barrier, seawater would migrate inland and contaminate the fresh groundwater supply of the Basin. In addition to providing seawater intrusion control, the Talbert Barrier also injects purified recycled water into the deeper Main aquifer with the primary purpose of replenishing the Basin. Potable drinking water may also be injected at the barrier, although blending is not required.

In the Anaheim Forebay area, GWRS purified recycled water and other waters are percolated at K-M-M-L Basins. Other waters may include SAR water and purchased imported water. Purified recycled water is conveyed from the AWPF to these four spreading basins by the 13-mile GWRS Pipeline installed along the west levee of the SAR channel. GWRS recharge at Kraemer and Miller Basins began in January 2008 along with start-up of the rest of the original GWRS components. Miraloma Basin began spreading purified recycled water in July 2012. La Palma Basin began spreading purified recycled water in November 2016. While recharge with purified recycled water is restricted to K-M-M-L Basins, other waters (i.e., SAR and imported) may be recharged at those four basins as well as nearby spreading basins Anaheim Lake, Mini-Anaheim Lake, and La Jolla Basin. Blending of purified recycled water with other waters is not required.

Turnouts from the GWRS Pipeline supply purified recycled water to the MBI Project, Anaheim CPP and ARTIC. The first component of the MBI Project (DMBI Project) began operation in April 2015 and consists of one injection well (MBI-1) near the SAR in Fountain Valley and Santa Ana. The second element of the MBI Project (MBI Centennial Park Project) began injecting purified recycled water at four injection wells (MBI-2 through MBI-5) in March 2020.

Purified recycled water deliveries to Anaheim CPP and to ARTIC for non-potable uses began in July 2011 and November 2014, respectively. A third non-potable water user, Anaheim Adventure Park, began operation at Miraloma Basin in July 2021.

Advanced Water Purification Facility Performance

During 2022 the AWPF produced a total of approximately 31,736 million gallons (MG), or 97,393 acre-feet (AF) (120,132,000 cubic meters [m^3]), of purified recycled water to prevent seawater intrusion, replenish the Basin, and supply non-potable users. A breakdown of the 2022 purified recycled water production and discharge by location is presented in Table ES-1 and illustrated on Figure ES-2.

Table ES-1. 2022 Summary of Purified Recycled Water Flows and Discharge Points

Purified Recycled Water Discharge Point	Annual Average Daily Flow Rate (Avg. MGD)	Annual Volume		Percent (rounded)
		Million Gallons (MG)	Acre-Feet (AF)	
Talbert Barrier	20.3	7,396	22,696	23.3%
Kraemer Basin	0.1	30	93	0.1%
Miller Basin	2.6	950	2,913	3.0%
Miraloma Basin[1]	12.3	4,497	13,801	14.2%
La Palma Basin	44.7	16,307	50,045	51.4%
MBI Project[2]	6.9	2,531	7,769	8.0%
Anaheim CPP	<0.1	21	64	<0.1%
ARTIC	<0.1	4	12	<0.1%
Total	**86.9**	**31,736**	**97,393**	**100%**

[1] Flows and volumes include use by Anaheim Adventure Park, which is located at Miraloma Basin.

[2] MBI Project consists of Mid-Basin Injection Wells.

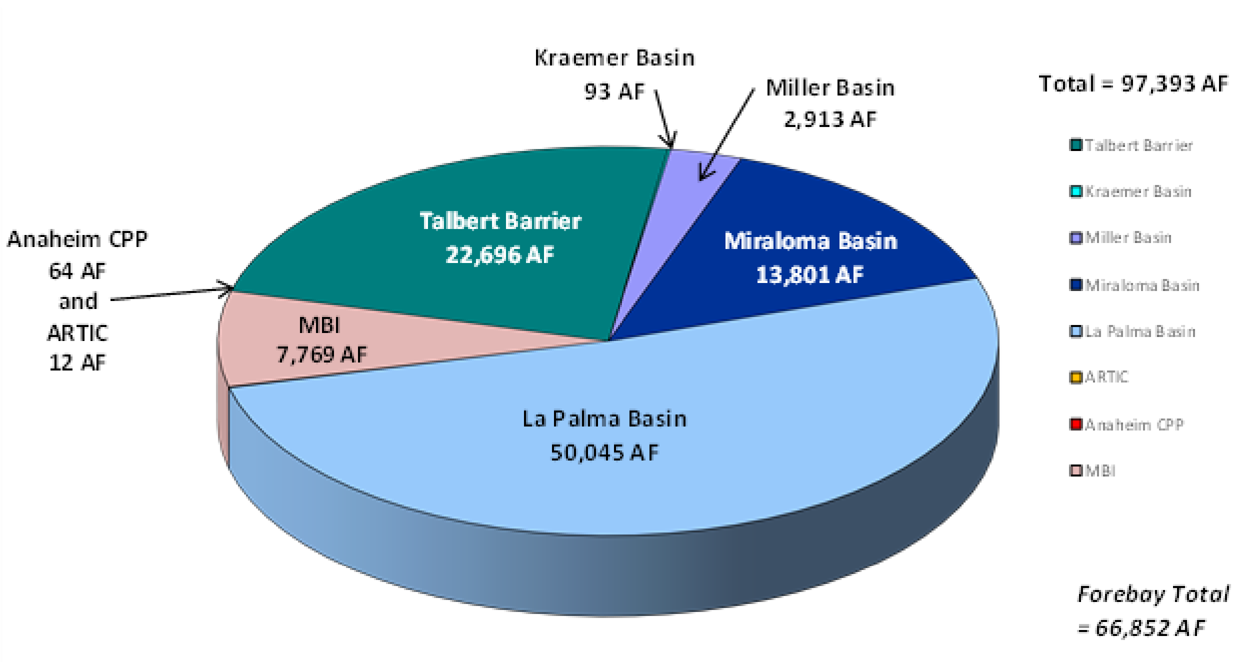
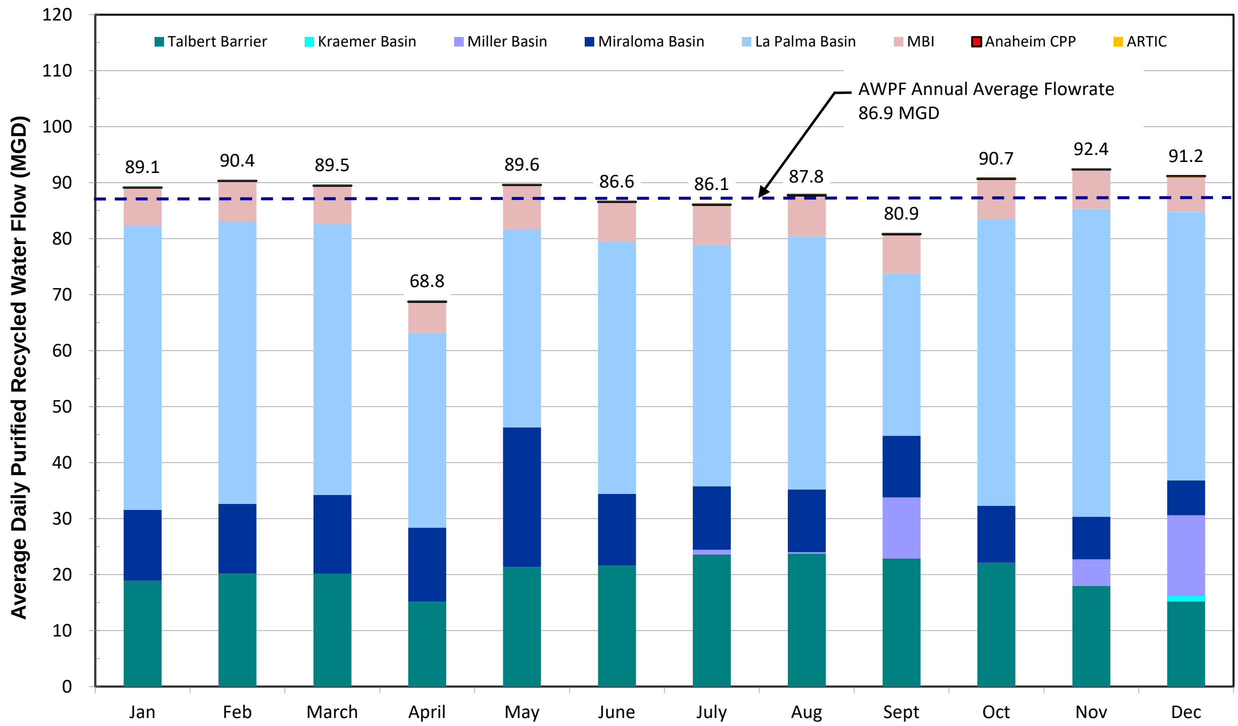


Figure ES-2. 2022 Purified Recycled Water Volume

In terms of average daily flows, the AWPF produced approximately 86.9 MGD (329,000 m^3/day) of purified recycled water in 2022. Overall, the AWPF was on-line approximately 354 days in 2022 (97.0% of the year). Figure ES-3 illustrates the average daily AWPF production by month with the reuse location.



Note: April average daily flow reflects the planned shutdown from April 18 - 22.
December production was reduced by GWRSFE commissioning and UV/AOP validation testing when FPW was diverted to the OC San ocean outfall.

Figure ES-3. 2022 Average Daily Purified Recycled Water Flow By Month

In comparison with prior years, the 2022 purified recycled water production (31,736 MG, 97,393 AF, or 120,132,000 m^3) was approximately 3% higher than the 2021 production, recognizing that both years' production rates were impacted by the GWRSFE construction. Planned and unplanned AWPF shutdowns or production restrictions as well as power curtailments were challenges continued in 2022. As illustrated on Figure ES-4, the 2022 GWRS total purified recycled water production was on par with 2020-2021 when production was also restricted by the GWRSFE construction. In comparison, a record high purified recycled water production was achieved in 2019 (33,521 MG, 102,872 AF or 126,891,000 m^3) primarily due to the absence of construction impacts.

The AWPF treatment processes operated well during the year, producing high quality purified recycled water in compliance with all permit requirements. Table ES-2 summarizes the average purified recycled water, or finished product water (FPW), quality for selected parameters.

Concentrations of inorganic constituents in the purified recycled water, such as aluminum and chromium, were either non-detect or if detected, far below the permit limits. Concentrations of

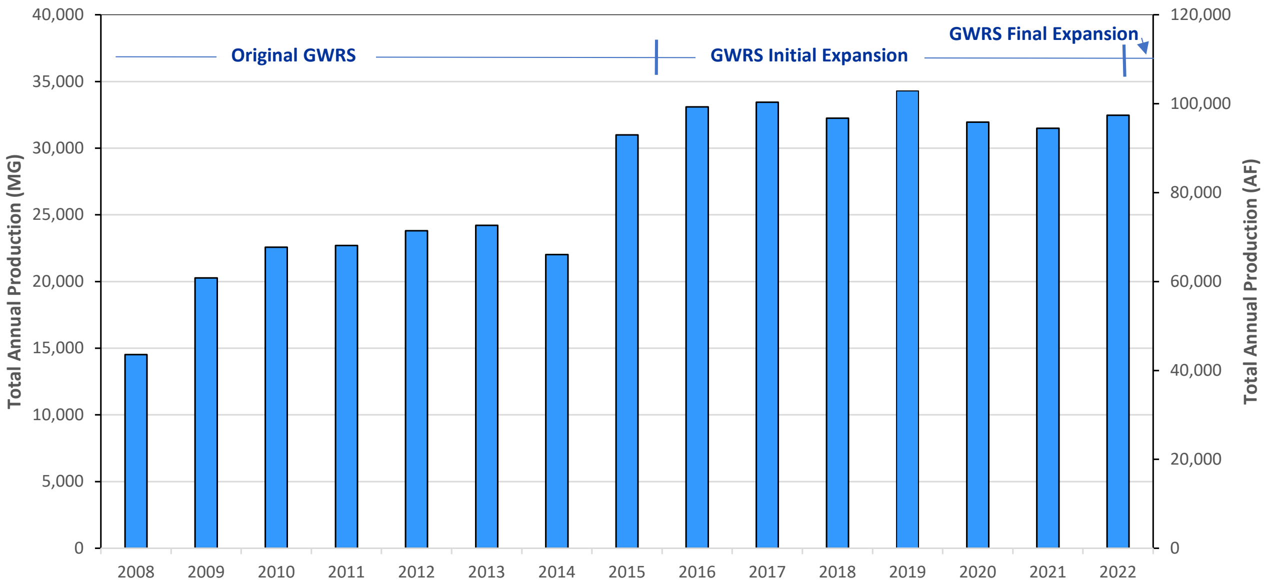


Figure ES-4. Historical GWRS Purified Recycled Water Production Since 2008

Table ES-2. 2022 Average Purified Recycled Water Quality

Parameter Name	Units [1]	FPW [2,3]	Permit Limit
Electrical Conductivity	µmhos/cm	106 [4]	900 [5]
Total Dissolved Solids	mg/L	53	500 [5]
pH	units	8.4 [4]	6 – 9
Chloride	mg/L	6.9	55
Total Nitrogen	mg/L	1.1	5 / 10 [6]
Arsenic	µg/L	<1 [7]	10
1,2,3-Trichloropropane (1,2,3-TCP)	µg/L	<0.005 [7]	0.005
N-nitrosodimethylamine (NDMA)	ng/L	1.0	N/A [8]
1,4-Dioxane	µg/L	<0.5 [7]	N/A
Perfluorooctanoic Acid (PFOA)	ng/L	<2 [7]	N/A
Perfluorooctane Sulfonic Acid (PFOS)	ng/L	<2 [7]	N/A
Perfluorobutane Sulfonic Acid (PFBS)	ng/L	<2 [7]	N/A
Perfluorohexane Sulfonic Acid (PFHxS)	ng/L	<2 [7]	N/A
Total Organic Carbon (unfiltered)	mg/L	0.08	0.5 [9]
Total Coliform	MPN/100 mL	0.1	2.2 [10]

[1] See Acronyms list for units' abbreviations.

[2] FPW is GWRS Finished Product Water (Purified Recycled Water).

[3] Arithmetic average of all available data in 2022. For purposes of calculating annual averages, 10% of the Reportable Detection Limit (RDL) was used for all non-detect (ND) values. Number of significant digits shown matches those in raw data.

[4] On-line average.

[5] See Appendix A for more information.

[6] Total Nitrogen limit was changed from 5 mg/L (RWQCB, 2004a) to 10 mg/L (RWQCB, 2022a).

[7] If all data for the period were ND, then the average is shown as "<RDL."

[8] Not applicable is abbreviated as N/A.

[9] 20-sample running average until December 2022 and 20-week running average beginning December 2022; see Section 2.2.2.2 and Appendix A for more information.

[10] 7-day median limit; see Appendix A for more information.

organic contaminants, such as volatile organic compounds, pesticides, and other synthetic organic compounds, were also non-detect or far below the permit limits. Analyses of purified recycled water for unregulated compounds and chemicals of emerging concern (CECs), such as endocrine disrupting chemicals and pharmaceuticals, were either non-detect or if detected, not found at levels currently thought to pose any significant public health risk. During 2022 the GWRS complied with pathogenic microorganism reduction requirements using the MF, RO, and UV/AOP processes at the AWPF, plus underground retention time as an environmental buffer. Table ES-3 summarizes the daily total pathogen log reduction values achieved in 2022 in comparison to the requirements.

Table ES-3. Summary of GWRS Pathogen Log Reduction Credits Achieved in 2022

Pathogen	Minimum Log Reduction Requirements[1]	Daily Pathogen Log Reduction Value Achieved in 2022					
		Secondary Treat-ment[2]	MF and Cl_2	RO	UV/AOP	Underground Retention Time[3]	Total
Giardia cysts	10	0	4.0	2.0	6.0	0	12.0
Cryptosporidium oocysts	10	0	4.0	2.0	6.0	0	12.0
Viruses	12	0	0	2.0	6.0	4 (5)	12.0

[1] Per Title 22 Water Recycling Criteria (CCR, 2018).

[2] No pathogen reduction credits claimed for secondary treatment at OC San.

[3] Daily virus LRV credit of 4-log for underground retention time, with one exception on 10/6/2022 when 5-log virus LRV credits were taken. See Figure 2-11.

Talbert Barrier Operations

The Talbert Barrier injection supply in 2022 was predominantly purified recycled water produced by the AWPF, as shown in Table ES-4. Negligible volumes of potable water from the Metropolitan Water District of Southern California (MWD) OC-44 turnout and City of Fountain Valley (FV) potable water were also injected at the barrier. Of the total annual volume of 7,404 MG (22,721 AF; 28,026,000 m^3) of injection water, the vast majority (99.89%), 7,396 MG (22,696 AF; 27,995,000 m^3), was GWRS purified recycled water. Only about 8.3 MG (25.4 AF; 31,300 m^3) of potable water were injected at the barrier during 2022. The potable water supply helped maintain a full, pressurized barrier supply pipeline during AWPF shutdowns until the purified recycled water injection was resumed. The total average daily flow rate injected at the Talbert Barrier in 2022 was 20.3 MGD.

Blending of purified recycled water with potable water is no longer required at the Talbert Barrier. While the maximum allowable recycled water contribution (RWC) at the Talbert Barrier is 100%, potable water may still be injected at the barrier.

Annual barrier injection in 2022 was the lowest since the GWRS came on-line in 2008 due to relatively high groundwater elevations throughout the Basin, as well as in the Talbert Gap area where groundwater levels were effectively maintained at or above protective elevations seaward of the barrier. Despite being off-line for 11 days in 2022 compared to 21 days in 2021, barrier injection in 2022 was nearly 12% less than in 2021 primarily due to significantly less coastal groundwater pumping in 2022.

Operation of the Talbert Barrier was consistent and stable throughout 2022 due to a relatively constant purified recycled water supply. Injection was intermittently maintained at relatively high rates at the operating injection wells during 2022; many injection wells were off-line or on standby for much of the year because they were not needed to maintain protective elevations for seawater intrusion control. On an annual basis, larger injection volumes were directed to the west end of the barrier than to the east end of the barrier for both seawater intrusion control and Basin replenishment, as is characteristic every year.

Table ES-4. 2022 GWRS Injection at the Talbert Barrier

Water Source	Flow Rate	Volume (rounded)			Description
	(Avg. MGD)	(MG)	(AF)	(m^3)	
Purified recycled water	20.3	7,396	22,696	27,995,000	GWRS finished product water (FPW)
OC-44 Potable water	<0.1	1.2	3.7	4,600	Imported water from MWD OC-44 turnout
FV Potable water	<0.1	7.1	21.7	26,700	Blend of imported water and groundwater from City of Fountain Valley
Total	**20.3**	**7,404**	**22,721**	**28,026,000**	

Groundwater Monitoring at the Talbert Barrier

The GWRS permit requires quarterly groundwater monitoring near the Talbert Barrier at five OCWD multi-point monitoring well sites: M10, M11, M45, M46, and M47 (RWQCB, 2004, 2020a prior to December 2022; RWQCB 2022a beginning December 2022). In addition to the five required monitoring well sites, OCWD continued to periodically sample a sixth monitoring well site, M19, because of its long history and proximity to the barrier. Groundwater level (piezometric elevation) measurements as well as groundwater quality monitoring for an extensive list of parameters were conducted during 2022 at these monitoring well sites near the barrier. Seasonal fluctuations in groundwater levels indicate that the potable aquifers in the

Talbert Barrier area are largely controlled by groundwater production, which varies considerably from winter to summer water demands, and to a lesser degree by barrier injection.

Barrier compliance monitoring wells were tested for: (1) an extensive list of inorganic, organic and radiological parameters, (2) the majority of the U.S. Environmental Protection Agency (EPA) Priority Pollutants, and (3) 1,4-dioxane and NDMA. Dissolved chloride concentrations continued to be used as an intrinsic tracer to track the subsurface movement of injection water in 2022. Chloride is relatively unaffected by sorption, chemical, or biological reactions in the aquifer, making it a relatively good, conservative tracer, especially since the chloride concentration of GWRS purified recycled water is much lower than both native groundwater and pre-GWRS injection water.

During 2022, groundwater quality at all the Talbert Barrier compliance monitoring wells complied with all Federal and State Primary Drinking Water Standards for the specific analytes tested using DDW-approved methods.

Groundwater quality testing at the compliance monitoring wells during 2022 revealed some results above the Federal and State Secondary Drinking Water Standards for apparent color, odor, and salinity (EC and TDS), similar to those in past years and unrelated to the injection of GWRS purified recycled water. It is suspected that the elevated color and odor levels may be due to the presence of Deep aquifer groundwater containing naturally occurring organic matter.

Testing for 1,4-dioxane and NDMA at monitoring wells near the Talbert Barrier continued quarterly in 2022. All barrier monitoring well sites except M47 had one or more aquifer zones with 1,4-dioxane concentrations that were above the DDW Notification Level (NL) of 1 μg/L during at least a portion of the year, but all samples at all six monitoring wells were significantly below the DDW Response Level (RL) of 35 μg/L for drinking water systems; these detections are a legacy of Water Factory 21 injection prior to GWRS. Concentrations of 1,4-dioxane have been generally decreasing at the barrier monitoring wells except for brief periods of gradient reversals causing older Water Factory 21 injection to migrate back to the wells. In contrast, NDMA was only detected at two monitoring wells during 2022, M19/3 and M46A/1, and was well below the DDW NL of 10 ng/L. In general, OCWD has observed 1,4-dioxane to be more persistent than NDMA in groundwater in the vicinity of the Talbert Barrier. Since the addition of more comprehensive industrial source control by OC San and UV/AOP treatment in 2001 after the discovery of 1,4-dioxane at Water Factory 21, the barrier injection water has consistently been non-detect and/or below the DDW NL for 1,4-dioxane.

Kraemer-Miller-Miraloma-La Palma Basins Operations

Water from three sources was percolated at K-M-M-L Basins and nearby spreading basins (Anaheim Lake, Mini-Anaheim Lake, and La Jolla Basin) in 2022: (1) GWRS purified recycled water (only at K-M-M-L Basins); (2) SAR water; and (3) imported water.

Table ES-5 summarizes the volumes of various waters recharged at Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins during 2022. A total volume of approximately 34,410 MG (105,600 AF; 130,256,000 m^3) of purified recycled water and other water (SAR water and imported water) was recharged at these seven basins.

Table ES-5. 2022 GWRS Spreading in the Vicinity of Kraemer-Miller-Miraloma-La Palma Basins

Water Source[1]	Flow Rate	Volume (rounded)			Description
	(Avg. MGD)	(MG)	(AF)	(m^3)	
Purified recycled water[2]	59.7	21,784	66,853	82,462,000	GWRS finished product water (FPW) delivered
Other water[3]	35.2	12,863	39,475	48,694,000	SAR water and/or imported water percolated
Spreading basin storage[4]		237	727	897,000	Water in recharge basin storage at the end of calendar year
Total	**94.9**	**34,410**	**105,600**	**130,256,000**	

[1] Includes spreading at Anaheim Lake, Mini-Anaheim Lake, Kraemer Basin, Miller Basin, Miraloma Basin, La Palma Basin, and La Jolla Basin.

[2] Purified recycled water is recharged only at K-M-M-L Basins. Volume shown is based on AWPF production records.

[3] Other water volume is estimated based on total percolation and change in basin storage records from Forebay Operations.

[4] Storage is the estimated volume of water either retained in the spreading basins that has not yet percolated or drained from prior volumes in the spreading basins by the end of said calendar year based on percolation records from Forebay Operations.

During 2022, the GWRS purified recycled water discharge was divided between the four spreading basins as follows:

- Kraemer Basin: 30 MG (93 AF; 115,000 m^3), or 0.1 MGD on average;
- Miller Basin: 950 MG (2,913 AF; 3,594,000 m^3), or 2.6 MGD on average;
- Miraloma Basin: 4,497 MG (13,801 AF; 17,023,000 m^3), or 12.3 MGD on average; and
- La Palma Basin: 16,307 MG (50,045 AF; 61,730,000 m^3), or 44.7 MGD on average.

In 2022, La Palma and Miraloma Basins received only GWRS purified recycled water. Historically, La Palma and Miraloma Basins have been dedicated almost exclusively to GWRS purified recycled water to minimize clogging and to maintain their exceptionally high percolation rates. Kraemer and Miller Basins typically receive both GWRS purified recycled water and other water.

Blending of purified recycled water with other water is no longer required for the Anaheim Forebay recharge operations. While the sources and volumes of spreading water continue to be reported, determination of the RWC is no longer required.

Groundwater Monitoring at the Anaheim Forebay

Groundwater monitoring near K-M-M-L Basins is required by the GWRS permit (RWQCB, 2020a before December 2022, and RWQCB, 2022a beginning December 2022) at five OCWD monitoring well sites: nested monitoring wells AMD-10 (required prior to December 2022) and AMD-12, plus single-point monitoring wells AM-7, AM-8, and AM-10. Monitoring well site AMD-10 is no longer a required monitoring location under the new GWRS permit (RWQCB, 2022a) and, since December 2022, is now a voluntary groundwater monitoring site. In addition to these monitoring wells, OCWD continued to periodically sample another single-point monitoring well OCWD-KB1 because of its proximity to Kraemer Basin and long historical record. Groundwater level measurements as well as groundwater quality monitoring for an extensive list of parameters were conducted during 2022 at these monitoring well sites near K-M-M-L Basins.

The Shallow aquifer groundwater flow paths emanating from K-M-M-L Basins, inferred from June 2022 groundwater elevation contours, were towards the west-southwest, similar to those in prior years. Shallow aquifer groundwater elevations at the monitoring wells were 3-10 feet lower in June 2022 than in June 2021 due to: (1) decreased Basin storage, (2) less rainfall in calendar year (CY) 2022 (6.71 inches) than in CY 2021 (9.16 inches), (3) lower recharge from April through June of 2022 compared to those three months in 2021, and (4) more pumping in 2022 than in 2021 upgradient (east) of Anaheim Lake from Yorba Linda Water District (YLWD) wells that were on stand-by during most of 2021 and were placed back on-line in early 2022 with PFAS treatment systems. Groundwater level trends during 2022 followed the typical seasonal pattern, rising in the winter and early spring, declining in the late spring and summer, and recovering in the late fall to the end of the year. The groundwater levels near K-M-M-L Basins during 2022 exhibited a large seasonal amplitude of 25-40 feet from the winter high to the late summer low.

Anaheim Forebay compliance monitoring wells were tested for: (1) an extensive list of inorganic, organic, and radiological parameters, (2) the majority of EPA Priority Pollutants, and (3) 1,4-dioxane and NDMA. During 2022, groundwater quality at all the Forebay compliance monitoring wells complied with all Federal and State Primary Drinking Water Standards for the specific analytes tested using DDW-approved methods.

No detections of 1,4-dioxane or NDMA were found in groundwater at any of the Forebay monitoring wells in 2022. Groundwater quality testing during 2022 at three compliance monitoring well sites, AM-7, AM-8, and AMD-10, revealed constituents above the Federal Secondary Drinking Water Standards for apparent color, odor, and iron, as well as turbidity at AMD-10/4 and manganese at AMD-10/5. Corrosion of the mild steel well casings at these three monitoring well sites was likely the contributing factor causing the Secondary MCL exceedances for total iron.

Manganese has been intermittently detected above the Secondary MCL at monitoring well AMD-10/5 since 2007, prior to commencement of GWRS recharge at Kraemer-Miller Basins in 2008.

Manganese concentrations decreased below the Secondary MCL in late-2019 along with a contemporaneous decrease in chloride concentrations for the first time that signaled the first arrival of GWRS water at this deep well. During 2022, manganese increased slightly above the Secondary MCL before again declining to below the Secondary MCL in the fourth quarter. The minor increase in manganese during 2022 was contemporaneous with an increase in chloride at well AMD-10/5 implying a non-GWRS manganese source or release trigger, such as arrival of SAR recharge following a GWRS water arrival event.

All the other Secondary MCL exceedances at AM-7, AM-8, and AMD-10 during 2022 were consistent with the historic monitoring data (2008-2022) and were not associated with the presence of GWRS purified recycled water.

OCWD continued additional non-compliance (voluntary) monitoring for dissolved arsenic; increases in arsenic concentrations correlate to contemporaneous chloride concentration decreases with the sustained arrival of large percentages of GWRS water, and subsequent decreases in arsenic correlate to contemporaneous increases in chloride with arrival of non-GWRS other water. Although GWRS purified recycled water arrival is the cause of the increased arsenic concentrations, it is not the source of the arsenic. Historically, SAR water recharged with elevated arsenic concentrations adsorbed onto mineral surfaces in the aquifer; the higher initial pH or lower ionic strength of GWRS water relative to surrounding groundwater causes the arsenic to desorb. Due to mass removal of arsenic during each sustained near-100% GWRS arrival event, each successive GWRS arrival event has generally led to reduced arsenic peaks, eventually declining below ambient concentrations until arrival of other water brings new arsenic mass for adsorption once again. To limit arsenic mobilization in the aquifer, operation of the AWPF post-treatment processes were modified beginning in 2015 to more closely control the FPW pH, targeting pH 8.5.

MBI Project Operation

The MBI Project was implemented in two phases: DMBI Project and MBI Centennial Park Project. The DMBI Project began injection of purified recycled water that was delivered via the GWRS Pipeline to the MBI-1 site in April 2015. The MBI Centennial Park Project began operation in March 2020 and consists of four injection wells, MBI-2, MBI-3, MBI-4, and MBI-5, which are also supplied purified recycled water by the GWRS Pipeline. The primary objective of the collective MBI Project is to replenish a heavily pumped region of the Principal aquifer more locally and directly. Over 90% of groundwater production in the Basin occurs from the Principal aquifer system.

During 2022 approximately 2,531 MG (7,769 AF; 9,583,000 m^3) of purified recycled water was injected at all five MBI Project wells. Blending of purified recycled water with potable water is not required at the MBI Project, and no other water was injected in 2022. Periodic backwash pumping of the five MBI wells totaled approximately 22.9 MG (70.4 AF; 87,000 m^3) during 2022, representing 0.9% of the total injection. All water produced during backwash pumping of the MBI wells is discharged to adjacent channels near the SAR under RWQCB and County of Orange Flood Control permits.

The total monthly injection volume at the MBI Project was distributed somewhat evenly among the five MBI Project wells, with MBI-5 consistently receiving slightly more injection than the other wells and MBI-3 receiving slightly less. The average daily injection rates by well during 2022 (average for all days, including on- and off-line) were:

- MBI-1 1.45 MGD
- MBI-2 1.39 MGD
- MBI-3 1.01 MGD
- MBI-4 1.18 MGD
- MBI-5 1.96 MGD

The total average daily injection rate was 6.9 MGD at the MBI Project during 2022. If only days when MBI wells were injecting are considered (i.e., excluding off-line days with AWPF shutdowns), the average daily injection rate of the five MBI wells during 2022 was 7.9 MGD. Injection yields at all five MBI wells declined in 2021 but stabilized in 2022, remaining approximately at late-2021 levels.

Groundwater Monitoring at the MBI Project

Groundwater monitoring for the MBI Project began in 2012 and continued through 2022. As part of the DMBI Project, two monitoring wells, SAR-10 and SAR-11, were installed immediately downgradient of MBI-1. However, monitoring at SAR-10 and SAR-11 was no longer required as SAR-12 and SAR-13, installed in late-2017 along a flow path from the MBI wells toward the closest downgradient drinking water production wells IRWD-12 and IRWD-17, now serve as the required permit compliance wells for the MBI Project.

Commencement of the MBI Project in March 2020 with all five MBI wells fully on-line also represented the start of the GWRS intrinsic tracer test to determine the underground travel time of injected purified recycled water to the downgradient compliance wells SAR-12 and SAR-13. Groundwater level and quality results from all four monitoring wells sites have been instrumental in determining groundwater flow patterns and velocities emanating from the MBI Project. Table ES-6 summarizes the estimated arrival times of GWRS purified recycled water at the SAR-12 and SAR-13 sites. Based on biweekly sulfate sampling, results of the tracer test estimated that the fastest arrival of GWRS purified recycled water occurred in the deepest aquifer zone (Main 7) at SAR-12/4 and SAR-13/4 at 6.1 and 2.1 months, respectively. Sampling continued during 2022 indicating sulfate concentrations declined as higher proportions of GWRS purified recycled water reached other aquifer zones with longer travel times (SAR-12/3, SAR-13/1, SAR-13/2, and SAR-

13/3). Only two monitoring wells (SAR-12/1 and SAR-12/2) showed no arrival of GWRS purified recycled water in 2022.

Table ES-6. GWRS Water Arrival Time Estimates to SAR-12 and SAR-13

Monitoring Well	Screened Interval (ft bgs)	Aquifer Name	Distance from nearest MBI Well (ft)	Sulfate[1] Arrival Time (days)	Sulfate[1] Arrival Time (months)
SAR-12/1	605 - 625	Lower Rho	1,025 (MBI-2)	No Arrival	No Arrival
SAR-12/2	755 - 775	Main 2	1,025 (MBI-2)	No Arrival	No Arrival
SAR-12/3	915 - 930	Main 4	1,025 (MBI-2)	379	12.6
SAR-12/4	1,045 - 1,055	Main 7	1,025 (MBI-2)	183	6.1
SAR-13/1	600 - 620	Lower Rho	725 (MBI-5)	155	5.2
SAR-13/2	750 - 770	Main 2	725 (MBI-5)	470	15.7
SAR-13/3	910 - 930	Main 4	725 (MBI-5)	155	5.2
SAR-13/4	1,045 - 1,055	Main 7	725 (MBI-5)	64	2.1

[1] Sulfate biweekly sampling with arrival times based on 10 to 20% reduction from most recent ambient.

The arrival of GWRS purified recycled water is also evident at IRWD-12 and IRWD-17 based on declines in tracer concentrations. During 2022, chloride and sulfate concentrations at IRWD-12 remained well below ambient background levels, supporting the 2020 tracer test observation that GWRS purified recycled water arrival time of 182 days or approximately 6 months from the MBI Project to IRWD-12.

Chloride and sulfate concentrations at IRWD-17 continued the gradual decline that began in 2020. A sulfate reduction of at least 10% was first observed at IRWD-17 in April 2021, yielding a GWRS water arrival time of 393 days or approximately 13 months from the startup of the MBI Project tracer test (March 18, 2020).

Groundwater quality monitoring for the MBI Project was similar to the Talbert Barrier and Anaheim Forebay: (1) an extensive list of inorganic, organic and radiological parameters, (2) the majority of the U.S. EPA Priority Pollutants, and (3) 1,4-dioxane and NDMA. During 2022, groundwater quality at all four monitoring wells SAR-10, SAR-11, SAR-12, and SAR-13 complied with all Federal and State Primary Drinking Water Standards for the specific analytes tested using DDW-approved methods. Results of groundwater analyses during 2022 indicated that arsenic remained below the Primary MCL (<10 µg/L) at all four monitoring wells. Two instances of aluminum exceeding the Secondary MCL (<200 µg/L) occurred at SAR-10/1 during 2022. Similar to the spikes observed in 2020-2022, the likely cause of the brief elevated aluminum levels in 2022 at SAR-10/1 was the AWPF shutdown and restart of injection at MBI-1, allowing native groundwater to move into and then back out of the SAR-10/1 zone, causing localized adsorption and subsequent desorption of aluminum. No other MBI monitoring well zones at SAR-10, SAR-11, SAR-12, or SAR-13 have exhibited comparably significant increases in aluminum. While iron concentrations at SAR-10/1 have followed the trend of aluminum from 2015-2021, no iron concentrations above the Secondary MCL (<300 µg/L) were observed at SAR-10/1 during 2022.

Groundwater at monitoring well sites SAR-10, SAR-11, SAR-12, and SAR-13 was sampled and analyzed for 1,4-dioxane and NDMA during 2022. All zones at the four MBI Project monitoring wells (SAR-10, SAR-11, SAR-12, and SAR-13) continued to be non-detect for 1,4-dioxane during 2022. NDMA concentrations in all four zones of SAR-10 during 2022 ranged from below the RDL (2 ng/L) to 9.2 ng/L, remaining below the NL (10 ng/L). NDMA concentrations at all zones of SAR-11, SAR-12, and SAR-13 were either non-detect or well below the NL during 2022.

During 2022 OCWD continued to refine the Talbert Model in the MBI Project area, improving the flow and transport calibration as well as using field-measured electrical conductivity as a tracer instead of sulfate. The refined Talbert Model has been adequately calibrated and is currently being used to develop a three-month primary and four-month secondary boundary area for the MBI Project area based on simulated GWRS arrival within the fastest flow path Main 7 aquifer zone (model layer 17) for the conservative condition of all five MBI wells simultaneously injecting at full capacity along with higher summer pumping rates at the downgradient IRWD Dyer Road Well Field (DRWF). Results of the Final MBI Tracer Test Report are pending.

Conclusions

The GWRS operated in compliance with its permits throughout 2022, producing a total of 31,736 MG, or 97,393 AF (120,132,000 m^3) of purified recycled water for injection at the Talbert Barrier, spreading at K-M-M-L Basins, injection at the MBI Project, and delivery to Anaheim CPP, ARTIC, and Anaheim Adventure Park for non-potable use. Of the purified recycled water produced, approximately 23% was injected at the barrier and nearly 69% was recharged at the spreading basins, including 51% at La Palma Basin alone. Approximately 8% was injected at the MBI Project, and a negligible volume (0.1%) was used for non-potable water purposes. On an annual average basis, the AWPF produced 86.9 MGD (329,000 m^3/day) of purified recycled water and was on-line 97.0% of the time in 2022. Purified recycled water production was sometimes limited due to GWRSFE construction activities and short-term power interruptions.

By the end of 2022, OCWD completed construction of the GWRSFE with the exception of “punch list” items. On December 12, 2022, the AWPF began receiving secondary effluent from OC San Plant 2 to supplement the source water from OC San Plant 1. The GWRSFE increased purified recycled water production up to 130 MGD (145,600 AFY; 179,630,000 m^3/year) to continue to supply the Talbert Barrier, replenish the Basin at the Anaheim Forebay and MBI Project, and be used for non-potable purposes at the Anaheim CPP, ARTIC, and Anaheim Adventure Park. OCWD is planning to recharge GWRS purified recycled water at other sites in the future.

1. INTRODUCTION

The Groundwater Replenishment System (GWRS) is a water supply project jointly sponsored by Orange County Water District (OCWD) and Orange County Sanitation District (OC San). The GWRS supplements existing water supplies by providing a reliable high-quality source of water to recharge the Orange County Groundwater Basin (the Basin), to protect the Basin from degradation due to seawater intrusion, and to also provide a water source for non-potable uses.

This introductory section of the 2022 Annual Report for the GWRS presents the:

- Purpose of the Annual Report;
- Description of the GWRS and Advanced Water Purification Facility (AWPF);
- History of OCWD Water Recycling Facilities; and
- Overview of the Operation Optimization Plan (OOP).

1.1 Purpose of the Annual Report

OCWD is the lead agency for the GWRS and responsible for permit compliance. The GWRS permit sets forth requirements for production and use of purified recycled water for: (1) injection at the Talbert Barrier; (2) spreading at Kraemer-Miller-Miraloma-La Palma (K-M-M-L) Basins; (3) injection at the Mid-Basin Injection (MBI) Project; and (4) non-potable water uses. One of the permit requirements is submittal of an Annual Report.

This Annual Report for 2022 is prepared in fulfillment of the requirements specified in the GWRS permit issued by the California Regional Water Quality Control Board, Santa Ana Region (RWQCB). From January 2022 until December 2022, OCWD operated the GWRS in compliance with *"Producer/User Water Recycling Requirements and Monitoring and Reporting Program for the Orange County Water District Interim Water Factory 21 and Groundwater Replenishment System Groundwater Recharge and Reuse at Talbert Gap Seawater Intrusion Barrier and Kraemer/Miller Basins"* adopted as Order No. R8-2004-0002 by the RWQCB on March 12, 2004 (RWQCB, 2004), and four subsequent amendments: (1) Order Nos. R8-2008-0058 on July 18, 2008 (RWQCB, 2008); (2) R8-2014-0054 on December 12, 2014 (RWQCB, 2014a); (3) R8-2016-0051 on July 29, 2016 (RWQCB, 2016); (4) R8-2019-0007 on March 22, 2019 (RWQCB, 2019). In November 2020, the RWQCB issued Revised Monitoring and Reporting Program requirements (RWQCB, 2020a), incorporating modifications to the 2004 permit made through amendments, correspondence, and updates for the Recycled Water Policy (SWRCB, 2018). On December 2, 2022, the RWQCB replaced the prior amended permit with a new permit, *"Order No. R8-2022-0050, Waste Discharge Requirements and Master Recycling Permit for the Orange County Water District Groundwater Replenishment System"* (RWQCB, 2022a).

Related to non-potable water use, in March 2021 the RWQCB adopted Order No. R8-2021-0003 "*Waste Discharge Requirements and Master Recycling Permit for Orange County Water District Advanced Water Purification Facility*" (RWQCB, 2021a). The 2021 order separately specified requirements for the GWRS for purified recycled water for non-potable uses, including requiring an Annual Report. The provisions of the 2021 order were incorporated into and superseded by the new 2022 GWRS permit (RWQCB, 2022a).

This 2022 Annual Report for the GWRS is intended to fulfill the requirements of Order Nos. R8-2004-0002 (as amended) and R8-2021-0003 that were in effect through December 1, 2022, as well as the new Order No. R8-2022-0050 that became effective on December 2, 2022. Monitoring and reporting requirements under the new permit became effective on January 1, 2023. This Annual Report serves two overall purposes by providing: (1) an in-depth review and evaluation of the operation of the entire GWRS during 2022 in fulfillment of the permit requirements; and (2) a continuing historical record of the operations of the OCWD water reuse and groundwater recharge facilities.

Information for this report was based on: (1) review of laboratory and on-line water quality data; (2) review of operations reports and groundwater monitoring records compiled by OCWD; and (3) on-site and virtual observations by the authors.

A complete detailed list of water quality permit requirements and purified recycled water quality during 2022 can be found in Appendix A. Appendices B and C contain laboratory analysis methods used for water quality monitoring. All water quality analyses are performed by state-certified laboratories that operate in accordance with quality assurance plans.

1.2 Groundwater Replenishment System

The GWRS produces a reliable, high-quality source of purified recycled water, recharges the Basin, and protects it from further degradation due to seawater intrusion.

The GWRS consisted of the following major components during 2022:

- AWPF, which includes treatment processes and pumping stations (further described in Section 2);
- Talbert Barrier, featuring injection wells and pipelines (further described in Section 3);
- K-M-M-L Basins, which are surface percolation basins supplied by the GWRS Pipeline (further described in Section 5);
- MBI Project, consisting of five injection wells supplied by the GWRS Pipeline (further described in Section 7); and
- Three non-potable end users: Anaheim Canyon Power Plant (Anaheim CPP) and Anaheim Regional Transportation Intermodal Center (ARTIC), both of which are supplied by

turnouts from the GWRS Pipeline, and Anaheim Adventure Park which operates at Miraloma Basin.

GWRS purified recycled water production by the AWPF, injection at the Talbert Barrier, and spreading at Kraemer-Miller Basins began in January 2008. Spreading at Miraloma Basin began in July 2012. GWRS purified recycled water injection at the DMBI injection well (MBI-1) began in April 2015, and four additional MBI injection wells were placed on-line in March 2020. Spreading at La Palma Basin began in November 2016. Purified recycled water service for non-potable purposes began at Anaheim CPP in July 2011 and at ARTIC in November 2014. The third non-potable water user, Anaheim Adventure Park, began operation in July 2021.

Secondary-treated wastewater is diverted from OC San facilities to the GWRS AWPF, where it is treated to better than drinking water standards using membrane filtration (MF), reverse osmosis (RO), an ultraviolet light/advanced oxidation process (UV/AOP), decarbonation, and lime stabilization. Following advanced treatment, two pumping stations at the AWPF in Fountain Valley deliver the purified recycled water to the: (1) Talbert Barrier in Fountain Valley and Huntington Beach, and (2) K-M-M-L Basins, with service connections to Anaheim CPP and ARTIC in Anaheim, plus the MBI Project in Fountain Valley and Santa Ana. Figure 1-1 schematically shows the location of the GWRS facilities in central Orange County, California.

The existing AWPF design purified recycled water production capacity is 130 million gallons per day (MGD). In December 2022, the GWRS Final Expansion (GWRSFE) increased the AWPF design purified recycled water production capacity from 100 to 130 MGD; related work included headworks improvements, flow equalization, and pumping facilities at OC San Plant 2 to convey reclaimable secondary-treated wastewater to the AWPF. AWPF source water flow equalization helps compensate for the diurnal fluctuation in secondary effluent from the OC San plants, i.e., higher daytime flows and lower nighttime flows.

Besides water supply, another purpose of the GWRS is to provide peak flow relief for OC San during emergency, high wet weather flow conditions. During peak wastewater flow events, the AWPF can provide hydraulic relief for the OC San ocean outfall by discharging up to 100 MGD of membrane filtered, ultraviolet (UV)-disinfected, recycled water to the Santa Ana River (SAR) under RWQCB Order No. R8-2022-0002/NPDES CA8000408R8 (RWQCB, 2022b), which became effective on April 1, 2022. The 2022 Order replaced the previous Order R8-2014-0069 (RWQCB, 2014b), which was effective from January 2015. Alternatively, since the GWRS Initial Expansion (GWRSIE) was completed in 2015, the AWPF can provide similar hydraulic relief for the OC San ocean outfall by continuing normal operation and production of up to 100 MGD of purified recycled water for recharge. The GWRSFE completed in 2022 enables the AWPF to provide up to 130 MGD of hydraulic relief for the OC San ocean outfall by continuing normal operation.

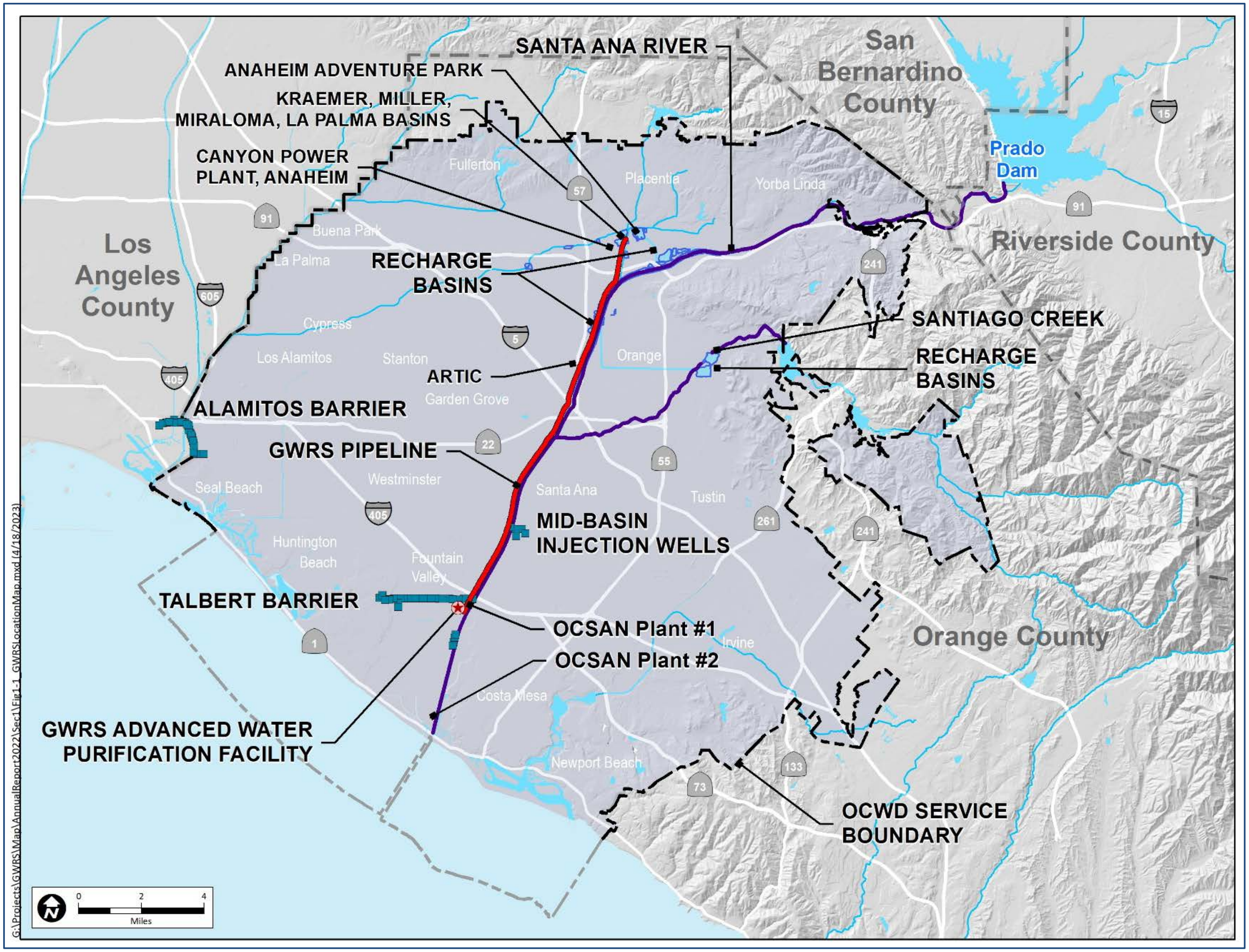


Figure 1-1. Groundwater Replenishment System Location Map

1.2.1 Source Water

Source water for the GWRS is secondary-treated wastewater, or secondary effluent, from the OC San. Prior to December 2022, the GWRS source water supply was entirely secondary effluent from OC San Reclamation Plant No. 1 (Plant 1 or P1). Beginning on December 12, 2022, reclaimable secondary effluent from OC San Treatment Plant No. 2 (Plant 2 or P2) was added to the GWRS source water supply for normal purified recycled water production. In order to produce 130 MGD of purified recycled water, the AWPF needs approximately 173 MGD of secondary effluent based on design recovery rates. The AWPF source water is currently comprised of a variable blend of secondary effluent from OC San Plants 1 and 2. Disinfected tertiary effluent from the Irvine Ranch Water District (IRWD) Michelson Water Recycling Plant (MWRP) may also be used as AWPF source water; however, no MWRP effluent was used by the GWRS prior to or during 2022.

Plant 1, which is located adjacent to the OCWD AWPF in Fountain Valley, has a rated secondary treatment capacity of 182 MGD (annual average dry weather). In addition to the GWRS, Plant 1 also provides secondary effluent for the Green Acres Project (GAP), which is a 7.5 MGD capacity tertiary treatment plant operated by OCWD that produces recycled water for non-potable irrigation and industrial uses. Modification projects at Plant 1 have improved its solids thickening and dewatering capability to support its liquid treatment capacity.

Plant 2, which is located in Huntington Beach near the coast, has a rated secondary treatment capacity of 150 MGD (annual average dry weather). Plant 2 secondary effluent was not an approved source for the GWRS until December 2022 (RWQCB, 2022a). Headworks and treatment process modifications and new flow equalization and pumping facilities were recently completed at Plant 2 to segregate reclaimable secondary effluent to supplement the GWRS source water supply and support the GWRSFE. Non-reclaimable secondary effluent is discharged via an existing outfall to the Pacific Ocean.

OC San maintains an industrial pretreatment and source control program to manage contaminants entering the wastewater tributary to both Plants 1 and 2 which may be harmful to the treatment facilities, environment, or to human health and drinking water supplies. The comprehensive OC San program fulfills the GWRS permit requirements and Title 22 Water Recycling Criteria source control requirements for groundwater replenishment with recycled water (CCR, 2018), ultimately helping to protect GWRS purified recycled water quality.

1.2.1.1 OC San Plant 1 Secondary Treatment

Raw wastewater influent to Plant 1 passes through the metering and diversion structure, mechanical bar screens, and grit chambers, which comprise preliminary treatment. Following screening and grit removal, the wastewater receives advanced primary treatment using ferric chloride and anionic polymer addition and primary sedimentation. Primary effluent is then conveyed to the activated sludge (AS) plants or to trickling filters (TF) for secondary treatment. The existing TF and associated secondary clarifiers were upgraded and began operation in October 2006 with a design treatment capacity of 30 MGD. The older AS plant (OC San Project No. P1-82 or AS1), which consists of aeration basins and secondary clarifiers, was upgraded in August 2007 to include anoxic and oxic zones and has a design treatment capacity of 80 MGD. Historically, OC San operated the P1 AS1 plant in the carbonaceous biochemical oxygen demand (CBOD) mode. Since late 2009, the P1 AS1 plant has operated in the biological nitrification/partial denitrification (NdN) mode. The newer AS plant at Plant 1 (OC San Project No. P1-102 or AS2) was completed in July 2012 with a design capacity of 60 MGD and has operated in the NdN mode achieving partial denitrification. Both P1 AS1 and P1 AS2 effluents are blended and used as source water for the GWRS.

Solids handling at Plant 1 consists of thickening centrifuges, anaerobic digestion, holding tanks, dewatering centrifuges, and truck loading facilities to haul stabilized solids to disposal. Support facilities include chemical addition, plant and city water systems, odor control, digester gas handling, and on-site power generation. Major upgrades to the biosolids thickening and dewatering facilities (OC San Project No. P1-101) were completed in 2019.

Since mid-2009, OC San has operated the Steve Anderson Lift Station (SALS) that conveys up to 50 MGD of additional raw wastewater to Plant 1 to increase the amount of secondary effluent available for the GWRS.

Nearly all secondary effluent from Plant 1 is recycled by OCWD at the GWRS and GAP. Secondary effluent flows by gravity to the GWRS AWPF, first passing through fine screens which are located at the Plant 1 site. While the ratio is variable, typically at least three times as much AS effluent (P1 AS1 plus P1 AS2) as TF effluent (P1 TF) is delivered from Plant 1 to the AWPF as feedwater.

1.2.1.2 OC San Plant 2 Secondary Treatment

Plant 2 features two separate wastewater treatment trains: reclaimable and non-reclaimable. The headworks was modified in 2022 by installing gates and stop plates to separate reclaimable wastewater from non-reclaimable wastewater as the various trunk sewer lines enter the plant (OC San Project No. P2-122). Modifications to the influent pump station were made to maintain the flow segregation, conveying wastewater to separate treatment process trains at Plant 2.

Reclaimable wastewater is screened, pumped to grit basins, metered and conveyed to primary sedimentation. Ferric chloride and polymer are added upstream of the primary clarifiers for advanced primary treatment. Primary effluent is pumped to trickling filter/solids contact (TF/SC) facilities. Clarified secondary effluent from the TF/SC facilities (P2 TF/SC effluent) is disinfected using sodium hypochlorite, stored in flow equalization tanks, and pumped to the GWRS AWPF screening facility. Up to 60 MGD of reclaimable secondary effluent can be delivered from Plant 2 to the AWPF as feedwater, although typically flows from Plant 1 are maximized as these flows are more easily treated by the GWRS, while also considering OC San's flow balancing and other operational needs. Any excess flow at Plant 2 is dechlorinated and discharged to the ocean.

Non-reclaimable wastewater at Plant 2 is treated by a separate train featuring screens, grit removal, metering, and primary sedimentation. Ferric chloride and polymer can be added upstream of the primary clarifiers for advanced primary treatment. Primary effluent is pumped to the pure oxygen activated sludge (POAS) aeration basins followed by secondary clarifiers. Non-reclaimable secondary effluent is disinfected using sodium hypochlorite, dechlorinated using sodium bisulfite, and pumped to the ocean outfall.

Primary solids at Plant 2 are stabilized by anaerobic digesters. Waste secondary sludge is thickened by dissolved air flotation units and treated by the anaerobic digesters. Stabilized biosolids are dewatered using centrifuges, and the resulting cake is transferred to storage hoppers and trucked to biosolids recycling compost sites. Support facilities at Plant 2 include chemical addition, plant and city water systems, odor control, digester gas handling, and on-site power generation.

1.2.2 Advanced Water Purification Facility

The AWPF features MF, RO, and UV/AOP advanced water treatment processes applied to 100% of the influent flow stream, followed by decarbonation and lime stabilization post-treatment processes, with large pumping stations to convey the purified recycled water to the Talbert Barrier, K-M-M-L Basins, MBI Project, and three non-potable water customers. Figure 1-2 shows the entrance to the AWPF. The AWPF process flow diagram is shown on Figure 1-3, and Figure 1-4 shows the site layout.

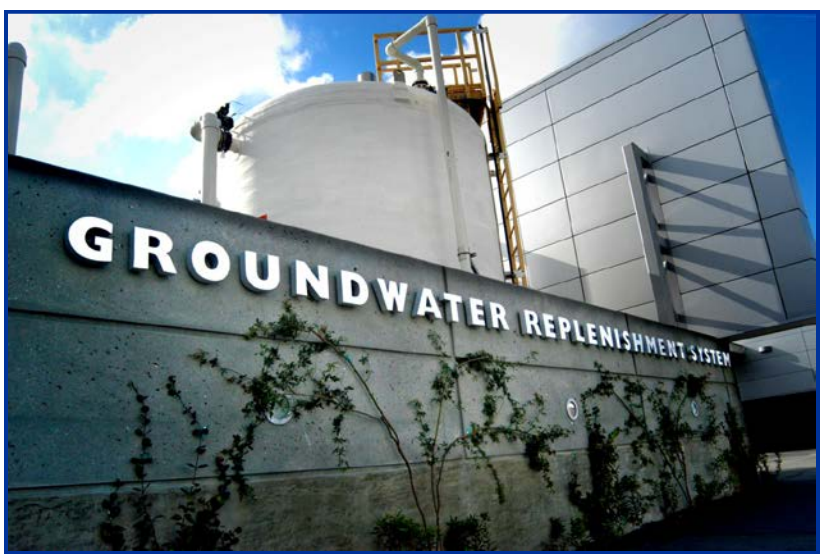


Figure 1-2. Groundwater Replenishment System

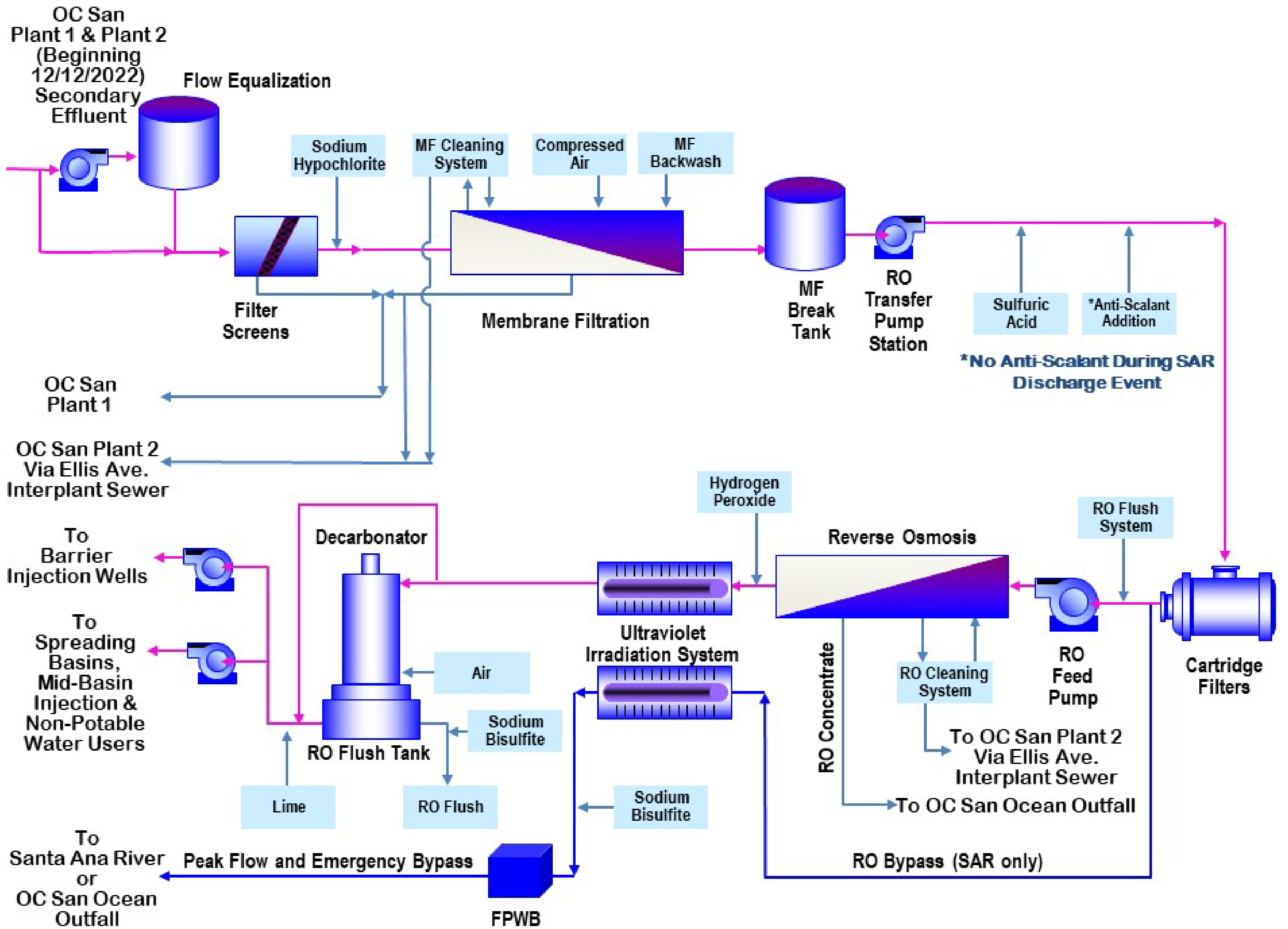


Figure 1-3. GWRS AWPF Process Flow Diagram

Figure 1-4. AWPF Site Layout with GWRSFE

1.3 History of OCWD Water Recycling Facilities

OCWD has a long history of water recycling for potable reuse, comprised of three recycled water groundwater recharge "eras", which can generally be identified by the water reclamation facilities in service at the time:

- Water Factory 21 (WF-21) — October 1976 to January 2004
- Interim Water Factory 21 (IWF-21) — June 2004 to August 2006
- GWRS AWPF — January 2008 to present

These OCWD water recycling facilities have produced highly treated recycled water for groundwater recharge at the Talbert Barrier. During two transitional periods, roughly from February to May 2004, and again from September 2006 until January 2008, OCWD had no operational facilities producing recycled water for groundwater recharge due to construction at the site.

Presently, the GWRS AWPF produces purified recycled water for injection and recharge at the Talbert Barrier and MBI Project and for recharge at K-M-M-L Basins to replenish the Orange County Groundwater Basin, plus limited non-potable uses.

1.3.1 Water Factory 21

OCWD operated WF-21 from October 1976 until January 2004 to produce recycled water for injection at the Talbert Barrier to help prevent the inflow of seawater into the Basin. Shown on Figure 1-5, WF-21 was originally designed as a 15-MGD capacity advanced water treatment (AWT) facility to reclaim secondary treated wastewater from OC San Plant 1.

Over this initial era of recycled water recharge, which spanned nearly three decades, the WF-21 facilities and operations were periodically modified and adjusted. The original WF-21 AWT system consisted of lime clarification, ammonia stripping, recarbonation, filtration, granular activated carbon (GAC), chlorination, blending reservoir, and pumping station. In September 1977, a 5-MGD capacity RO system with cellulose acetate membranes was added to demineralize part of the recycled water flow stream. Later, when it was found that ammonia was removed by nitrification at the OC San plant and by the RO process, the ammonia stripping towers were taken out of service in 1987 and demolished in 1998. Lastly, a UV/AOP unit consisting of UV light exposure with hydrogen peroxide addition was added in 2001 to remove low molecular weight organic contaminants (e.g., NDMA and 1,4-dioxane).

Figure 1-5. Water Factory 21 in 1976

Two types of recycled water produced by WF-21, AWT water and RO product water, were blended with deep well water and pumped to the Talbert Barrier injection wells until 2000. After that, only RO product was recharged, blending with groundwater from deep wells and potable water from the City of Fountain Valley and the OC-44 turnout (treated potable water from MWD).

Operation of WF-21 ceased on January 15, 2004 for construction of IWF-21 and the GWRS. Portions of WF-21, specifically the RO and UV/AOP processes as well as the blending reservoir and barrier pump station, were maintained for use in IWF-21. Other WF-21 facilities were demolished.

1.3.2 Interim Water Factory 21

Operation of IWF-21 began on June 21, 2004, and ceased on August 8, 2006, for relocation of portions of its equipment to the GWRS AWPF. Although this second era of water recycling for groundwater recharge was relatively brief, the purpose of IWF-21 was twofold: (1) produce up to 5 MGD of recycled water for the Talbert Barrier to help prevent seawater intrusion; and (2) serve as a training facility to allow operations and maintenance staff to gain experience with the same treatment train as that planned for the larger GWRS AWPF. Figure 1-6 shows the IWF-21 facilities.

Figure 1-6. Interim Water Factory 21 in 2006

Utilizing new treatment processes along with modified WF-21 facilities, IWF-21 featured MF, RO, decarbonation, and UV/AOP to treat secondary effluent from OC San's Plant 1. Recycled water was blended with diluent water, chlorinated, and pumped to the Talbert Barrier injection wells.

The RO system removed minerals, organics, viruses, and other contaminants. The original WF-21 RO system was retrofitted with new thin-film composite polyamide membranes in 2004, which offered improved mineral and contaminant rejection rates and operated at lower pressure, thereby conserving energy. The IWF-21 RO process followed MF and consisted of three steps: chemical pretreatment and cartridge filtration, RO membrane treatment, and post-treatment. Following RO, treatment included decarbonation for product water degasification and removal of carbon dioxide. The nominal rated permeate capacity of the IWF-21 RO system was 5 MGD. Concentrate from the RO process was discharged via a brine pipeline to the OC San ocean outfall for disposal.

The IWF-21 UV/AOP facilities provided photolysis, advanced oxidation, and disinfection using hydrogen peroxide and UV exposure. Hydrogen peroxide was added to the decarbonated RO permeate upstream of the UV light treatment. UV exposure was used for disinfection and destruction of UV-sensitive contaminants (e.g., NDMA). Hydrogen peroxide exposed to UV light produces hydroxyl radicals that result in advanced oxidation to destroy UV-resistant contaminants (e.g., 1,4-dioxane). The UV/AOP featured a closed, in-vessel type UV system with low-pressure high-output lamps. The UV unit's nominal rated capacity of 8.75 MGD was oversized for IWF-21 because it was designed to be relocated to the GWRS AWPF.

IWF-21 utilized the original WF-21 chlorination system to help prevent biofouling of the injection wells. The blending reservoir combined water from three sources (purified recycled water, potable water from the City of Fountain Valley, and deep well water) for injection and in-plant use. The barrier pump station conveyed water from the blending reservoir to the Talbert Barrier.

After IWF-21 was taken out of service in August 2006 until construction of the full-scale GWRS was completed in January 2008, only potable water from MWD via the OC-44 turnout and from the City of Fountain Valley was available for injection at the Talbert Barrier.

1.3.3 Groundwater Replenishment System

The third and most recent era of OCWD water reclamation for groundwater recharge is the GWRS. Described in detail in subsequent sections of this report, the GWRS is a significant achievement and sets OCWD apart as a world leader in water recycling and groundwater management. The GWRS is the largest potable reuse facility in the world.

The original purified recycled water design production capacity of the GWRS was 70 MGD. Injection of purified recycled water produced by the AWPF at the Talbert Barrier began on January 10, 2008. Recharge of purified recycled water produced by the AWPF at Miller Basin began on January 17, 2008. Purified recycled water recharge at Kraemer Basin began on February 19, 2008.

The GWRSIE, increasing the AWPF purified recycled water design production capacity up to 100 MGD, began operation on May 21, 2015. By adding flow equalization facilities and 30 MGD of production capacity, the GWRSIE significantly enhanced the local water supply reliability within the Basin.

The GWRSFE construction began in 2019 and operation began on December 12, 2022. The GWRSFE added 30 MGD of capacity, increasing the AWPF purified recycled water design production capacity to 130 MGD.

1.4 Operation Optimization Plan Overview

The GWRS OOP describes the operating parameters, critical control points, maintenance schedules, and troubleshooting guides for the AWPF, injection barrier and spreading basins. The GWRS operated in accordance with the 2018 OOP until mid-December 2022 (OCWD, 2018).

The OOP was revised and updated in 2022 to include the GWRSFE (OCWD and DDB Engineering, Inc., 2022) and current permit (RWQCB, 2022a). The updated OOP was submitted to DDW and the RWQCB in November 2022 prior to the onset of operation of the GWRSFE.

2. ADVANCED WATER PURIFICATION FACILITY PERFORMANCE

The GWRS AWPF continued to optimize performance and increase production during its fifteenth year of operation. The GWRS AWPF water quality met all compliance requirements in 2022. This section summarizes the performance of the AWPF during 2022:

- Purified recycled water production volume and flows;
- Purified recycled water quality and compliance record;
- Performance and operational record; and
- Anticipated changes.

2.1 Purified Recycled Water Volume and Flows

During 2022, the AWPF produced a total of approximately 31,736 MG, or 97,393 AF, of purified recycled water to help prevent seawater intrusion and replenish the Basin. The AWPF purified recycled water production volume is based on Product Water Pump Station and Barrier Pump Station discharge flow records and therefore, excludes internal plant water uses and MF effluent (MFE) and UV product (UVP) water supplied to GAP. On an annual average basis, the AWPF produced approximately 86.9 MGD of purified recycled water for injection, recharge, and non-potable uses in 2022 (average includes periods of facility non-operation). As shown on Figure 2-1, more than two-thirds of the GWRS purified recycled water was delivered to the Anaheim Forebay with the majority recharged at Miraloma and La Palma Basins.

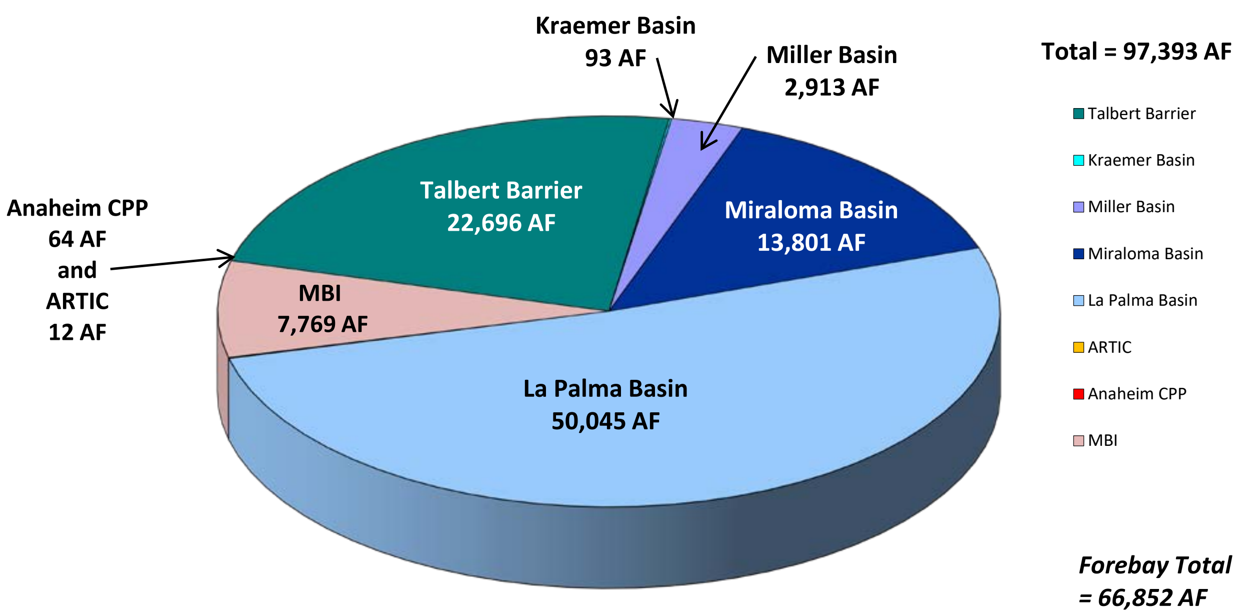
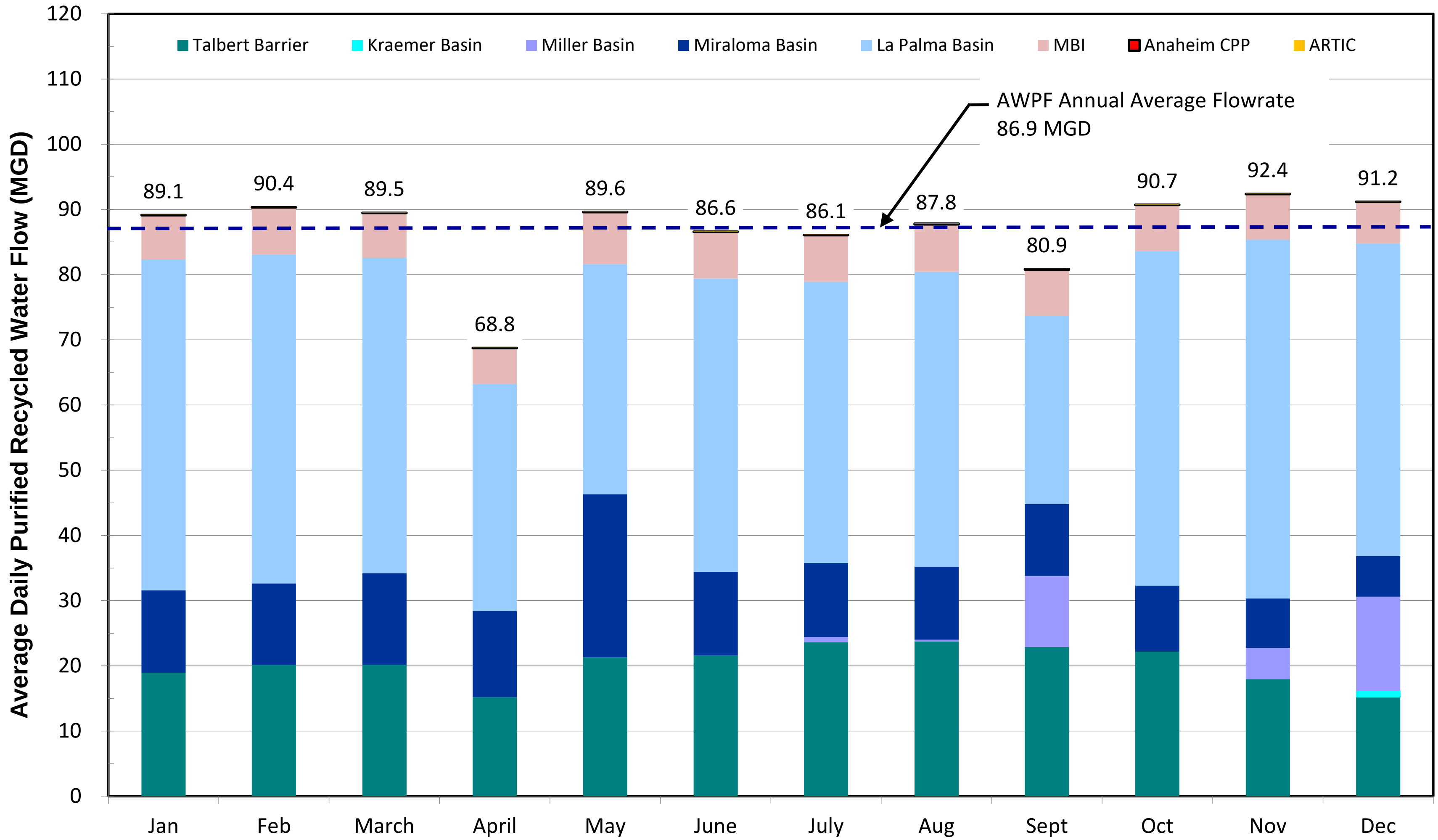


Figure 2-1. 2022 Purified Recycled Water Volume

Nearly a quarter of the AWPF production was injected at the Talbert Barrier. Nearly one-tenth of the purified recycled water was injected at the MBI Project. Small amounts of purified recycled water were used for non-potable purposes at the Anaheim CPP and ARTIC. Non-potable use at Anaheim Adventure Park is included in the Miraloma Basin purified recycled water volume.

Figure 2-2 illustrates the average daily AWPF deliveries by month with the reuse location. At times in 2022, the AWPF operated at reduced production rates or was off-line entirely, primarily due to GWRSFE construction work. AWPF operations are discussed in more detail in Section 2.3.

Overall, the AWPF was on-line 97.0% of the time during 2022 with daily average purified recycled water production ranging from 0.0 MGD (e.g., April 18-22 for a planned shutdown) up to 119.9 MGD (on December 20) compared with its GWRSFE design production capacity of 130 MGD. On December 12, 2022, OCWD received a new RWQCB permit authorizing an increase in recycled water production from 100 MGD up to 130 MGD (RWQCB, 2022a).



Note: April average daily flow reflects the planned shutdown from April 18 - 22.
December production was reduced by GWRSFE commissioning and UV/AOP validation testing when FPW was diverted to the OC San ocean outfall.

Figure 2-2. 2022 Average Daily Purified Recycled Water Flow by Month

2.1.1 Source Water in 2022

The AWPF feedwater (Q1) was a variable blend of only AS and TF effluents from OC San Plant 1 through December 11, 2022. Beginning December 12, 2022, OC San Plant 2 TF/SC effluent was added as a third component of the AWPF influent blend. In 2022, source water exhibited consistently low turbidity and nitrogen levels because of the NdN operation of the AS facilities (see Sections 2.2.2.1 and 2.2.3.2).

2.1.1.1 Secondary Effluent Flow Equalization and Influent Screening

Like other wastewater treatment plants, both OC San plants experience a daily diurnal flow pattern, peaking during the daytime and declining to minimal levels at night. Variations in secondary effluent flow are managed by flow equalization facilities to provide a more consistent feedwater flow rate to the GWRS. Secondary effluent flow equalization (SEFE) facilities store secondary effluent during the day when flows are higher and release it during the night when flows are lower, thereby enabling the AWPF to operate at a more constant flow rate.

At Plant 1, SEFE facilities located adjacent to the AWPF consist of two 7.5 million gallon (MG) above-ground tanks and a pump station, which are pictured on Figure 2-3. During the day, Plant 1 AS secondary effluent flows exceeding the AWPF production rate setpoint are pumped to the SEFE tanks for storage; at night and during the early morning, Plant 1 SEFE flows are released by gravity to the GWRS influent screening facility.

At Plant 2, flow equalization tanks store TF/SC secondary effluent that is pumped at a controlled flow rate to the AWPF influent screening facility via a 60-inch diameter pipeline. Shown on Figure 2-4, the Plant 2 SEFE facilities consist of two above ground storage tanks (2.5 and 3.5 MG) and a pump station. Plant 2 TF/SC secondary effluent was first blended with Plant 1 secondary effluent at the GWRS influent screening facility on December 12, 2022.

Secondary effluent is delivered to the influent screening facility, which consists of five fine screens that remove suspended solids larger than 2 millimeters (mm). Influent screening helps protect and extend the life of the downstream membrane treatment processes at the AWPF. Screened secondary effluent flows from the influent screening facility to the MF system. Solids with screen wash wastewater are returned to Plant 1 for treatment and disposal with other OC San solids.

Figure 2-3. OC San Plant 1 Secondary Effluent Flow Equalization (SEFE) Tanks and Pump Station

Figure 2-4. OC San Plant 2 Secondary Effluent Flow Equalization (SEFE) Tanks and Pump Station

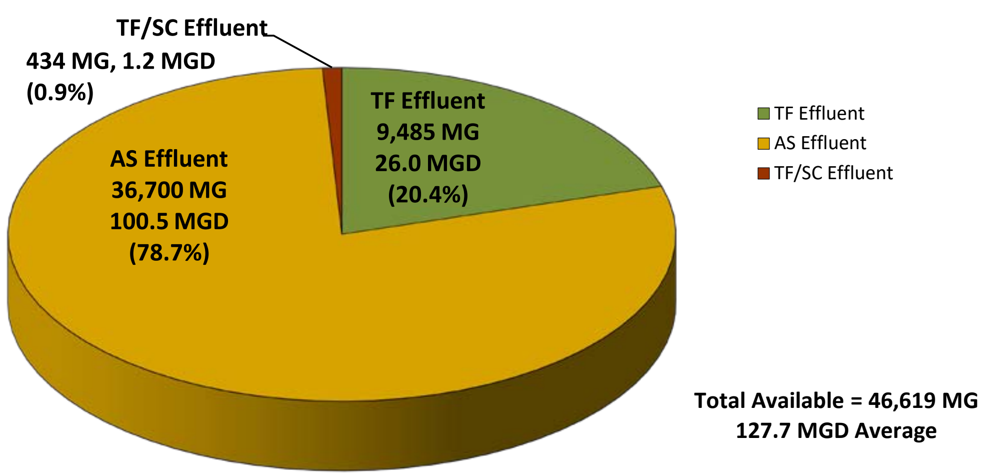
2.1.1.2 TF Effluent and TF/SC Effluent Fractions

The OC San secondary effluent supplied as source water for the AWPF was a blend of Plant 1 AS effluent (P1 AS1 and P1 AS2) and TF effluent (P1 TF) prior to mid-December 2022; Plant 2 TF/SC effluent (P2 TF/SC) was added to the AWPF feedwater on December 12, 2022. The blend is variable, with typically more secondary effluent flow provided by the AS facilities. During 2022, the Q1 source water to the AWPF consisted of 36,700 MG of AS effluent, 9,485 MG of TF effluent, and 434 MG of TF/SC effluent, as illustrated on Figure 2-5, for a total annual influent flow of 46,619 MG (rounded). On an annual average daily flow basis, the theoretical volumes of secondary effluent available to the AWPF were approximately 100.5 MGD of AS effluent, 26.0 MGD of TF effluent, and 1.2 MGD of TF/SC effluent for a total of 127.7 MGD; these values represent the average measured flows entering the Q1 influent station during 2022. However, due various hydraulic and operational factors, recycling all Q1 flows is not feasible.

The volume of TF effluent made up approximately 20.4% of the total influent during 2022; however, the day-to-day operation varied with the daily proportion of TF effluent in AWPF source water ranging from 11.6% (April 5) to 29.4% (September 20). The average proportion of TF effluent in the AWPF source water during 2022 (20.4%) was slightly higher than that in 2021 (19.8%).

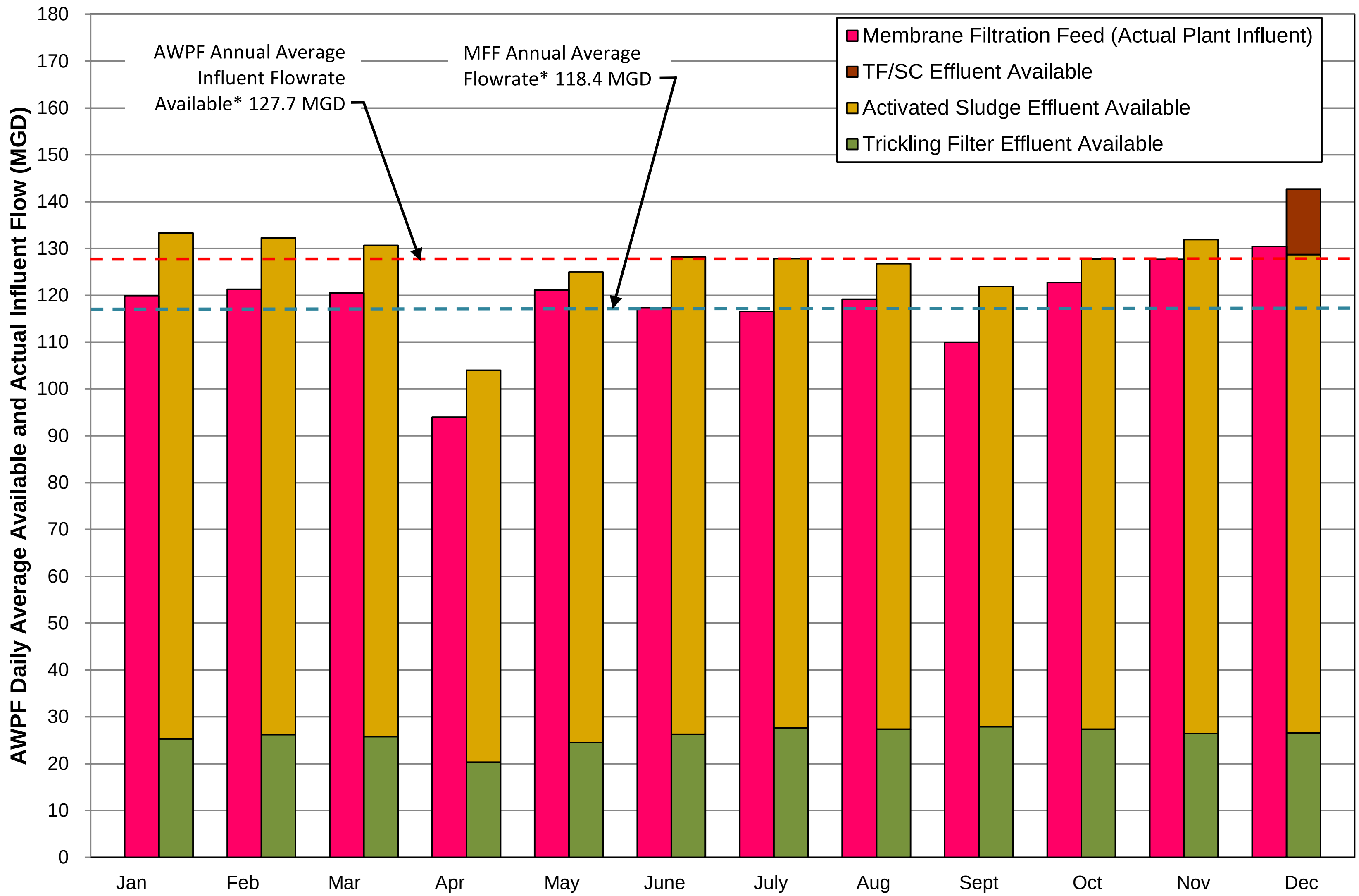
TF/SC effluent use began on December 12, 2022, with the daily proportion of TF/SC effluent in the AWPF source water ranging from 8.4% (December 12) to 19.3% (December 20). From December 12 through December 31, the sum of TF/SC effluent and TF effluent in the AWPF source water averaged 31.9%, ranging from 26.9% to 36.9%.

Figure 2-6 shows the average daily flow rate of AS effluent, TF effluent, and TF/SC effluent for each month during 2022. As discussed above, December 2022 was the only month with all three secondary effluent sources. Of the 2022 influent flow stream, about 3,394 MG, or 12.3 MGD on average, was not sent to the AWPF and instead directed to the ocean outfall via the influent weir overflow at the screening facility. The unreclaimed flow volume in 2022 was less than that in 2021 (4,805 MG or 13.2 MGD on average), primarily due to fewer AWPF planned shutdowns for the GWRSFE construction. The monthly influent weir overflow during 2022 ranged from



Note: TF/SC Effluent use began on December 12, 2022

Figure 2-5. 2022 AWPF Average Influent Flow Sources and Volumes



*Available flow includes weir overflow returned to OC San. Difference between available flow and MFF flow is weir overflow.

Figure 2-6. 2022 AWPF Influent Sources and Average Flows by Month

approximately 119 MG, or 3.8 MGD on average, in May to 417 MG, or 13.4 MGD, in January. The net total MFF flow during 2022 was approximately 42,225 MG or an annual average daily flow of 118.4 MGD.

2.2 Purified Recycled Water Quality and Compliance Record

AWPF purified recycled water quality is monitored for compliance with the GWRS permit (RWQCB, 2004 as amended in 2008, 2014a, 2016, 2019, and 2020a; RWQCB, 2021a; RWQCB, 2022a). Except for turbidity and transmittance, all permit-required final purified recycled water monitoring was performed on finished product water (FPW), also referred to as final product water, following post-treatment and just prior to pumping for distribution. Turbidity is monitored continuously on the RO product (ROP) flow stream. Transmittance is measured continuously on the UV/AOP feed (UVF) flow stream (UVF is immediately downstream of the hydrogen peroxide addition to the ROP). As a backup for the redundant on-line analyzers, daily composite sampling and laboratory analysis for transmittance is also conducted at the UVF station.

Water quality results are reported to the RWQCB in conformance with the permit requirements on a quarterly basis. Beginning in 2023, this quarterly reporting will transition to digital reporting to the state GeoTracker database, as required in the new permit (RWQCB, 2022a). Also beginning in 2023, water quality results will be separately reported to DDW via the California Laboratory Intake Portal (CLIP). Additionally, water quality is monitored throughout the AWPF treatment train to measure and optimize process performance. The AWPF process schematic and monitoring locations are illustrated on Figure 2-7. This operational monitoring is discussed in more detail in Section 2.3. Appendix A summarizes all available water quality data for the AWPF purified recycled water during 2022. Appendix B lists laboratory methods of analyses, and Appendix C presents water quality constituents with associated laboratory methods.

AWPF influent (Q1) flow is metered and its quality is monitored for selected constituents to control and optimize the operation of the treatment processes; the new GWRS permit requires quarterly Q1 composite sampling for Biochemical Oxygen Demand (5-day) (BOD_5), Total Suspended Solids (TSS), and Total Dissolved Solids (TDS). The Q1 sampling point is at the screening facility influent chamber immediately downstream of the fine screens; this location provides a representative sample of the Q1 source water because it is downstream of the SEFE facilities and upstream of the sodium hypochlorite injection prior to the MF system. Through December 11, 2022, the AWPF influent was secondary effluent from OC San's Plant 1, which is a combination of clarified AS and TF effluents. Beginning on December 12, 2022, the AWPF also began accepting flows from OC San's Plant 2, which produces reclaimable TF/SC effluent, as part of the Q1 stream. The ratio of AS to TF (TF plus TF/SC) effluent flows in the Q1 supply is variable, as described in detail in Section 2.1.1.2.

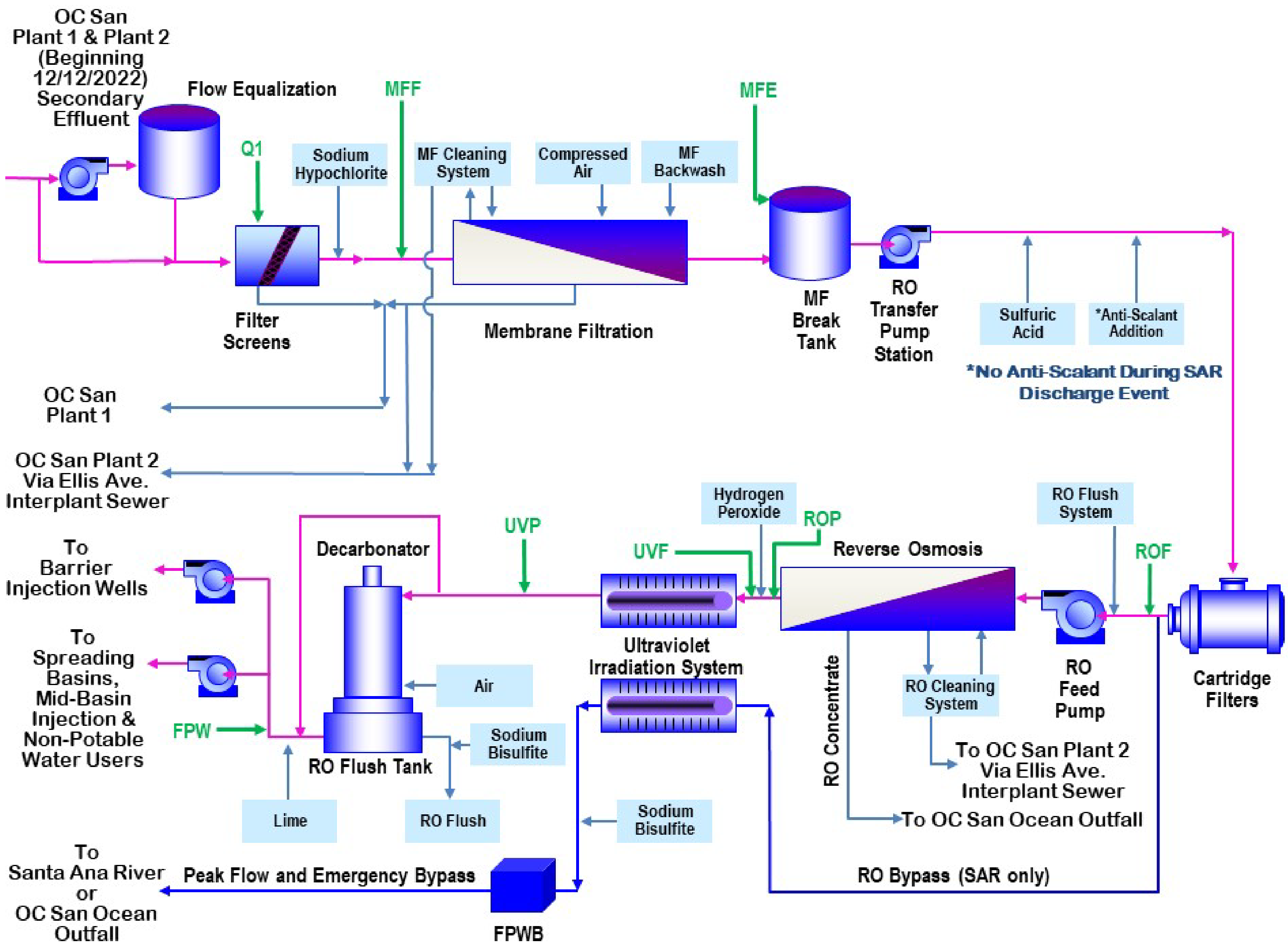


Figure 2-7. AWPF Process Sampling Locations Diagram

In addition to the required finished product water compliance monitoring, unit-specific monitoring is performed for pathogen reduction compliance. The operational performance of each of OC San's secondary treatment processes is independently monitored and may be reported for secondary treatment virus log reduction credit when needed. The integrity of each MF cell is monitored via daily pressure decay testing. The performance of the bulk MF system is monitored by comparing upstream water quality in the MF feed (MFF) after sodium hypochlorite addition with downstream water quality in the MF effluent (MFE). MFE turbidity is measured on-line directly downstream of the MF cells.

Similarly, the performance of the RO system is monitored upstream at the RO feed (ROF), after acid and threshold inhibitor (antiscalant) are added, and then downstream where the ROP leaves the process. On-line total organic carbon (TOC) and electrical conductivity (EC) analyzers monitor the ROF and ROP flow streams and provide continuous indication of the RO process performance and act as surrogates for monitoring pathogen removal. Monitoring the UV/AOP process feed (UVF) and product (UVP) streams are indicators of its disinfection and organics degradation performance.

Furthermore, both select unit process and FPW monitoring are required under the *Water Quality Control Policy for Recycled Water* (SWRCB, 2018). Health-based constituents of emerging concern (CECs) and bioanalytical screening tools are assessed in FPW, while performance indicator CECs and CEC surrogates are assessed in both FPW and upstream (ROF) and downstream (ROP) of the RO process.

2.2.1 Source Water Compliance in 2022

The Title 22 Water Recycling Regulations for Groundwater Recharge Reuse Projects (GRRPs) requires that the recycled municipal wastewater used for groundwater recharge is from a wastewater agency that is not in violation of effluent limits pertaining to groundwater replenishment, as established in the wastewater agency's Regional Board Permit (CCR, 2018). Additionally, the wastewater agency supplying recycled municipal wastewater must administer a pretreatment and pollutant source control program as described in the Title 22 GRRP Regulations.

OC San administers an industrial pretreatment and pollutant source control program as a requirement of its own separate NPDES permit for sewage collection, treatment, and discharge (RWQCB, 2021b). OC San serves as the Control Authority to implement and enforce its EPA-approved Multijurisdictional Pretreatment Program, under which OC San operates its Source Control Program and permits, monitors, and regulates industrial facilities.

OC San maintains a comprehensive industrial pretreatment and source control program to prevent contaminants, which may be harmful to the treatment facilities, environment, and to human health and drinking water supplies, from entering the wastewater tributary to both Plants 1 and 2. Through an expanded comprehensive monitoring program required by the Title 22 GRRP Regulations, OC San can ensure that the treated municipal wastewater (secondary effluent and, if any, disinfected tertiary effluent) delivered to the GWRS AWPF is not contaminated with toxic chemicals of industrial origin which are of concern for public health. This program protects GWRS recycled water quality.

OC San's pretreatment and source control activities for the first half of 2022 (January through June) are summarized in their *FY 2021/22 Pretreatment Program Annual Report* dated October 31, 2022 (OC San, 2022). The pretreatment and source control activities for the second half of 2022 (July through December) will be summarized in the OC San FY 2022/23 Pretreatment Program report.

2.2.2 Finished Product Water Compliance in 2022

Table 2-1 summarizes the average purified recycled water quality for selected constituents during 2022 at various points in the AWPF treatment process. Drinking water standards as well as the GWRS permit requirements are shown for comparison. For other parameters, Appendix A contains the quarterly monitoring results for 2022. All FPW water quality compliance requirements were met in 2022. The performance of individual treatment processes measured by water quality is discussed later in this section.

It is interesting to compare 2022 average Q1 and FPW quality for selected constituents with average values in 2021 to monitor for any trends. Table 2-2 compares these two years' results and shows that some changes occurred in the average water quality of Q1 and FPW in 2022 as compared to the previous year.

The average Q1 total dissolved solids (TDS) concentration increased somewhat from 2021 (981 milligrams per liter [mg/L]) to 2022 (1,016 mg/L), though still falling within the range of average Q1 TDS concentrations observed during operation of the GWRS since 2008 (902-1,035 mg/L). The average Q1 chloride levels also slightly increased from 2021 (277 mg/L) to 2022 (299 mg/L). This increase in average Q1 TDS and chloride levels is related to the acceptance of P2 TF/SC effluent, as the average 2022 concentrations prior to December 12, 2022, (988 mg/L and 277 mg/L for TDS and chloride, respectively) are in line with 2021 averages. From December 12 through 31, 2022, the added P2 TF/SC effluent significantly increased the average Q1 concentrations of TDS (1,460 mg/L) and chloride (542 mg/L).

For the FPW quality, average TDS levels slightly increased from 2021 (50 mg/L) to 2022 (53 mg/L). Average FPW chloride concentrations also increased from 2021 (5.0 mg/L) to 2022 (6.9 mg/L). Prior to December 12, 2022 (before P2 TF/SC effluent was added to the Q1 source water), the average FPW TDS and chloride concentrations (52 mg/L and 6.5 mg/L, respectively) were somewhat higher than the 2021 average. After December 12, 2022, the average FPW TDS and chloride concentrations (67.5 mg/L and 12 mg/L, respectively) increased noticeably due to the P2 TF/SC effluent component in the source water.

Average Q1 total suspended solids levels slightly increased from 2021 (6.7 mg/L) to 2022 (7.5 mg/L). Average Q1 turbidity negligibly decreased from 2021 (1.3 Nephelometric Turbidity Units [NTU]) to 2022 (1.1 NTU).

The average Q1 total nitrogen concentration slightly increased from 2021 (11.4 mg/L) to 2022 (13.1 mg/L). The average FPW total nitrogen concentration was effectively the same in 2021 (0.9 mg/L) and 2022 (1.1 mg/L).

As determined by laboratory analysis, the average Q1 TOC concentration was nearly the same in 2021 (10.94 mg/L) as in 2022 (10.61 mg/L), while the average FPW TOC concentration remained constant during 2021 (0.08 mg/L) and 2022 (0.08 mg/L).

The annual average concentration of N-nitrosodimethylamine (NDMA) in the Q1 source water decreased from 2021 (44.7 nanograms per liter [ng/L]) to 2022 (35.1 ng/L). The FPW average NDMA concentration was unchanged from 2021 (1.0 ng/L) to 2022 (1.0 ng/L). None of the FPW samples analyzed for NDMA in 2022 exceeded the DDW Notification Level (NL) of 10 ng/L.

The annual average Q1 concentrations of 1,4-dioxane slightly decreased from 2021 (1.2 micrograms per liter [µg/L]) to 2022 (1.1 µg/L). The FPW average 1,4-dioxane concentrations in both 2021 and 2022 were below the laboratory Reportable Detection Limit (RDL) of 0.5 µg/L; furthermore, all individual FPW sample results during 2021 and 2022 were below the RDL and below the DDW NL of 1 µg/L for 1,4-dioxane.

Table 2-1. 2022 Average Water Quality[1]

Parameter Name	Units	Q1	MFF	MFE	ROF	ROP	UVP	FPW	Permit Limit
Electrical Conductivity	umhos/cm	1,706	1,736[2]	1,645	1,736[2]	41[2]	44	106[2]	900[3]
Total Dissolved Solids	mg/L	1,016	na	na	1,019	20	na	53	500[3]
Total Suspended Solids	mg/L	7.5	5.9	<2.5	na	na	na	<2.5	N/A
Turbidity	NTU	1.1	3.40[2]	0.04[2]	0.03[2]	0.02[4]	na	0.03[2]	≤0.2 / ≤0.5[3]
Ultraviolet percent transmittance (%UVT) @254nm	%	na	na	68.0	na	97.22[4]	na	na	≥90
pH	UNITS	7.35	7.19[2]	7.38	6.90[2]	5.21[2]	5.84	8.36[2]	6 - 9
Total Hardness (as CaCO3)	mg/L	319	na	na	310	<1	na	34.7	240[3]
Calcium	mg/L	77.9	na	na	75.3	<0.5	na	13.9	N/A
Magnesium	mg/L	30.2	na	na	28.8	<0.5	na	<0.5	N/A
Sodium	mg/L	227	na	na	223	8.0	na	7.5	45
Potassium	mg/L	19.9	na	na	19.4	0.5	na	0.5	N/A
Bromide	mg/L	na	na	na	na	na	na	<0.01[5]	N/A
Chloride	mg/L	299	na	na	288	6.5	na	6.9	55
Sulfate	mg/L	200	na	na	205	<0.5	na	0.1	100
Bicarbonate (as CaCO3)	mg/L	na	na	na	198	10.0	na	40.6	N/A
Nitrate Nitrogen	mg/L	7.29	na	na	6.89	0.80	na	0.77	3[3]
Nitrite Nitrogen	mg/L	1.2	na	na	1.29	<0.002	na	0.069	1[3]
Ammonia Nitrogen	mg/L	3.6	na	na	4.3	0.5	na	0.4	N/A
Organic Nitrogen	mg/L	1.2	na	na	0.5	0.02	na	0.01	N/A
Total Nitrogen	mg/L	13.1	na	na	13.0	na	na	1.1	5 / 10[6]
Phosphate Phosphorus	mg/L	0.54	na	na	0.5	na	na	<0.01	N/A
Iron	ug/L	463	na	na	110	<5	na	<5	300
Manganese	ug/L	44.4	na	na	43.5	<1	na	<1	50
Aluminum	ug/L	12.0	na	na	3.8	0.2	na	0.7	200[3]
Arsenic	ug/L	1.2	na	na	1.1	<1	na	<1	10
Barium	ug/L	40.6	na	na	37.8	<1	na	<1	1,000
Boron	mg/L	0.43	na	na	0.43	0.27	na	0.25	N/A
Cadmium	ug/L	<1	na	na	<1	<1	na	<1	5
Chromium	ug/L	<1	na	na	<1	0.58	na	<1	50
Copper	ug/L	8.5	na	na	7.2	<1	na	<1	1,000[3]
Cyanide	ug/L	<5	na	na	1.0	<5	na	<5	150
Fluoride	mg/L	0.93	na	na	1.0	na	na	<0.1	2
Lead	ug/L	<1	na	na	0.7	<1	na	<1	15
Mercury	ug/L	<1	na	na	<1	<1	na	<1	2
Nickel	ug/L	6.0	na	na	5.2	<1	na	<1	100
Perchlorate	ug/L	na	na	na	na	na	na	<2	6
Selenium	ug/L	2.3	na	na	2.4	<1	na	<1	50
Silica	mg/L	18.6	na	na	18.5	0.2	na	1.2	N/A
Silver	ug/L	0.3	na	na	<1	<1	na	<1	100
Zinc	ug/L	15.1	na	na	21.0	0.2	na	<1	5,000
1,2,3-Trichloropropane	ug/L	<0.005	na	na	<0.005	<0.005	<0.005	<0.005	0.005
N-nitrosodimethylamine	ng/L	35.1[7]	na	na	15.5[7]	7.3[7]	<2[7]	1.0[7]	N/A
1,4-Dioxane	ug/L	1.1	na	na	1.1	<0.5	<0.5	<0.5	N/A
Perfluorooctanoic Acid	ng/L	na	na	na	7.5	<2	na	<2	N/A
Perfluorooctane Sulfonic Acid	ng/L	na	na	na	11.7	<2	na	<2	N/A
Perfluorobutane Sulfonic Acid	ng/L	na	na	na	6.2	<2	na	<2	N/A
Perfluorohexane Sulfonic Acid	ng/L	na	na	na	3.9	<2	na	<2	N/A
Total Trihalomethanes	ug/L	0.5	na	na	6.3	2.8	2.6	1.9	80
Dibromoacetic Acid	ug/L	na	na	na	na	na	na	<1	60,total HAA5
Dichloroacetic Acid	ug/L	na	na	na	na	na	na	<1	60,total HAA5
Monobromoacetic Acid	ug/L	na	na	na	na	na	na	<1	60,total HAA5
Monochloroacetic Acid	ug/L	na	na	na	na	na	na	<1	60,total HAA5
Trichloroacetic Acid	ug/L	na	na	na	na	na	na	<1	60,total HAA5
Total Organic Carbon (unfiltered)	mg/L	10.61	10.02	na	8.37	0.09	0.14	0.08	0.5[3]
Total Coliform	MPN/100 mL	542,675	39,033	<1	na	<1	na	0.1	2.2 / 23 / 240[3]
Escherichia coli (E. coli)	MPN/100 mL	142,177	4,914	<1	na	<1	na	<1	N/A

Q1 Secondary Effluent (AWPF Influent) ROF Reverse Osmosis Feed UVF Ultraviolet UV/AOP Feed na Not analyzed
MFF Microfiltration Feed ROP Reverse Osmosis Product UVP Ultraviolet UV/AOP Product N/A Not applicable
MFE Microfiltration Effluent FPW Finished Product Water

[1] For purposes of calculating annual averages, 10% of the Reportable Detection Limit (RDL) was used for all non-detect (ND) values. If all data for the period were ND, then the average is shown as "<RDL". Number of significant digits shown match those in raw data.

[2] On-line average

[3] See Appendix A for more information

[4] On-line average shown for UVF, which is effectively ROP downstream of hydrogen peroxide addition.

[5] Two methods were used for bromide with two RDLs: (1) XI-300.0 with RDL = 0.1 mg/L, and (2) 300.1B with RDL = 0.01 mg/L. All results were non-detectable.

[6] Total nitrogen limit was changed from 5 mg/L (RWQCB, 2004a) to 10 mg/L (RWQCB, 2022a)

[7] Average results shown using In-house Method NDMA-LOW with RDL = 10 ng/L for Q1 and ROF, and In-house Method NDMA-LOW with RDL = 2 ng/L for ROP, UVP, and FPW. See Appendix A.

Table 2-2. Comparison Between 2021 and 2022 Average Water Quality[1]

Parameter Name	Units	2021 Q1	2022 Q1	2021 FPW	2022 FPW	Permit Limit
Electrical Conductivity	umhos/cm	1,655	1,706	100[2]	106[2]	900[3]
Total Dissolved Solids	mg/L	981	1,016	50	53	500[3]
Total Suspended Solids	mg/L	6.7	7.5	<2.5	<2.5	N/A
Turbidity	NTU	1.3	1.1	0.03[2]	0.03[2]	≤0.2 / ≤0.5[3]
Ultraviolet percent transmittance (%UVT) @254nm	%	na	na	na	na	>90
pH	UNITS	7.22	7.35	8.42[2]	8.36[2]	6 - 9
Total Hardness (as CaCO3)	mg/L	307	319	34.7	34.7	240[3]
Calcium	mg/L	76.7	77.9	13.7	13.9	N/A
Magnesium	mg/L	28.0	30.2	<0.5	<0.5	N/A
Sodium	mg/L	217	227	6.0	7.5	45
Potassium	mg/L	18.9	19.9	0.3	0.5	N/A
Bromide	mg/L	na	na	0.01	<0.01[4]	N/A
Chloride	mg/L	277	299	5.0	6.9	55
Sulfate	mg/L	191	200	0.3	0.1	100
Bicarbonate (as CaCO3)	mg/L	na	na	38.9	40.6	N/A
Nitrate Nitrogen	mg/L	7.29	7.29	0.63	0.77	3[3]
Nitrite Nitrogen	mg/L	1.137	1.200	0.047	0.069	1[3]
Ammonia Nitrogen	mg/L	2.1	3.6	0.2	0.4	N/A
Organic Nitrogen	mg/L	1.0	1.2	0.04	0.01	N/A
Total Nitrogen	mg/L	11.4	13.1	0.9	1.1	5 / 10[5]
Phosphate Phosphorus	mg/L	0.43	0.54	<0.01	<0.01	N/A
Iron	ug/L	449	463	2.8	<5	300
Manganese	ug/L	50.8	44.4	<1	<1	50
Aluminum	ug/L	10.2	12.0	1.9	0.7	200[3]
Arsenic	ug/L	0.4	1.2	<1	<1	10
Barium	ug/L	58.8	40.6	<1	<1	1,000
Boron	mg/L	0.42	0.43	0.23	0.25	N/A
Cadmium	ug/L	<1	<1	<1	<1	5
Chromium	ug/L	<1	<1	<1	<1	50
Copper	ug/L	7.0	8.5	<1	<1	1,000[3]
Cyanide	ug/L	<5	<5	<5	<5	150
Fluoride	mg/L	0.90	0.93	<0.1	<0.1	2
Lead	ug/L	<1	<1	<1	<1	15
Mercury	ug/L	<1	<1	<1	<1	2
Nickel	ug/L	5.9	6.0	<1	<1	100
Perchlorate	ug/L	na	na	<2	<2	6
Selenium	ug/L	1.4	2.3	<1	<1	50
Silica	mg/L	19.6	18.6	1.0	1.2	N/A
Silver	ug/L	<1	0.3	<1	<1	100
Zinc	ug/L	16.4	15.1	0.5	<1	5,000
1,2,3-Trichloropropane	ug/L	<0.005	<0.005	<0.005	<0.005	0.005
N-nitrosodimethylamine	ng/L	44.7[6]	35.1[6]	1.0[6]	1.0[6]	N/A
1,4-Dioxane	ug/L	1.2	1.1	<0.5	<0.5	N/A
Perfluorooctanoic Acid	ng/L	na	na	<2	<2	N/A
Perfluorooctane Sulfonic Acid	ng/L	na	na	<2	<2	N/A
Perfluorobutane Sulfonic Acid	ng/L	na	na	<2	<2	N/A
Perfluorohexane Sulfonic Acid	ng/L	na	na	<2	<2	N/A
Total Trihalomethanes	ug/L	0.4	0.5	2.6	1.9	80
Dibromoacetic Acid	ug/L	na	na	<1	<1	60,total HAA5
Dichloroacetic Acid	ug/L	na	na	<1	<1	60,total HAA5
Monobromoacetic Acid	ug/L	na	na	<1	<1	60,total HAA5
Monochloroacetic Acid	ug/L	na	na	<1	<1	60,total HAA5
Trichloroacetic Acid	ug/L	na	na	<1	<1	60,total HAA5
Total Organic Carbon (unfiltered)	mg/L	10.94	10.61	0.08	0.08	0.5[3]
Total Coliform	MPN/100 mL	318,036	542,675	<1	0.11	2.2 / 23 / 240[3]
Escherichia coli (E. coli)	MPN/100 mL	82,613	142,177	<1	<1	N/A

Q1 Secondary Effluent (AWPF Influent)
FPW Finished Product Water
na Not analyzed
N/A Not applicable

[1] For purposes of calculating annual averages, 10% of the Reportable Detection Limit (RDL) was used for all non-detect (ND) values. If all data for the period were ND, then the average is shown as "<RDL". Number of significant digits shown match those in raw data.

[2] On-line average

[3] See Appendix A for more information

[4] Two methods were used for bromide with two RDLs: (1) X1-300.0 with RDL = 0.1 mg/L, and (2) 300.1B with RDL = 0.01 mg/L. All results were non-detectable.

[5] Total nitrogen limit was changed from 5 mg/L (RWQCB, 2004a) to 10 mg/L (RWQCB, 2022a)

[6] Average results shown using In-house Method NDMA-LOW with RDL = 10 ng/L for Q1, and In-house Method NDMA-LOW with RDL = 2 ng/L for FPW. See Appendix A.

2.2.2.1 Total Nitrogen Removal in 2022

Performance data for AWPF total nitrogen removal are summarized in Table 2-3 and Figure 2-8. On an annual basis, the Q1 total nitrogen concentration (sum of ammonia, nitrite, nitrate, and organic nitrogen, all expressed as nitrogen) averaged approximately 13.1 mg/L during 2022, which was greater than the 2021 average (11.5 mg/L). Low total nitrogen concentrations in the Q1 flow stream were an indication of OC San's NdN operation of the AS facilities at Plant 1, which began in late 2009. Prior to the introduction of NdN operation in 2009, concentrations of total nitrogen at Q1 were roughly double the current concentrations, as described in more detail in prior annual reports. The addition of P2 TF/SC effluent to the AWPF source water had a small increasing effect on the Q1 total nitrogen concentration in late December 2022 (15.0 mg/L average in December 2022).

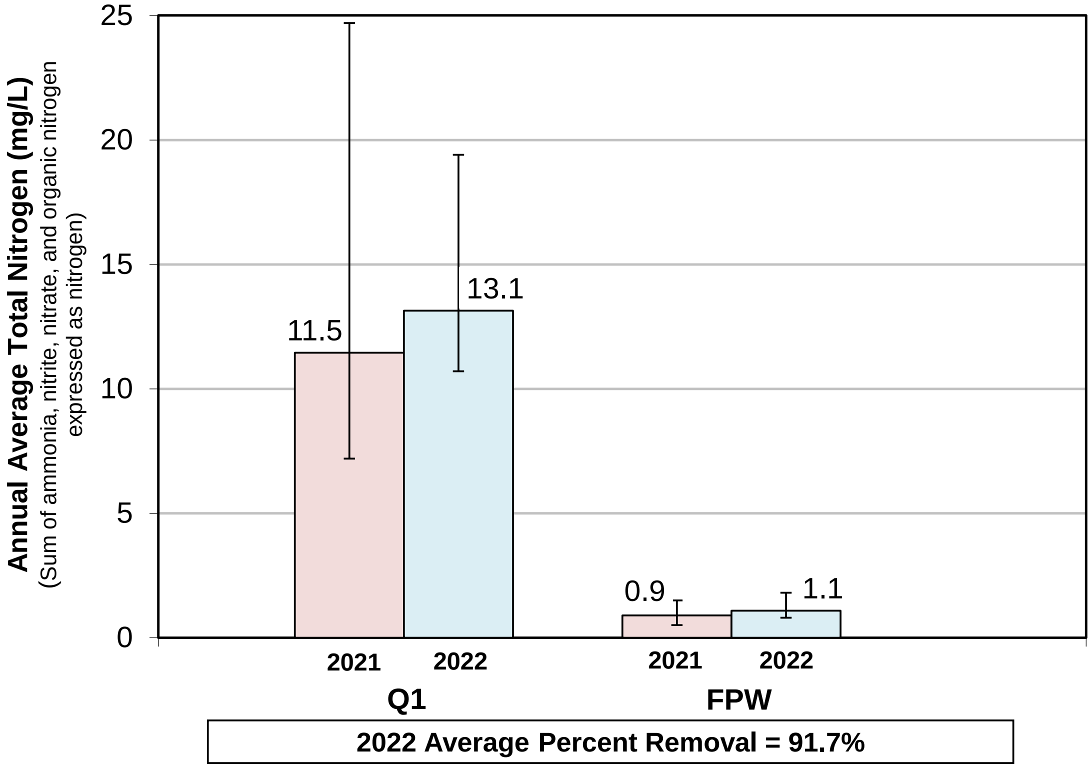
Overall, during 2022, the low influent total nitrogen concentration helped the AWPF to achieve consistently low concentrations of total nitrogen levels in the FPW, ranging from approximately 0.8 to 1.8 mg/L based on individual samples. Removal of total nitrogen occurs primarily, if not exclusively, via the RO process. The annual average FPW total nitrogen concentration remained low over the past two years, 0.9 mg/L in 2021 and 1.1 mg/L 2022. Figure 2-8 presents the 2022 annual average total nitrogen reduction performance of the AWPF and compares it with that achieved in the previous year.

Table 2-3. 2022 AWPF Total Nitrogen Removal Performance

	Total Nitrogen [1,2]			
	Secondary Effluent Q1		AWPF Effluent FPW	
Month	Avg. (mg/L)	Max. (mg/L)	Avg. (mg/L)	Max. (mg/L)
January	11.7	12.3	0.9	1.0
February	11.7	11.8	0.9	1.2
March	12.2	14.8	0.9	1.0
April	13.1	14.9	1.1	1.3
May	11.9	12.1	1.1	1.4
June	12.5	12.8	1.0	1.2
July	13.7	18.3	1.1	1.3
August	14.1	19.4	1.3	1.5
September	14.2	15.1	1.5	1.8
October	13.1	13.9	1.1	1.3
November	14.5	16.1	1.2	1.5
December	15.0	18.6	1.0	1.3
Annual Average	13.1	---	1.1	---
Maximum	---	19.4	---	1.8
Average % Removal	91.7%			

[1] Total nitrogen is based on the sum of ammonia, nitrite, nitrate, and organic nitrogen, all expressed as nitrogen.

[2] Total nitrogen data based on weekly Q1 and semi-weekly FPW individual grab sample results.



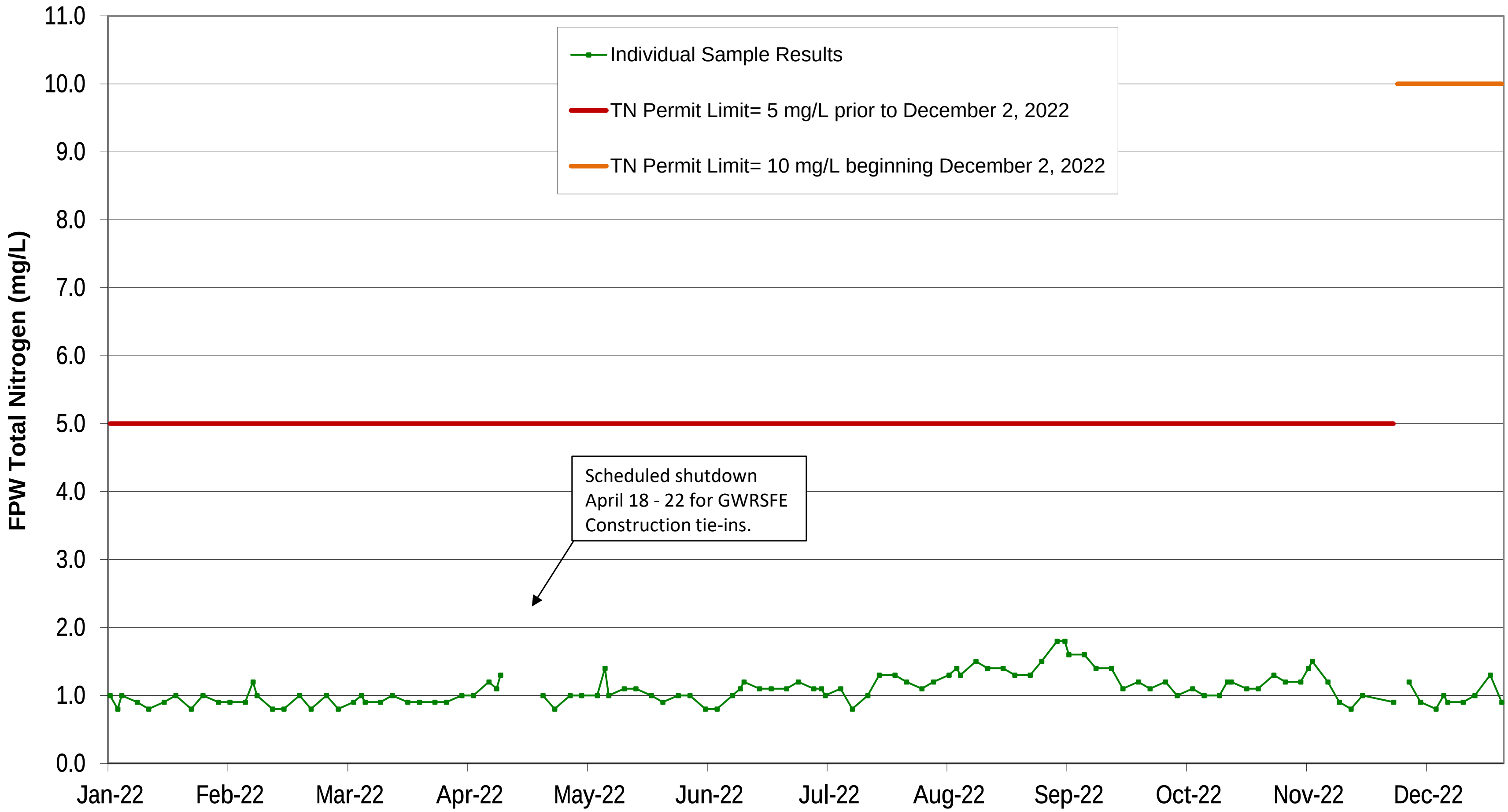
Note: Black bars represent the range in individual grab samples for the years shown.

Figure 2-8. 2022 AWPF Total Nitrogen Removal Performance

Figure 2-9 illustrates the FPW total nitrogen concentration during 2022, showing it was always well below the total nitrogen GWRS permit limits of 5 mg/L (before December 2, 2022) and 10 mg/L (beginning December 2, 2022). The required FPW sampling frequency for total nitrogen analyses was semi-weekly, generally about three days apart, for most of 2022; with adoption of the new permit on December 2, 2022, the required FPW sampling frequency for total nitrogen was reduced to weekly (RWQCB, 2022a). However, voluntary semi-weekly total nitrogen monitoring of FPW continued through the end of 2022.

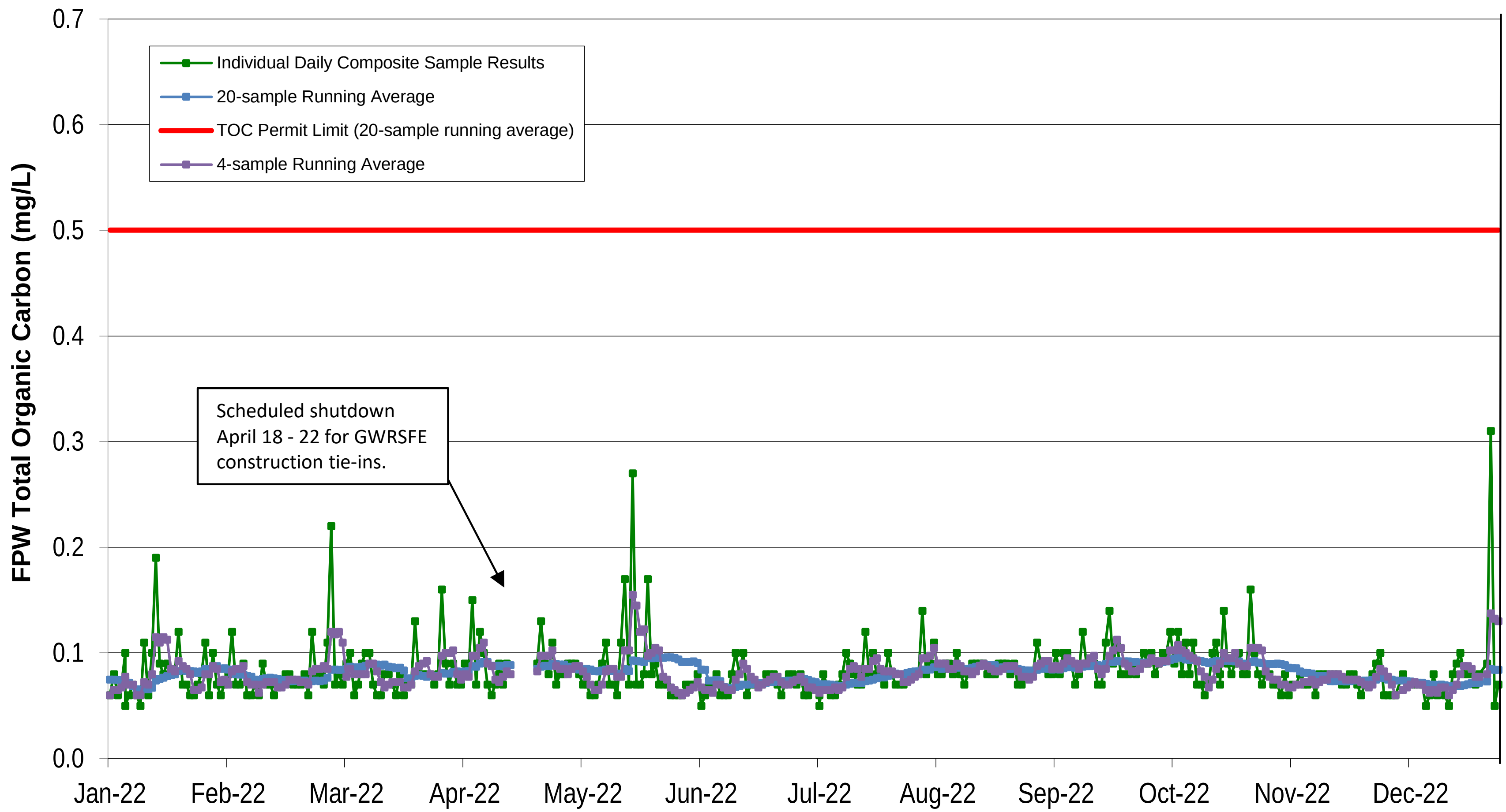
2.2.2.2 Total Organic Carbon Removal in 2022

Figure 2-10 shows the TOC concentration in the FPW during 2022 based on daily 24-hour composite samples. The maximum individual daily composite FPW TOC result in 2022 was 0.31 mg/L (December 29). A second elevated individual daily composite FPW TOC result of 0.27 mg/L was observed on May 18. The running 20-sample average TOC concentration in the FPW was generally about 0.08 mg/L. The running 4-sample average TOC concentration in the FPW was also approximately 0.08 mg/L. The overall FPW annual average TOC concentration was 0.08 mg/L as well (Table 2-1).



Note: Reportable Detection Limit is 0.3 mg/L using Method X1-351.2
TN Permit Limit was 5 mg/L before 12/2/2022 and 10 mg/L beginning 12/2/2022

Figure 2-9. 2022 Purified Recycled Water Total Nitrogen



Note: Reportable Detection Limit is 0.05 mg/L using Method 5310C.
TOC Permit Limit beginning December 2, 2022, is based on a 20-week running average.

Figure 2-10. 2022 Purified Recycled Water Total Organic Carbon

Compliance with the permit TOC limit is determined monthly based on the running average TOC concentration in the most recent 20 composite samples of FPW. The TOC limit is calculated based on the DDW-specified maximum RWC at each recharge location. The TOC limit for all recharge sites (Talbert Barrier, K-M-M-L Basins, and MBI Project) is 0.5 mg/L (determined by dividing 0.5 mg/L by the DDW-specified maximum allowable RWC at that location, which is 100% for all sites).

During 2022, the running 20-sample average FPW TOC was consistently well below 0.5 mg/L and in compliance with the permit requirements. Beginning December 2, 2022, the permit limit is based on the 20-week (rather than 20-sample) and 4-sample running average FPW TOC concentration, consistent with the Title 22 Water Recycling Criteria for GRRPs (CCR, 2018).

2.2.2.3 Total Coliform Removal in 2022

Regarding disinfection through the entire AWPF, total coliform levels in Q1 averaged approximately 543,000 Most Probable Number per 100 milliliters (MPN/100 mL) in 2022. (See Table 2-1 presented earlier.) Sodium hypochlorite addition upstream of MF reduced the total coliform levels to an average of approximately 39,000 MPN/100 mL in the MFF, representing an average total coliform removal of 1.1-log. MF treatment further reduced all MFE total coliform results to non-detect (less than 1 MPN/100 mL). Total coliform levels were less than 1 MPN/100 mL through the RO and UV/AOP processes. Compliance was maintained at all times with the Title 22-based permit limit for total coliform, which requires that the FPW shall not exceed 240 MPN/100 mL in any single sample, 23 MPN/100 mL in more than one sample in any 30-day period, and the 7-day median shall not exceed 2.2 MPN/100 mL. During 2022, the total coliform levels in the FPW were less than 1 MPN/100 mL with two exceptions when the FPW total coliform levels were 2 MPN/100 mL (September 22 and 24); these detections may have been an artifact of a brief scheduled outage for GWRSFE construction on September 20, after which the total coliform concentrations returned to below the 1 MPN/100 mL detection limit.

In addition to total coliform, which is required to be monitored daily, concentrations of *E. coli* were also voluntarily analyzed to confirm bacteria removals through the AWPF. *E. coli* concentrations were diminished by adding sodium hypochlorite upstream of the MF process in 2022. (See Table 2-1 presented earlier.) The Q1 *E. coli* level averaged approximately 142,000 MPN/100 mL, and the MFF *E. coli* levels averaged approximately 4,910 MPN/100 mL following disinfection. Confirming the MF, RO, and UV/AOP expected performance, the average MFE, ROP, and FPW results for *E. coli* were less than 1 MPN/100 mL consistently in 2022.

2.2.3 Summary of GWRS Pathogen Log Reduction Compliance in 2022

Table 2-4 summarizes the daily total pathogen log reduction value (LRV) credits achievable by the GWRS, demonstrating compliance with the Title 22 Water Recycling Regulations for GRRPs (CCR, 2018). The pathogen log reduction achieved by each treatment process is discussed in Sections

2.2.3.1 (Secondary treatment), 2.2.3.2 (MF), 2.2.3.3 (RO), and 2.2.3.4 (UV/AOP). Figure 2-11 illustrates the daily total pathogen log reduction values actually achieved during 2022.

GWRS complies with pathogen reduction requirements using the MF, RO, and UV/AOP processes at the AWPF as discussed above plus underground retention as an environmental barrier. Beginning in December 2022, the GWRS may also claim credit for primary and secondary treatment. However, no pathogen reduction credits for primary and secondary treatment were claimed in 2022.

Table 2-4. Summary of Pathogenic Microorganism Control for the GWRS

Pathogen	Minimum Log Reduction Requirements[1]	Pathogen Log Reduction Credits Available by Treatment Process					
		Secondary Treat-ment[2]	MF and Cl_2	RO	UV/AOP	Underground Retention Time[3]	Total
Giardia cysts	10	0	≥4.0	≥2.0	6.0	0	≥12.0
Cryptosporidium oocysts	10	0	≥4.0	≥2.0	6.0	0	≥12.0
Viruses	12	0.18	0	≥2.0	6.0	4 (5)	≥12.0

[1] Per Title 22 Water Recycling Criteria (CCR, 2018).

[2] Beginning December 12, 2022, 0.18-log virus reduction credit could be claimed for secondary treatment at OC San. However, no pathogen reduction credits claimed for secondary treatment in 2022.

[3] Daily virus LRV credit of 4-log for underground retention time in 2022, with the exception of 10/6/2022 when 5-log virus LRV credits were taken. See Figure 2-11.

In addition to the pathogen log reduction achieved by OC San and the MF, RO, and UV/AOP systems, GWRS provides a minimum underground retention time prior to withdrawal at the nearest drinking water well of more than four months via established primary and secondary boundary areas at the Talbert Barrier and Anaheim Forebay that were confirmed by added tracer studies; the MBI Project area has approved boundary areas based on groundwater modeling which are being verified by intrinsic tracer tests using chloride and sulfate that were conducted between 2015 and 2023 (See Section 8). Currently all drinking water wells are located outside these boundary areas with more than six months (typically many years) of subsurface travel prior to the extraction of GWRS water recharge or injection. Based on the 1-log virus reduction credit per month of underground retention time allowed by the Title 22 Water Recycling Criteria for groundwater recharge (CCR, 2018), GWRS therefore provides at least 4-log reduction of viruses after surface spreading and direct injection. As noted in Table 2-4, 4-log virus reduction credits for underground retention time were taken during 2022, except on October 6 when 5-log virus reduction credits were taken. The additional 1-log virus reduction credit for underground retention time enabled the GWRS to make up for the slightly lower virus reduction

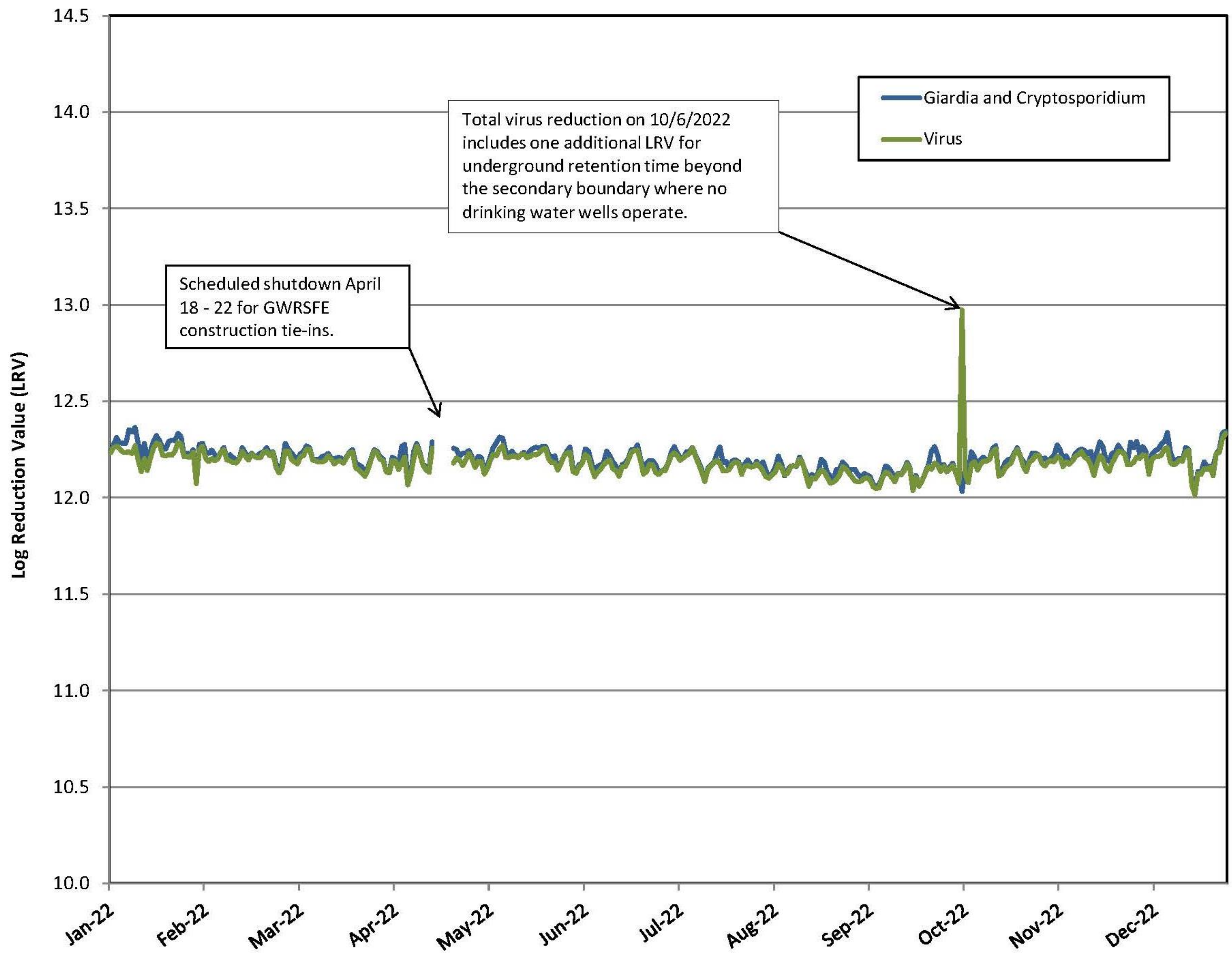


Figure 2-11. Summary of Daily GWRS Pathogen Log Reduction Credits Achieved in 2022

credits achieved by the RO process on October 6 (See Section 2.2.3.3 and monthly pathogenic microorganism reduction reports in Appendix D). No production wells are located within 5-months travel time of the GWRS recharge facilities.

2.2.3.1 Secondary Treatment Pathogen Log Reduction Monitoring

Beginning in December 2022, the AWPF was eligible to receive virus reduction credit for the primary and secondary treatment conducted by OC San. To receive this credit, effluent from each of the four secondary treatment processes that provides influent to the AWPF (P1 AS1, P1 AS2, P1 TF, P2 TF/SC) is monitored daily by OC San. The turbidity of the blended AWPF influent is also measured by OCWD, as an indicator of the blended secondary effluent quality before (MFF) and following (MFE) MF treatment.

The OC San secondary treatment pathogen log reduction credit is a contingent credit and is only claimed by OCWD when needed to meet the total minimum 12-log virus reduction credit required in Title 22. This contingent credit was not required in December 2022 (after the new GWRS permit became effective). Therefore, no secondary treatment pathogen log reduction was claimed.

2.2.3.2 MF System Pathogen Log Reduction Monitoring

The MF process receives pathogen log reduction credits for *Giardia* cysts and *Cryptosporidium* oocysts in accordance with the updated OOP (OCWD, 2018). No credit for reduction of enteric virus is attributed to the MF process. A combination of on-line turbidimeters and daily pressure decay test (PDT) results are used to show compliance with pathogen removal requirements. The critical control points and critical limits designated for MFE turbidity and MF PDT (See Section 2.3.2) establish the criteria that enable the MF process to demonstrate at least 4-log reduction of *Giardia* cysts and *Cryptosporidium* oocysts.

The MFE turbidity and MF PDT results are recorded and used to calculate the pathogen log removal credit achieved each MF cell in accordance with the *Membrane Filtration Guidance Manual* (USEPA, 2005). The calculated pathogen log removal is automatically displayed in the GWRS process control system (PCS) and recorded as explained in the OOP (OCWD, 2018 and OCWD and DDB Engineering, Inc., 2022). If a log removal result based on the PDT calculation for an individual MF cell is less than 4-log based on the retesting protocol described below, the affected cell is taken out of service until the cell can comply with the 4-log reduction requirement.

Monthly reports are submitted to DDW documenting the daily pathogen log reduction values achieved by the MF process; each day, the overall process is assigned the lowest daily individual cell log reduction value derived from the PDT results. Appendix D contains copies of the 2022 monthly reports submitted to DDW and the RWQCB documenting pathogenic microorganism control achieved by GWRS.

MF membrane integrity is monitored continuously with on-line turbidimeters on the MFF and MFE flow streams, and continuous readings are averaged to determine the daily averages. One bulk MFF turbidimeter measures the combined MFF turbidity (a second bulk MFF turbidimeter is a standby unit). The MFE turbidity is continuously measured using 12 individual high-resolution laser turbidimeters, each assigned to a group of four MF cells (MF cell groups are also referred to as "half-trains"). In addition, one bulk MFE turbidimeter continuously tracks the combined MFE flow stream as a backup for the 12 "half-train" turbidimeters.

Table 2-5 summarizes the monthly MF system performance for 2022 in terms of turbidity reduction. Average monthly MFF turbidity results are based on the daily average MFF turbidity readings for the bulk MFF stream. Monthly average MFE turbidity results are based on the daily average results of the 12 individual turbidimeters serving the MF "half-trains".

The daily average MFF turbidity ranged from 2.45 to 5.85 NTU based on daily averages of on-line turbidimeter readings taken upstream of the MF process. The annual average on-line MFF turbidity was 3.40 NTU in 2022. The OC San Plant 1 original AS1 plant (Project P1-82 or P1 AS1) and the newer AS2 plant (Project No. P1-102 or P1 AS2) have operated in the NdN mode achieving nitrification and partial denitrification since 2009 and 2012, respectively; because of these operational changes at Plant 1, low MFF turbidity has been reliably achieved, demonstrating the benefits of biological NdN.

The daily average MFE turbidity during 2022 ranged from 0.02 to 0.10 NTU, with an annual average turbidity of 0.04 NTU based on on-line turbidimeter readings taken from 12 MFE turbidimeters (one per bank of four MF cells).

On an annual average basis, the MFF turbidity of 3.40 NTU was consistently reduced through the MF process to an MFE turbidity of 0.04 NTU, which is equivalent to a 98.9% reduction (See Table 2-5, Figure 2-12, and Appendix D). The maximum MFE turbidity reading of 0.10 NTU was reached on four days in November, nevertheless demonstrating membrane integrity, i.e., the MFE turbidity was consistently less than 0.2 NTU throughout 2022. Issues with the new turbidimeters installed for the GWRSFE MF cells resulted in erroneously high MFE turbidity values in November that were investigated and corrected.

Table 2-5. 2022 MF Performance

Month	Turbidity			
	MF Feed MFF[1]		MF Effluent MFE[1]	
	Avg. (NTU)	Max (NTU)	Avg. (NTU)	Max (NTU)
January	3.17	3.48	0.03	0.04
February	3.68	4.54	0.03	0.03
March	3.73	5.03	0.03	0.03
April	3.36	4.59	0.03	0.04
May	3.41	4.71	0.03	0.04
June	3.14	4.58	0.04	0.05
July	3.09	4.00	0.03	0.04
August	2.75	3.24	0.04	0.04
September	3.21	4.79	0.04	0.07
October	3.97	5.85	0.04	0.05
November	4.02	5.31	0.06	0.10
December	3.29	3.98	0.04	0.07
Annual Average	3.40	---	0.04	---
Maximum	---	5.85	---	0.10
Average % Removal	98.9%			

[1] Based on daily average turbidity readings from MFF and MFE on-line turbidimeters. Values shown represent the monthly average for all MF cells. Daily average MFE turbidity readings from 12 individual analyzers (one per group of 4 MF cells) are used to determine the monthly average MFE turbidity.

Figure 2-12 presents the annual average turbidity reduction achieved by the MF system in 2022 and compares it with the MF system performance during 2021. Overall, the average turbidity removal rate of 98.9% in 2022 was essentially the same as the 99.0% removal rate in 2021.

Continuous MFF and MFE turbidity readings, plus daily MF PDT results are critical control points and compliance with those critical limits supports the pathogen reduction by the MF process. (See Appendix E, Figures E-3 and E-4 for MFF and MFE turbidity, respectively). Corresponding daily average PDT results for all cells confirm MF membrane integrity based on pressure decay results were within the target range throughout 2022. OCWD tracks the daily PDT results for each MF cell to recognize trends and confirm membrane integrity.

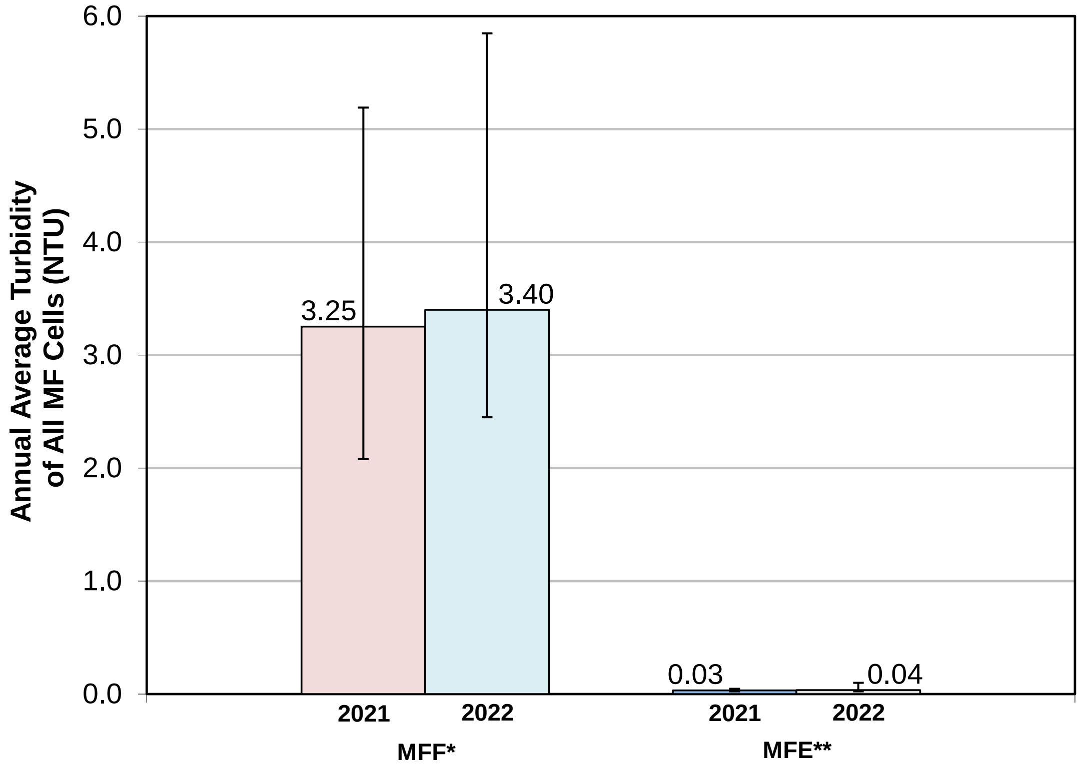


Figure 2-12. 2022 MF Turbidity Removal Performance

OCWD Operations staff continued to follow the PDT retesting protocol that began in December 2020 and involved performing up to two additional manual PDT tests on any cell that did not pass its 4.0 LRV threshold after its normal daily programmed PDT was completed. This protocol was further updated in mid-2022. Updated retesting protocol steps are:

- Any cell with a daily PDT-based LRV result less than 4.00-log is secured (taken out of service) and is retested up to three times;
- If the first retest still shows a PDT greater than 0.40 psi/min, then a second retest is conducted.
- During the retest, fixed filtration reductions may be set as low as 2400 gpm.
  - The cell is switched to manual/fixed rate filtration, or if already in manual/fixed rate, the cell's filtration rate set point is further reduced. Lowering the cell's filtration rate also reduces the cell's TMP, which often helps the cell pass its daily 4.00 LRV requirement.
  - If a cell passes at a fixed flow rate, it must remain at that flow rate during operation until its next daily programmed PDT can take place and new LRV value calculated.

- After three PDT attempts and/or filtration rate reductions (to a minimum rate of 2400 gpm), if the cell still does not pass the 4.00 LRV requirement, the cell must remain out of service until corrective maintenance is performed, up to and including a full clean-in-place (CIP). The cell must then pass another PDT and LRV calculation before being placed back into service.

The PDT retesting protocol commonly corrected a cell's low daily LRV test result. MF cells that were unable to achieve the PDT value necessary for an LRV calculation of at least 4.0-log for *Giardia* cysts or *Cryptosporidium* oocysts were taken out of service until the issue had been corrected. The PDT retesting protocol appeared to help control the MF operational issues commonly encountered during cold winter months. In addition, operators could switch struggling cells from automatic to manual fixed filtration rates to enable them to improve upon low LRV values.

2.2.3.3 RO System Pathogen Log Reduction Monitoring

The RO process receives a nominal pathogen log reduction credit of 2-log each for *Giardia* cysts, *Cryptosporidium* oocysts, and enteric virus, based on TOC monitoring conducted in accordance with the 2018 OOP and updated 2022 OOP (OCWD, 2018; OCWD and DDB Engineering, Inc., 2022) to determine the actual daily credit achieved. Two redundant on-line TOC analyzers (one duty and one standby) continuously monitor the bulk (common header) ROF flow stream, providing full redundancy; likewise, two redundant on-line TOC analyzers (one duty and one standby) continuously monitor the bulk (common header) ROP flow stream, providing full redundancy. Minimum, maximum, and average results are recorded daily along with the calculated average percent daily TOC removal. Beginning in December 2022, the GWRS may also claim enhanced pathogen reduction credit using strontium, sulfate, or adenosine triphosphate (ATP) monitoring of the RO process. However, this enhanced pathogen monitoring was not implemented in 2022. Monthly reports are submitted to DDW and the RWQCB documenting the daily pathogen log reduction values achieved by the RO process.

The RO process performance for pathogen reduction is measured using TOC removal (OCWD, 2018; OCWD and DDB Engineering, Inc. 2022). DDW has approved this methodology that uses on-line TOC as a surrogate for RO membrane integrity and pathogen reduction (CDPH, 2014). TOC removal as a continuous indicator of membrane integrity in 2022 compared on-line ROF and ROP TOC data. (See also critical control points discussion in Section 2.3.2 and Appendix E, Figure E-8 for ROP TOC results.)

The three-stage RO process is designed to remove inorganic and organic compounds as well as bacteria and virus pathogens, producing up to 130 MGD of product water at a recovery rate of approximately 85% (with GWRSFE). Monthly performance data for the RO process in 2022 for key constituents, EC and TOC, are summarized in Table 2-6. Regarding salinity removal in 2022, the bulk ROF EC averaged 1,714 µmhos/cm, and the bulk ROP EC averaged 44 µmhos/cm based on semi-weekly grab samples. This represents an average salinity removal rate for the RO process of 97.4% during 2022.

Table 2-6. 2022 RO Performance

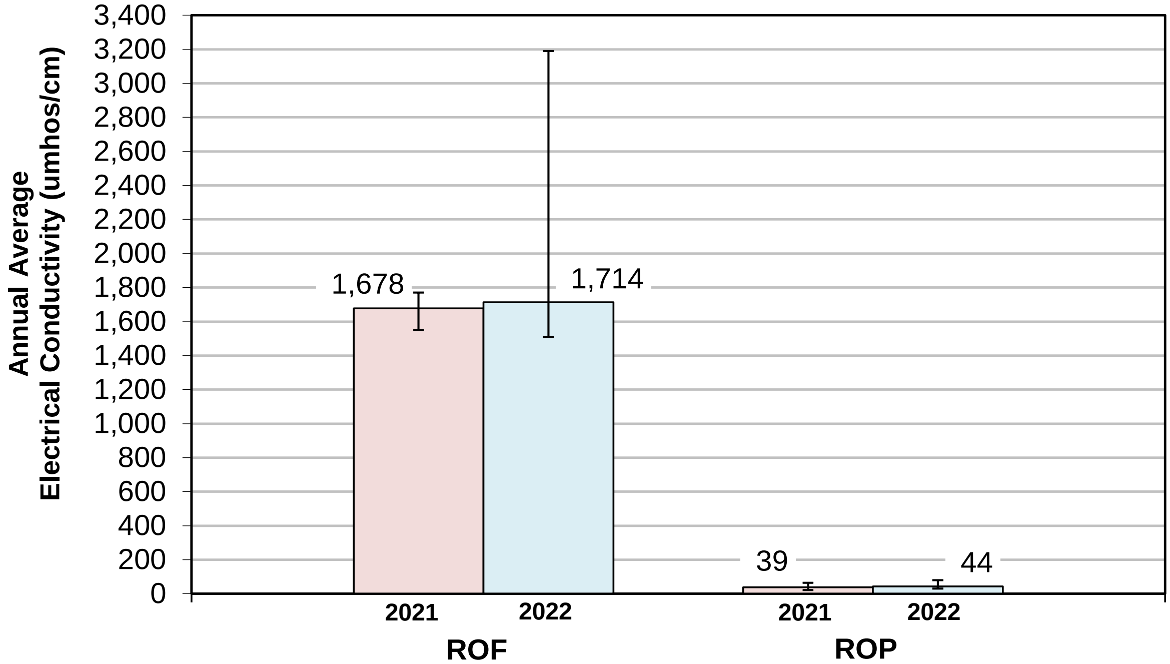
	Electrical Conductivity[1,2]				Total Organic Carbon[3]			
	RO Feed ROF		RO Product ROP		RO Feed ROF		RO Product ROP	
Month	Avg. (µmhos/cm)	Max. (µmhos/cm)	Avg. (µmhos/cm)	Max. (µmhos/cm)	Avg. (mg/L)	Max. (mg/L)	Avg. (mg/L)	Max. (mg/L)
January	1,644	1,720	33	39	8.07	8.86	0.08	0.25
February	1,718	1,760	39	42	8.59	11.60	0.08	0.21
March	1,646	1,700	37	42	8.63	12.10	0.08	0.16
April	1,698	1,740	39	43	8.79	11.30	0.10	0.19
May	1,698	1,730	41	44	8.69	10.20	0.08	0.23
June	1,636	1,720	41	46	8.29	9.10	0.07	0.10
July	1,576	1,650	46	54	8.13	8.69	0.07	0.10
August	1,664	1,720	55	61	8.20	8.75	0.08	0.12
September	1,692	1,750	55	79	8.55	11.20	0.09	0.15
October	1,717	1,750	43	46	8.60	10.20	0.10	0.19
November	1,700	1,770	42	46	8.33	9.12	0.08	0.17
December	2,480[4]	3,190[4]	62[4]	73[4]	7.68	8.34	0.07	0.14
Annual Average	1,714	---	44	---	8.37	---	0.08	---
Maximum	---	3,190	---	79	---	12.10	---	0.25
Average % Removal	97.4%				99.0%			

[1] Electrical Conductivity (EC) data for RO are not normalized with respect to ROF pressure or temperature
[2] EC semi-weekly grab sample results
[3] TOC daily grab sample results
[4] Higher EC due to introduction of P2 TF/SC to AWPF source water beginning December 12, 2022

Figure 2-13 presents the 2022 annual average EC reduction performance of the RO system and compares it with the RO system's average EC reduction the previous year. As indicated by the black bars, the ROF EC increased to 3,190 µmhos/cm on December 21, due to the volume of higher salinity P2 TF/SC effluent blended with the AWPF source water (See Section 2.1.1.2). The annual average EC reduction was effectively the same in 2022 and 2021 at 97.4% and 97.7%, respectively.

Figure 2-14 presents the annual average TOC removal performance of the RO system, comparing 2021 and 2022 laboratory-analyzed composite sample results. The average TOC removal of 99.0% in 2022 was identical to the 99.0% average TOC removal rate achieved in 2021. In general, this TOC removal performance indicates rejection rates remained constant over this period.

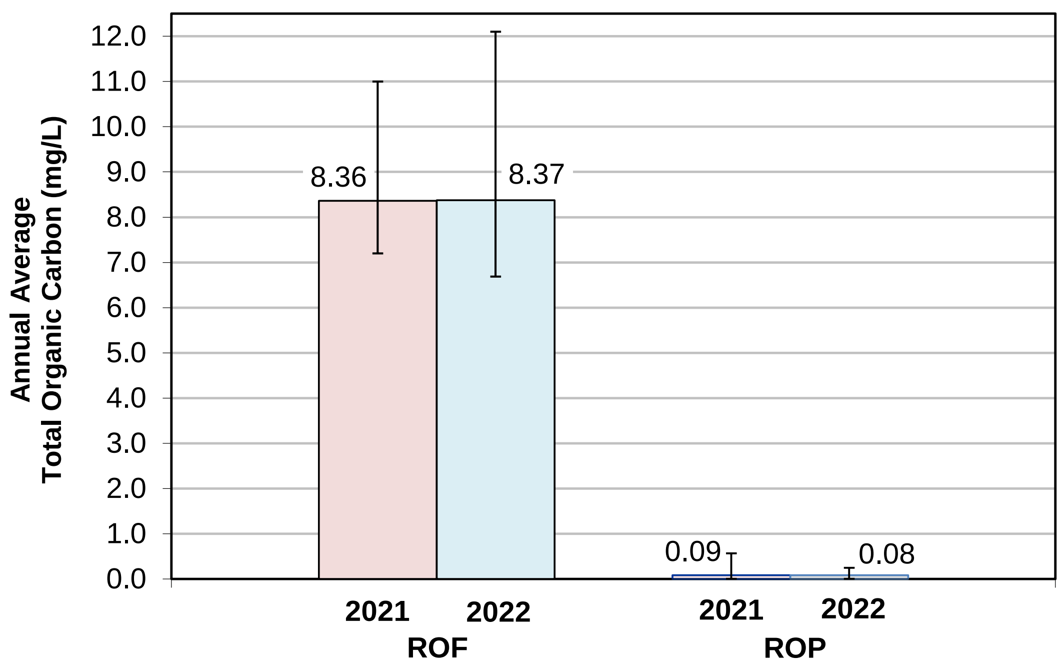
The TOC concentration in the ROF based on daily composite samples averaged 8.37 mg/L in 2022, which is essentially the same as the 8.36 mg/L average observed in 2021. The ROF TOC concentration range in 2022 was wider than in the prior year, from 6.69 to 12.10 mg/L as shown



2022 Average Percent Removal = 97.4%

Note: Black bars represent the range in individual grab samples for the years shown.

Figure 2-13. 2022 RO Electrical Conductivity Removal Performance



2022 Average Percent Removal = 99.0%

Note: Black bars represent the range in individual grab samples for the years shown.
Daily RO LRV compliance uses on-line RO TOC data (not grab sample data). See Section 2.2.3.3.

Figure 2-14. 2022 RO Total Organic Carbon Removal Performance

by the vertical black bars on Figure 2-14. Throughout 2022, the ROP TOC concentration was consistently below the 0.5 mg/L permit limit (20-sample running average and 4-sample average, assessed at FPW). The TOC concentration in the ROP based on daily composite samples averaged 0.08 mg/L during 2022, ranging from less than the 0.05 mg/L RDL to 0.25 mg/L Available operating records are indicative of the dependable performance of the RO system in 2022.

Figure 2-15 shows the daily average on-line ROF and ROP TOC results in 2022. It is interesting to note that the daily average on-line ROF TOC decreased in December 2022. This trend was also observed in ROF TOC results based on daily composite samples. Before December 12, 2022, prior to using P2 TF/SC effluent as part of the AWPF feedwater, the daily average ROF TOC was 8.4 mg/L based on daily composite samples. After P2 TF/SC effluent was added to the AWPF feedwater, the daily average ROF TOC from December 12-31 was 7.5 mg/L based on daily composite sample results. A review of the AWPF influent (Q1) TOC results based on daily composite and weekly grab samples revealed a similar decline; the average Q1 TOC before December 12, 2022, was 10.7 mg/L, and after that date, which is when P2 TF/SC effluent began to be part of the Q1 blend, the average Q1 TOC was 8.5 mg/L.

Figure 2-16 illustrates the minimum daily average pathogen LRVs achieved by the RO process based on TOC monitoring in 2022 as reported to DDW and the RWQCB; Appendix D includes monthly pathogen reduction reports in 2022. The annual daily average demonstrated pathogen LRV by the RO process in 2022 was 2.18-log. The maximum daily pathogen LRV demonstrated by the RO process was 2.33-log on December 31, 2022.

The pathogen log reduction values demonstrated by the RO process during 2022 were equal to or greater than 2.00-log based on on-line TOC readings, except for one value of 1.97-log on October 6, 2022. A review of the on-line TOC values on that date revealed that both the daily average ROF and ROP TOC concentrations were above average. (See Appendix D, p. D-83-85 and p. D-90 for details.) Slightly higher TOC values are common when water temperatures increase; AWPF influent temperatures were above average from early August through mid-October in 2022. Operations records show no remarkable RO process or TOC analyzer issues occurred on October 6. It is suspected that the elevated on-line ROP TOC concentration was caused by a Q1 TOC increase on October 6. While lab results were unable to confirm any abnormal TOC levels, review of the Q1 grab sample results for acetone revealed multiple elevated concentrations ranging from 47.8 to 71.6 µg/L from October 4-8. Other elevated acetone readings above the RDL (10 µg/L) were found in Q1 grab samples from time to time during 2022, albeit the RO process was able to achieve LRVs equal to or greater than 2.00-log based on on-line TOC readings. In conclusion, investigations revealed no apparent source(s) for the one-day TOC spike on October 6 that caused the LRV to be less than 2.00-log. Section 2.3.4.2 discusses TOC analyzer issues and brief elevated ROP TOC readings.

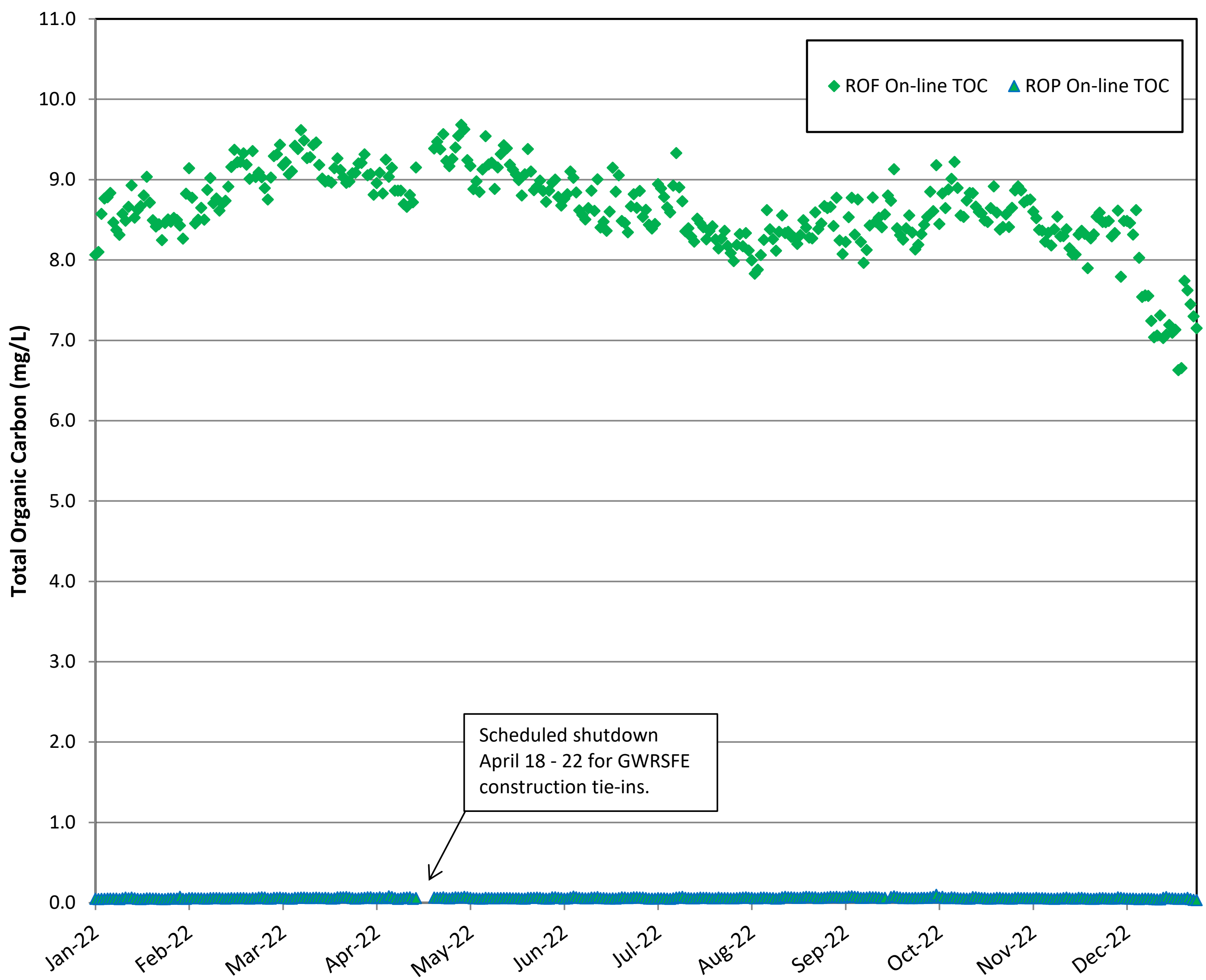


Figure 2-15. TOC Reduction Achieved by the RO Process in 2022

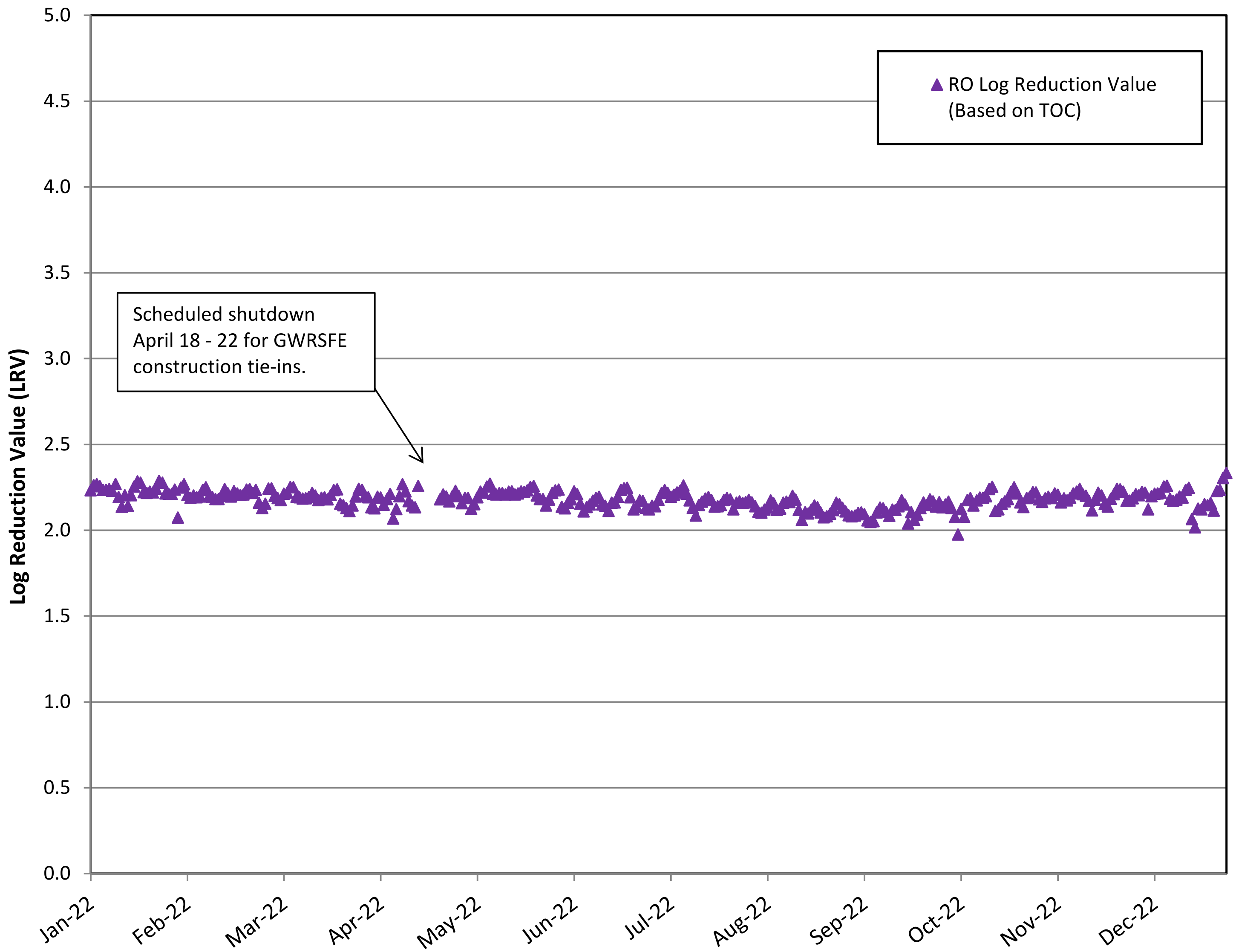


Figure 2-16. RO Log Reduction Values in 2022: *Giardia* Cysts, *Cryptosporidium* Oocysts, and Virus

2.2.3.4 UV/AOP Pathogen Log Reduction Monitoring

The UV/AOP system receives up to 6-log pathogen log reduction credits each for *Giardia* cysts, *Cryptosporidium* oocysts, and enteric virus in accordance with the 2018 and recently updated 2022 OOP (OCWD, 2018; OCWD and DDB Engineering, Inc., 2022). The on-line UV transmittance analyzer and ballast power level are used to verify the 6-log pathogen removal. By continuously monitoring critical control points, a UV transmittance of at least 95% combined with a minimum UV power level of 74 kW per train ensure that a minimum EED of 0.23 kWh/kgal achieves the required 6-log pathogen reduction.

The UV/AOP system continuously monitors UV transmittance, UV train power levels, calculated UV dose, and EED, which are all critical control points (See Section 2.3.2 and Appendix E, Figures E-9, E-10, E-11, and E-12). The pathogen reduction credits achieved by the UV/AOP process are based on these critical control points (OCWD, 2018 and 2022) with the approval of DDW (CDPH, 2014). Following start-up of the GWRSFE, a UV/AOP validation study was performed on December 27-28, 2022; results of the study may lead to modification of the required UV/AOP setpoints for pathogen reduction credit.

Operating records for 2022 show that the monthly average calculated EED ranged from 0.244 to 0.390 kWh/kgal, which is greater than the minimum EED of 0.23 kWh/kgal for virus reduction approved by DDW for the UV system.

The daily average on-line UV transmittance (%UVT) values during 2022 were well above the minimum 95% target.

The on-line UV train power was greater than the minimum critical limit of 74 kW for each UV train, with the exception of UV Train H from September 28-30, 2022, and October 5-9, 2022, when its UV train power dipped to 72.5 kW. UV Train H was secured to address a relay issue with its upstream electrical gear and correct its UV train power level. The overall UV system average power level for September 28-30 was between 78.6 and 80.9 kW, which is well above the critical limit of 74 kW. Furthermore, the UV train power target, in addition to the %UVT, are used to ensure that each train meets the minimum 111 mJ/cm^2 required for disinfection. Throughout 2022, the calculated UV dose for each train and the UV system overall was always more than two times the minimum UV dose of 111 mJ/cm^2. This includes the UV Train H power, which ranged from 239 to 296 mJ/cm^2 during the period when UV train power was less than 74 kW in September and October 2022.

On this basis, the UV/AOP system can be credited for 6-log reduction of *Giardia* cysts, *Cryptosporidium* oocysts, and viruses throughout 2022. Figure 2-17 illustrates the daily LRV credits achieved by the UV/AOP system in 2022.

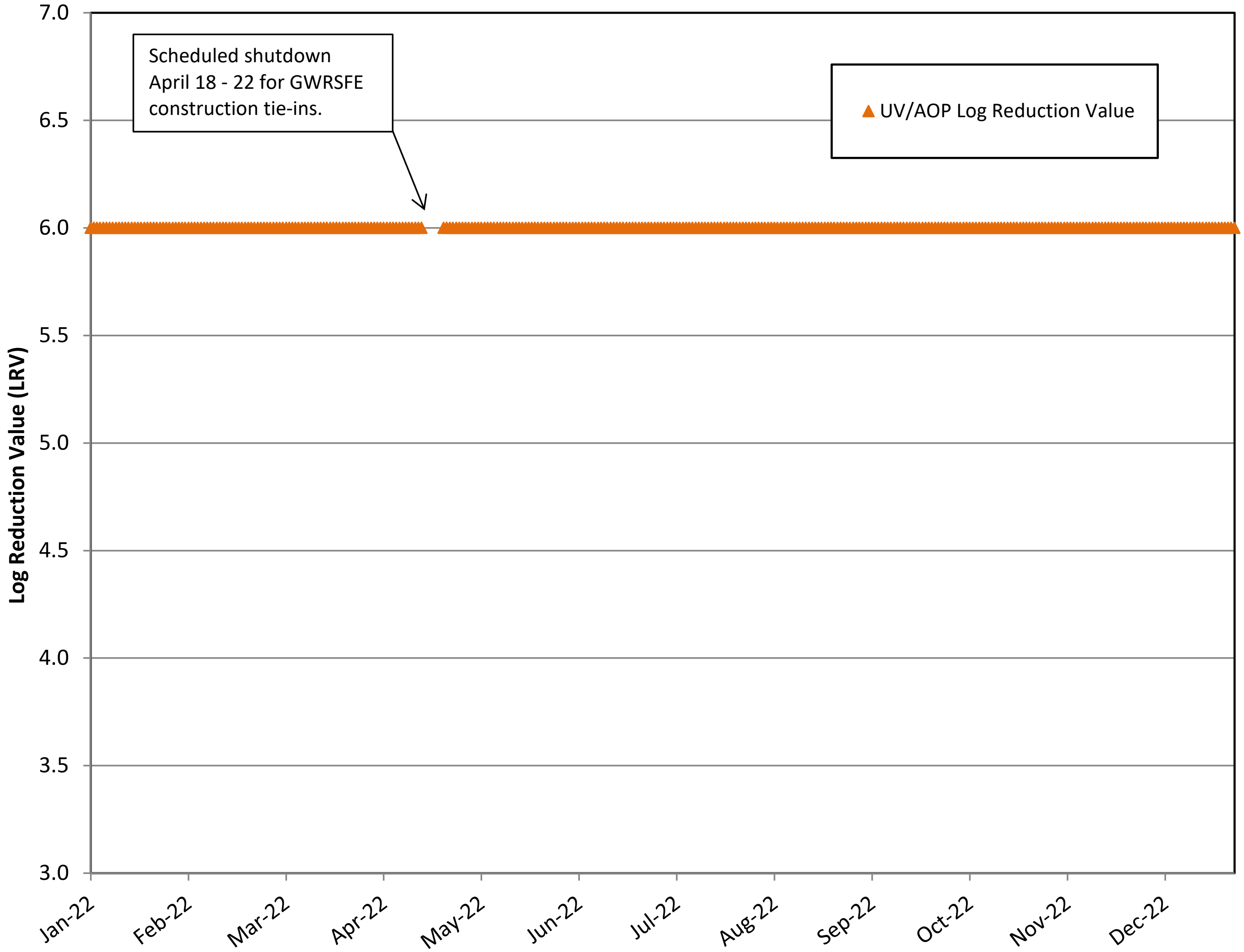


Figure 2-17. UV/AOP Log Reduction Values in 2022: *Giardia* Cysts, *Cryptosporidium* Oocysts and Virus

2.2.4 CEC Monitoring and Compliance with SWRCB Recycled Water Policy

The SWRCB adopted an updated *Water Quality Control Policy for Recycled Water* in 2018 (aka Recycled Water Policy) (SWRCB, 2018). The RWQCB issued GWRS modified monitoring and reporting requirements in November 2020 to comply with the latest SWRCB provisions (RWQCB, 2020a); the 2020 monitoring and reporting requirements were in effect until December 2022. The RWQCB included the same SWRCB Recycled Water Policy requirements in the new GWRS permit that was issued on December 2, 2022 (RWQCB, 2022a).

The Recycled Water Policy requires submittal of a Quality Assurance Project Plan (QAPP) for review and approval by the SWRCB and RWQCB. The SWRCB approved the OCWD QAPP in June 2021, with the exception of the Aryl Hydrocarbon Receptor (AhR) bioassay (SWRCB, 2021a). The laboratory for AhR analysis that is listed in the OCWD's approved QAPP for the Recycled Water Policy has not yet secured method approval. OCWD is evaluating options for other laboratories approved by the SWRCB Division of Water Quality for the method. If an alternative lab is selected, the QAPP will be updated and submitted to the RWQCB for approval. In the meantime, the SWRCB approved the OCWD in-house laboratory methods for several analytes for purpose of monitoring outlined in the Recycled Water Policy, namely 1,4-dioxane, NDMA, NMOR, sucralose, and sulfamethoxazole (SWRCB, 2021b-d).

Initial phase quarterly monitoring of CECs and surrogates was conducted per the approved QAPP and GWRS permit monitoring and reporting requirements (RWQCB, 2020a and 2022a) beginning in July 2021 and continuing through 2022 as follows:

- CECs (relevance/indicator type shown in parentheses)
  - 1,4-Dioxane (health) in FPW;
  - NDMA (health and performance) in ROF, ROP, UVP, and FPW;
  - Perfluorooctane sulfonate (PFOS) (health) in FPW;
  - Perfluorooctanoic acid (PFOA) (health) in FPW;
  - N-nitrosomorpholine (NMOR) (health) in FPW;
  - Sucralose (performance) in ROF, ROP, and FPW; and
  - Sulfamethoxazole (performance) in ROF, ROP, and FPW.
- Surrogates for CECs
  - Electrical conductivity (EC) in ROF, ROP, and FPW; and
  - Total Organic Carbon (TOC) in ROF, ROP, UVP, and FPW.
- Bioanalytical screening tools
  - Estrogen receptor-α in FPW;
  - Aryl hydrocarbon receptor in FPW (pending QAPP resubmittal and approval).

Table 2-7 summarizes the monitoring requirements for subsurface injection projects (i.e., those using RO and AOP advanced treatment) and presents the results for GWRS in 2022.

Table 2-7. Summary of CEC and Surrogate Monitoring for GWRS in 2022

Constituent	Constituent Group	Relevance/Indicator Type		Required Reporting Limit	OCWD RDL	Units	ROF		ROP		UVP		FPW		Removal Percentages (%)			
		Health	Performance[1]				No. Of Samples	Average[2]	No. Of Samples	Average[2]	No. Of Samples	Average[2]	No. Of Samples	Average[2]	Average	Minimum	Maximum	Target[3]
CECs to be monitored[3]																		
Groundwater Recharge Reuse - Subsurface Applications																		
1,4-Dioxane	Industrial chemical	✓		0.5[4]	0.5	µg/L	NR	NR	NR	NR	NR	NR	52	<0.5	NR	NR	NR	N/A
NDMA[5]	Disinfection byproduct	✓	✓	2	2	ng/L	55	15.5	55	7.3	51	<2	55	1.0	98.7%	80.0%	99.4%	>80%
NMOR	Industrial chemical	✓		2	2	ng/L	NR	NR	NR	NR	NR	NR	55	<2	NR	NR	NR	N/A
PFOS	Consumer/industrial chemical	✓		6.5	2	ng/L	NR	NR	NR	NR	NR	NR	4	<2	NR	NR	NR	N/A
PFOA	Consumer/industrial chemical	✓		7	2	ng/L	NR	NR	NR	NR	NR	NR	4	<2	NR	NR	NR	N/A
Sucralose[6]	Food additive		✓	100	1000/100/100 ROF/ROP/FPW	ng/L	4	78,425	4	<100	na	na	4	<100	100.0%	100.0%	100.0%	>90%
Sulfamethoxazole[6]	Antibiotic		✓	10	10/1/1 ROF/ROP/FPW	ng/L	4	858	4	<1	na	na	4	<1	100.0%	100.0%	100.0%	>90%
Surrogates to be monitored[3]																		
Groundwater Recharge Reuse - Subsurface Applications																		
Electrical Conductivity (EC) [7,8]				N/A	1	µm/cm	356	1,714	53	44	na	na	356	103	94.0%	90.6%	97.4%	>90%
Total Organic Carbon (TOC) [7,8]				N/A	0.05	mg/L	386	8.37	374	0.09	13	0.14	361	0.08	99.0%	95.4%	99.6%	>90%
Bioanalytical Screening Tools for CECs																		
Groundwater Recharge Reuse - Subsurface Applications																		
Estrogen receptor-α [9]				0.5	0.5	ng/L[8]	na	na	na	na	na	na	4	<0.5	N/A	N/A	N/A	N/A

[1] Results shown for initial assessment monitoring phase and may be refined for subsequent monitoring phases.

[2] Average of all available 2022 data based on using 10% of the RDL for non-detectable readings unless noted otherwise.

[3] GWRS compliance with the 2018 Recycled Water Policy is based on monitoring and reporting requirements for subsurface application (SWRCB, 2018) and (1) prior to December 2, 2022, the 2020 GWRS Revised Monitoring and Rporting Requirements (RWQCB, 2020), and (2) after December 2, 2022, Order No. R8-2022-0050 (RWQCB, 2022a).

[4] Recycled Water Policy required reporting limit is 0.1 µg/L. A higher reporting may be approved, as long as the ratio between the reporting limit and the monitoring trigger limit of 0.1 µg/L is no less than two. A reporting limit of 0.5 µg/L has been approved for GWRS.

[5] Percent removals for NDMA shown for ROF to UVP.

[6] Percentage removals for sucralose and sulfamethoxazole shown for ROF to ROP.

[7] Based on grab sample results. On-line measurements are also taken and available results are reported in Appendix E.

[8] Percent removals for EC and TOC shown for ROF to FPW.

[9] Estrogen receptor-α results shown as the required bioanalytical equivalent concentration (BEQ) of agonist 17-beta Estradiol measured in ng/L. The Monitoring Trigger Level (MTL) is 3.5 ng/L The calculated BEQ/MTL ratio is less than the 0.15 threshold that would require a response action.

na = Not analyzed

N/A = Not applicable

NR - Not required

2.3 Performance and Operational Record

The overall performance and operational record of the AWPF are summarized below in terms of general operating records, including start/restart issues, downtimes, operator certifications, compliance with critical control points, and focused studies to optimize performance and increase water production.

Appendix F includes a list of OCWD operators with their grades of certification as well as summaries of equipment calibration records for 2022. As of December 2022, OCWD had approximately 60 water production staff, of which 23 are certified operators and five have the highest certification level (WWTP V). OCWD tracks the expiration dates for all certified operators to ensure certifications are maintained. Additionally, OCWD is phasing in a new permit requirement for California-Nevada Section of the Advanced Water Works Association/California Water Environment Association advanced water treatment operator (AWTO) certification for some operators (RWQCB, 2022a). The AWPF control room is staffed 24 hours per day, 7 days per week.

2.3.1 General Operational Performance

The AWPF continued to successfully operate and produce purified recycled water for groundwater recharge through 2022. The original AWPF began operation on January 10, 2008, with a 70 MGD design production capacity, following a rigorous commissioning and acceptance testing period. The GWRSIE began operation on May 21, 2015, first enabling the AWPF to produce up to 85 MGD and later up to 100 MGD of purified recycled water; final acceptance and completion of the GWRSIE construction project followed on July 31, 2015. Construction of the GWRSFE began in late 2019 and continued through 2022 with commissioning of the new facilities on December 5-6, 2022. During commissioning, the AWPF discharged all FPW to waste via the Finished Product Water Bypass Structure that directed flow to the OC San ocean outfall (i.e., no FPW was discharged to GWRS recharge sites during GWRSFE commissioning). The expanded AWPF began normal operation with P2 TF/SC effluent as part of the source water blend on December 12, 2022, producing up to 130 MGD of purified recycled water for recharge.

The AWPF was on-line 354 days in 2022 (97.0% of the year). Table 2-8 summarizes the AWPF off-line events during 2022. Appendix F contains detailed descriptions of all plant shutdowns during the year.

The lengthy planned shutdown from April 18-22 (144.75 hours) enabled the GWRSFE contractor to perform PCS software downloads and complete tie-ins of equipment and piping for the expanded influent screening, MF, RO, and dechlorination facilities. A shorter planned shutdown on June 8 (10.5 hours) allowed the GWRSFE contractor to complete PCS software downloads for the RO system and connect and test a variety of new equipment for the expanded MF and RO auxiliary systems (e.g., MF backwash pumps, air and vacuum system, heaters, RO flush pump)

Table 2-8. Summary of AWPF Shutdowns in 2022

Start Date and Time	Duration (hours)	Cause
4/17/2022 at 0815 hours	144.75	Planned shutdown for GWRSFE construction work
6/8/2022 at 0600 hours	10.50	Planned shutdown for GWRSFE construction work
8/1/2022 at 0706 hours	2.33	Unplanned SCE power outage
9/6/2022 at 1735 hours	5.00	Unplanned shutdown due to equipment issues during SCE load reduction demand response
9/19/2022 at 2355 hours	22.75	Planned shutdown for GWRSFE construction work
11/8/2022 at 1255 hours	3.53	Unplanned power failure that closed GWRS pipeline valve caused PWPS to shutdown
11/19/2022 at 1058 hours	2.97	Unplanned SCE power outage
12/5/2022 at 0553 hours	35.00	Planned shutdown (flow to waste) for GWRSFE commissioning
12/27/2022 at 0205 hours	37.12	Planned shutdown (flow to waste) for UV validation testing

and lime storage power upgrades. The September 6 shutdown (5.0 hours) occurred while the AWPF was reducing production in response to a call from Enel X for the AWPF to reduce its SCE power demand to be under 5.048 Megawatts (MW) for a 3-hour period. Mandatory load reduction events are conducted by SCE as part of the Enel X Demand Response Program that allows SCE to request periodic reductions in electrical power consumption during peak demand periods. OCWD's agreement with Enel X, the regional Demand Response Program provider, requires a load reduction to a total of 5 MW instantaneous usage or less during a load shedding event. The AWPF can maintain production at a low level (15-20 MGD) during these periods, while still delivering the required power reduction for the Enel X program. Flows during these periods of low production are typically distributed to the Talbert Barrier only. OCWD receives financial compensation for participating in this program.

The AWPF operation was modified on December 5-6 to divert FPW to waste (i.e., OC San outfall) while the GWRSFE conducted commissioning tests with the new Plant 2 SEFE pump station (35.0 hours). The second shutdown occurred on December 27-28 while the AWPF operated in the FPW diversion to waste mode during UV/AOP validation testing to confirm the UV/AOP system's effectiveness with the inclusion of P2 TF/SC effluent as source water (37.12 hours).

2.3.2 Critical Control Points

Operation of the AWPF involves performance monitoring at multiple points or steps along the entire treatment process. This performance monitoring enables the operators to track how the system is doing at each step and gives them ample time to take corrective actions if necessary. Such performance monitoring ensures that the purified recycled water is safe, complies with regulatory requirements, and may be recharged and/or reused.

Critical control points and critical limits are shown in Table 2-9, as well as important process monitoring and control criteria used to operate the AWPF. Developed over time, the critical control points and critical limits were originally identified in the OOP (OMMP in 2008) and later modified in 2015-2016 with review and oversight by the Panel (NWRI, 2017). At the request of the Panel and in compliance with the groundwater recharge regulations (CCR, 2018), PDT results were added as an indicator of MF membrane integrity. Since 2017 and in response to new requirements from DDW (DDW, 2017), the critical control points and critical limits have been adapted to demonstrate daily pathogen log reduction values for compliance with the groundwater recharge regulations (CCR, 2018). OCWD submitted an updated OOP to DDW in 2018 (OCWD, 2018) documenting the criteria for pathogen log reduction values and adding electrical energy dose (EED) as an indicator of UV/AOP performance. In November 2022 OCWD submitted an updated OOP that includes the GWRSFE to DDW (OCWD and DDB Engineering, Inc., 2022). Evaluation of operating records for each critical control point with respect to the associated critical limit provides an indication of performance during the year.

Appendix E contains plots of data from the AWPF PCS showing how the AWPF operation compared with the critical limits listed above during 2022. Except for PDT monitoring, the critical control point readings are from continuous on-line analyzers rather than sampling and laboratory analyses. The plots in Appendix E are based on daily averages of the continuous data recorded at least every 15 minutes. Exceedance of a critical control point triggers alarms in the AWPF PCS for the operators to take corrective actions if a limit is exceeded. The critical control points and corresponding critical limits are used for operating the AWPF and were not historically used for permit compliance. However, in order to comply with Title 22 regulations (CCR, 2018), some of the critical control points have been adopted for the demonstration of pathogen LRVs by each unit process; this is described in Sections 2.2.3.2 (MF), 2.2.3.3 (RO), and 2.2.3.4 (UV/AOP).

Table 2-9. Summary of Critical Control Points and Critical Limits

Parameter		Flow Stream or Process	Target Operating Range
1.	Combined Chlorine Residual	MFF (bulk)	3 to 5 mg/L
2.	Combined Chlorine Residual	ROF (bulk)	< 5 mg/L
3.	Turbidity	MFF (bulk)	< 5 NTU optimum ≤ 20 NTU for membrane warranty > 20 NTU for no more than 4 hours < 50 NTU at all times
4.	Turbidity	MFE (bulk)	< 0.15 NTU optimum > 0.20 NTU for no more than 4 hours ≤ 0.5 NTU at all times
5.	Turbidity	ROP (bulk)	0.1 to 0.15 NTU
6.	Transmembrane Pressure (TMP)	MF (cell)	3 to 12.5 psi
7.	Pressure Decay Test (PDT) based on daily testing	MF (cell)	LRV calculation from PDT result < 4.00 LRV triggers shutdown of cell and work order to be issued
8.	Electrical Conductivity	ROP (unit)	< 95 µmhos/cm[1] < 110 µmhos[2]/cm for individual units
9.	Total Organic Carbon	ROP (bulk)	≤ 0.1 mg/L
10.	UV Transmittance	UV/AOP Feed (bulk)	95% minimum (at 254 nanometers)[3]
11.	Electrical Energy Dose (EED)	UV/AOP Feed (bulk)	0.23 kWh/kgal minimum[2,3]
12.	Average UV Train Power	UV/AOP (train)	74 kW per train minimum[3]
13.	Calculated UV Dose per Train	UV/AOP (train)	111 mJ/cm^2 minimum[3,4]
14.	pH	FPW	< 9.0 units at all time <8.5 units as daily average

[1] CCP determined using a 2015 statistical analysis of the on-line conductivity data.
[2] EED is used to demonstrate compliance with 6-log virus reduction.
[3] CCP may be adjusted pending review of results from GWRSFE UV/AOP validation conducted in December 2022.
[4] Calculated UV dose per train is significantly greater than the minimum.

2.3.3 MF System Operation and Performance

2.3.3.1 MF System Facilities

MF removes suspended and colloidal solids, including bacteria and protozoa, and serves as a pretreatment step before the RO process. Screened secondary effluent flows by gravity to below-grade MF cells, pictured on Figure 2-18. From 2015 through September 2022, the MF system featured a total of 36 submerged MF cells, 34 cells feature polypropylene hollow-fiber membranes with a nominal pore size of 0.2 micrometers (microns), while two cells feature polyvinylidene difluoride (PVDF) hollow-fiber membranes with a nominal pore sizes of 0.1 micron (Cell E03) and 0.04 micron (Cell E04). In September, two existing polypropylene cells (E01 and E02) were replaced with 0.04 micron PVDF cells. Then, beginning in October 2022, 12 additional MF cells with PVDF hollow fiber membranes and nominal pore sizes of 0.04 micron were commissioned as part of the GWRSFE and placed into operation. The entire MF system currently has a total of 48 cells arranged in six trains, each with eight cells with 684 in-basin submerged membrane elements.

Figure 2-18. MF System

Filtrate pumps, operating in a vacuum mode, continuously pull water through the MF membranes using a piping manifold and discharge the filtrate, or MF effluent, to the MF Break Tank. With completion of the GWRSFE, the maximum rated filtrate production capacity of the MF system is 162.2 MGD with one cell out of service or in backwash. The design average filtrate production capacity of the MF system is 153 MGD based on 89% recovery to account for backwashing and clean-in-place (CIP) cycles and to enable the RO system to produce 130 MGD of ROP. The MF cells with polypropylene membranes are regularly backwashed using filtrate from the MF using citric acid and sodium hydroxide with a proprietary chemical to remove foulants and restore membrane performance. The MF cells with PVDF membranes are periodically cleaned-in-place using sodium hypochlorite and citric acid with maintenance washes. Waste backwash is returned to OC San Plant 1 for treatment. MF CIP spent cleaning solutions are sent to OC San Plant 2.

2.3.3.2 MF System Operation

The MF system operated well during 2022 and produced exceptional MF effluent (MFE) water quality that was fully compliant with Title 22 water recycling criteria. Various cells were temporarily taken off-line for normal membrane integrity testing (aka PDT), preventive maintenance on valves and instruments, and CIP procedures. Some temporary cell downtimes were required to investigate and correct elevated PDT values, adjust valves, repair piping, and resolve instrument communication issues.

In general, lower LRV issues occurred more frequently in MF cells with older polypropylene membranes (installed in 2016-2017) as well as the older PVDF membranes (installed in 2018 and 2019); these cells intermittently exhibited higher than normal PDT results.

Table 2-10 lists the MF membrane types and installation dates as of the end of 2022.

Table 2-10. Summary of MF Membrane Types and Installation Dates as of December 31, 2022

MF Train[1]	MF Cell(s)	Membrane Type[2]	Installation Date
A	A01 – A02	Evoqua Polypropylene	December 2022
	A03 – A04	Evoqua Polypropylene	November 2022
	A05 – A08	Evoqua Polypropylene	July - August 2017
B	B01 – B08	Evoqua Polypropylene	September 2021—March 2022
C	C01 – C08	Evoqua Polypropylene	November 2020 – March 2021
D	D01 – D08	Evoqua Polypropylene	October 2016 – May 2017
E	E01[1]	Memcor/Dupont PVDF	September 2022
	E02[1]	Memcor/Dupont PVDF	September 2022
	E03[2]	Memcor/Dupont PVDF	January 2019
	E04[3]	Memcor/Dupont PVDF	October 2022
	E05 – E08[4]	Memcor/Dupont PVDF	October 2022
F	F01 – F08[4]	Memcor/Dupont PVDF	November 2022

[1] MF Cells E01 and E02 Evoqua polypropylene membranes were replaced with Memcor/Dupont PVDF membranes in the GWRSFE.
[2] MF Cell E03 was used to demonstrate Memcor/Dupont PVDF membranes performance for planning GWRSFE.
[3] MF Cell E04 was used to demonstrate Scinor PVDF membranes performance. Replacement Memcor/Dupont PVDF membranes were installed in the GWRSFE.
[4] MF Cells E05 – E08 and F01 – F08 were installed in the GWRSFE.

2.3.4 RO System Operation and Performance

The RO process demineralizes water and removes inorganics, organics, viruses, and a wide range of other contaminants using spiral-wound, thin-film composite polyamide membranes. The RO system performed well during 2022. Beginning in mid-2015 and continuing through 2022, the three-stage RO system operated at an ROF pH of 6.9 and recovery rate of 85%.

2.3.4.1 RO System Facilities

MF effluent is pumped from the MF Break Tank to the RO system by the RO Transfer Pump Station. The RO process features pretreatment chemical addition using sulfuric acid and antiscalant (threshold inhibitor), cartridge filtration, and high-pressure feed pumps that supply the pressure vessels containing the RO membranes. Immediately upstream of the RO system are 16 cartridge filters using 10-micron filters. As of the end of 2022, the RO system featured 27 units (26 duty units and one standby unit), each rated at 5 MGD permeate capacity.

Three RO units' membranes were replaced in 2022: B02, C02, and D02. The GWRSFE installed two new RO trains (H and I), each with three units, for a total of six new RO units; this brought the total number up to 27 RO units, arranged in nine trains. Table 2-11 lists the RO trains, units, membrane types, and dates installed in the RO system. Highlights of the RO system operation in 2022 are discussed below.

Table 2-11. RO System Membrane Types and Installation Dates

RO Train[1,2]	RO Unit	Membrane Type[3]	Installation Date
A	A01	LG Chemical	October 2018
	A02	LG Chemical	October 2018
	A03	LG Chemical	October 2018
B	B01	Dupont-FilmTec BW30XFRLE	October 2020
	B02	Dupont-FilmTec BW30XFRLE	May 2022
	B03	Hydranautics ESPA2-LD	January 2017[4]
C	C01	Dupont FilmTec BW30XFRLE	October 2020
	C02	Dupont FilmTec BW30XFRLE	April 2022
	C03	Hydranautics ESPA2-LD	January 2017[4]
D	D01	Dupont-FilmTec BW30XFRLE	October 2020
	D02	Dupont-FilmTec BW30XFRLE	May 2022
	D03	Hydranautics ESPA2-LD	February 2017[4]
E	E01	Hydranautics ESPA2-LD	March 2017[4]
	E02	Hydranautics ESPA2-LD	March 2017[4]
	E03	Hydranautics ESPA2-LD	March 2017[4]
F	F01	Dupont-FilmTec XFRLE-400	April 2015
	F02	Dupont-FilmTec XFRLE-400	April 2015
	F03	Dupont-FilmTec XFRLE-400	April 2015

RO Train[1,2]	RO Unit	Membrane Type[3]	Installation Date
G	G01	Dupont-FilmTec XFRLE-400	May 2015
	G02	Dupont-FilmTec XFRLE-400	May 2015
	G03	Dupont-FilmTec XFRLE-400	May 2015
H	H01	Dupont FilmTec BW30XFRLE	September 2022
	H02	Dupont FilmTec BW30XFRLE	September 2022
	H03	Dupont FilmTec BW30XFRLE	September 2022
I	I01	Dupont FilmTec BW30XFRLE	September 2022
	I02	Dupont FilmTec BW30XFRLE	September 2022
	I03	Dupont FilmTec BW30XFRLE	September 2022

[1] Trains F and G have ERDs. Trains A through E and Trains H and I do not have ERDs.
[2] Trains A through E and Trains H and I have interstage booster pumps. Trains F and G do not have interstage booster pumps.
[3] Thin Film Composite Polyamide RO Membranes.
[4] Limited "stage-only" membrane replacements with newer used membranes from other RO units were completed in 2020.

Shown on Figure 2-19, each RO unit consists of 150 pressure vessels arranged in three banks (stages). The original 15 RO units are configured in a 78:48:24 array; the six GWRSIE RO units are configured in a 77:49:24 array with turbocharger energy recovery devices (ERDs) that also provide interstage flux balancing and monitoring capabilities. The six GWRSFE RO units are configured in a 77:49:24 array. As part of the GWRSFE, interstage booster pumps are installed on 21 RO units (Trains A-E and H-I). At a design recovery rate of 85%, the total nominal rated permeate capacity of the RO system is 130 MGD. Concentrate (i.e., reject) from the RO process is sent to the OC San ocean outfall for disposal. The RO system would be bypassed during a peak wet weather SAR discharge event.

2.3.4.2 RO System TOC Analyzers

The two parallel bulk ROF and bulk ROP TOC analyzers operated within acceptable deviation ranges (<3%) in their respective readings throughout 2022. The two redundant ROF and two redundant ROP TOC analyzers exhibited numerous brief spikes of false high and low TOC readings. The false ROP TOC spikes are evident due to their brief duration (e.g., one high reading between normal readings every four minutes on the analyzer) and meanwhile the redundant ROP TOC analyzer shows normal readings. It is suspected that the false spikes are caused by air bubble entrainment on the peristaltic pump and supply line that draws the sample into the ROP TOC analyzer. The ROP TOC analyzer instability issues proved challenging and may have been associated with changes in the RO system during GWRSFE construction. OCWD is working with the analyzer manufacturer to improve ROP TOC analyzer operating consistency.

Figure 2-19. RO System

Multiple bulk on-line elevated ROP TOC events above the internal OCWD CCP target (0.10 mg/L) occurred in 2022. At no time did any of these elevated ROP TOC events exceed the 0.5 mg/L permit limit. Table 2-12 summarizes the short-term elevated ROP TOC events by month and duration with investigation notes; events lasting longer than 60 minutes instigated special process sampling and lab analyses to confirm the elevated TOC. Following the TOC Response Matrix (OOP, 2022), OCWD Operations contacted the OC San operations control center to inquire if Plant 1 may have had any activities associated with the elevated TOC (prior to December 12, 2022, all AWPF feedwater was from Plant 1).

In general, OCWD Operations staff have noted that the following activities during GWRSFE construction tended to cause short-term elevated on-line ROP TOC events:

- New RO membranes coming on-line;
- AWPF shutdowns;
- AWPF restarts, particularly at reduced production rates.

For the elevated on-line ROP TOC events confirmed by grab samples that occurred in April and October, OCWD investigated potential causes with OC San however, definitive causes remain undetermined.

Table 2-12. Summary of Brief Elevated On-Line ROP TOC Events Observed in 2022

Month	Date	Event Duration	Maximum Bulk On-Line ROP TOC (>0.1 mg/L critical limit) (mg/L)	Investigation Notes
January	None	--	--	--
February	None	--	--	--
March	None	--	--	--
April	4/1/2022	1 hr 25 min	0.44	TOC confirmed by OCWD lab. No elevated acetone. Suspect new membrane flushing caused TOC spike
	4/8/2022	5 hrs 3 min	0.179	TOC confirmed by OCWD lab. OC San Plant 1 reported a slug of high pH influent of unknown origin
	4/9/2022	2 hrs 51 min	0.126	TOC confirmed by OCWD lab. Unexplained cause
	4/13/2022	4 min	0.17	After full RO membrane change
	4/14/2022	5 min	0.20	After restarting RO Unit C02 with new membranes
	4/15/2022	48 min	0.11	Lowered MFF chlorine dose in response to ROF chlorine residual and low %UVT alarms, which corrected the ROP TOC
	4/23/2022	2 min	0.17	After AWPF restart and increasing production rate
	4/29/2022	1 min	0.11	Unexplained cause
May	5/2-3/2022	3 hrs	0.109	Confirmed by OCWD lab. Unexplained cause
	5/5/2022	14 min	0.10	Unexplained cause
	5/10/2022	3 min	0.118	Suspect cycling RO Train A on/off for GWRSFE caused the TOC spike
	5/15/2022	10 min	0.162	After restarting RO Unit B02 with new membranes
	5/22/2022	14 min	0.363	Sudden production rate change caused multiple RO units to start system flushes.
June	6/8/2022	32 min	0.188	After AWPF restart and increasing production rate after shutdown for GWRSFE construction
	6/8/2022	20 min	0.207	After AWPF restart and increasing production rate after shutdown for GWRS construction
	6/8/2022	2 min	0.113	After AWPF restart and increasing production rate
July	None	--	--	--

Month	Date	Event Duration	Maximum Bulk On-Line ROP TOC (>0.1 mg/L critical limit) (mg/L)	Investigation Notes
August	8/1/2022	10 min	0.10	After AWPF restart and increasing production rate following power outage
	8/16/2022	4 min	0.10	Unexplained cause
September	9/7/2022	15 min	0.10	After AWPF restart
	9/7/2022	2 min	0/10	After AWPF restart
	9/7/2022	1 hr 45 min	0.131	After AWPF restart
	9/8/2022	2 hr 15 min	0.131	Following OC San TF caustic cleaning. Lab results found slight increase in acetone
	9/21/2022	30 min	0.108	Fluctuating production rates due to RO Trains F and G testing new interstage booster pumps
	9/22/2022	5 hr 15 min	0.149	Following OC San TF caustic cleaning. Lab results found slight increase in acetone
October	10/1/2022	6 min	0.196	Unexplained cause
	10/4/2022	1 hr 3 min	0.117	AWPF increasing production. Lab results found slight increase in acetone
	10/6/2022	8 hr 15 min	0.213	Lab results found slight increase in acetone. Unexplained cause
	10/8/2022	3 hr 16 min	0.133	Lab results found slight increase in acetone. Unexplained cause
	10/18/2022	41 min	0.117	Unexplained cause
November	11/17/2022	3 min	0.118	Following RO Unit D01 cleaning
	11/18/2022	3 min	0.109	Unexplained cause
December	12/20/2022	20 min	0.139	Unexplained cause
	12/21/2022	3 hr 25 min	0.150	During vibration tests on new RO Trains H and I, cycling on/off. Lab results found no acetone
	12/28/2022	20 min	0.153	During AWPF restart following UV/AOP validation tests and flow to waste

2.3.5 Ultraviolet/Advanced Oxidation Process Operation and Performance

The UV/AOP (hydrogen peroxide advanced oxidation and UV light exposure) system performance is demonstrated by the UVP results as compared with those in the UV/AOP influent, or feed water stream (UVF).

2.3.5.1 UV/AOP System Facilities

The UV/AOP system consists of two steps: hydrogen peroxide addition and UV light treatment. UV light exposure is used for primary disinfection and for photolysis of UV light-sensitive contaminants such as N-nitrosodimethylamine (NDMA). Hydrogen peroxide exposed to UV light produces hydroxyl radicals that result in an advanced oxidation process to destroy UV-resistant contaminants such as 1,4-dioxane. The hydrogen peroxide design dosage is 3 mg/L. The closed, in-vessel type UV system utilizes low-pressure high-output lamps. The UV system is arranged with 16 trains. Each train contains six reactors and has a rated maximum capacity of 8.75 MGD for a total of 140 MGD capacity with all trains in service. The three newer UV trains - N, O, and P were installed with the GWRSFE in 2021. No major changes were made to the UV system in 2022. Figure 2-20 shows a photo of two UV trains.

Figure 2-20. UV/AOP System

2.3.5.2 UV/AOP System Operation

The UV/AOP system operated well during 2022, but periodically experienced various issues that I&E staff were able to correct.

Several UV train reactors experienced low UV intensity readings that were corrected by (1) replacing the UV intensity meter transmitter, (2) installing a new UV intensity sensor with (as needed) viewing windowpane, (3) replacing UV lamps, or (4) replacing ballasts. UV intensity is not a critical control limit for the AWPF as the SCADA/PCS shows individual lamp failures, which are more directly applicable to UV dose. OCWD staff continued replacing UV lamps according to the normal preventive maintenance schedule.

Standby reactors came on-line when necessary. Cycling the local power typically corrected power distribution center failures, and replacing ballasts or fuses corrected issues. In February, the ballasts of the three newer UV Trains N, O, and P were replaced (under warranty). From time to time, chiller pumps experienced air entrainment issues that were resolved by I&E staff bleeding trapped air from the chiller pumps' supply and return piping.

Normally the hydrogen peroxide metering pumps operate in a two-duty, one-standby arrangement. Operators staff on each shift check the accuracy of the pump feed rates using calibration columns and manual pump drawdowns (target is 3 mg/L). Compared with the prior year, the hydrogen peroxide metering pumps experienced fewer dosing issues during 2022.

The UV/AOP validation tests were conducted on December 27-28, 2022, to demonstrate compliance with the updated GWRS permit requirements (RWQCB, 2022a). The UV/AOP validation test report was submitted to DDW for review in late March 2023.

2.3.5.3 1,4-Dioxane Removal

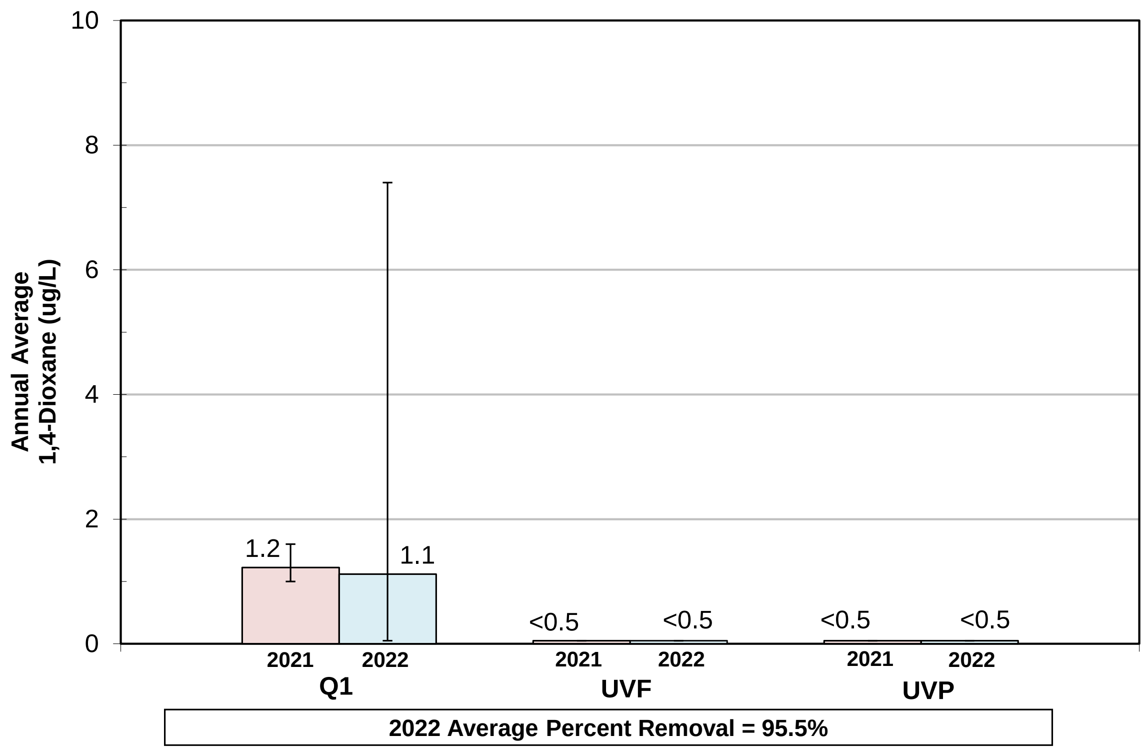
Performance of the UV/AOP system, as well as that of the RO system, can also be measured based on removal of 1,4-dioxane. Table 2-13 and Figure 2-21 show how well 1,4-dioxane was removed by both the RO and UV/AOP processes. As was demonstrated in 2022, 1,4-dioxane was neither detected in UVF (after RO treatment) nor in UVP (after UV-AOP treatment).

Table 2-13. 2022 RO/UV/AOP 1,4-Dioxane Removal Performance

Month	1,4 Dioxane					
	Secondary Effluent Q1		UV Influent UVF		UV Effluent UVP	
	Avg. [1] (µg/L)	Max. (µg/L)	Avg. [1] (µg/L)	Max. [1] (µg/L)	Avg. [1] (µg/L)	Max. [1] (µg/L)
January	1.4	2.8	<0.5	<0.5	<0.5	<0.5
February	1.0	1.2	<0.5	<0.5	<0.5	<0.5
March	1.1	1.2	<0.5	<0.5	<0.5	<0.5
April	1.5	3.6	<0.5	<0.5	<0.5	<0.5
May	1.0	1.1	<0.5	<0.5	<0.5	<0.5
June	1.1	1.5	<0.5	<0.5	<0.5	<0.5
July	0.7	1.0	<0.5	<0.5	<0.5	<0.5
August	1.1	1.3	<0.5	<0.5	<0.5	<0.5
September	0.9	1.2	<0.5	<0.5	<0.5	<0.5
October	0.8	1.0	<0.5	<0.5	<0.5	<0.5
November	0.8	0.8	<0.5	<0.5	<0.5	<0.5
December	1.9	7.4	<0.5	<0.5	<0.5	<0.5
Annual Average	1.1	---	<0.5	---	<0.5	---
Maximum	---	7.4	---	<0.5	---	<0.5
Average % Removal (RO/UV/AOP System) [2]	95.5%					
Average Log Removal (RO/UV/AOP System) [2]	1.4					

[1] Average of weekly grab samples. For purposes of calculating monthly averages, 10% of the Reportable Detection Limit (RDL) was used for all non-detect (ND) values. If all data for the month were ND, then the average is shown as "<RDL".

[2] Average % removal and log removal calculated based on non-detect (ND) = 10% of RDL.



Note: Black bars represent the range in individual weekly grab samples for the years shown.

Figure 2-21. 2022 RO/UV/AOP 1,4-Dioxane Removal Performance

2.3.5.4 NDMA Removal

Besides disinfection and 1,4-dioxane removal, a key performance criterion for the UV/AOP system relates to destruction of NDMA as shown in Table 2-14 and illustrated on Figure 2-22. The 2022 average concentration of NDMA in the UVF was approximately 7.8 ng/L, based on weekly grab samples ranging from 2.7 to 15.7 ng/L (using OCWD's in-house NDMA-LOW laboratory method with an RDL of 2 ng/L). UVF NDMA results reflect net effects of formation via MFF chlorine addition and partial removal via RO treatment. For comparison purposes, the average concentration of NDMA in the Q1 stream during 2022 was approximately 35.1 ng/L, ranging from non-detect to 89.2 ng/L.

All UVP NDMA results in 2022 were non-detect. Overall, comparison of the average UVF and UVP NDMA concentrations in 2022, the UV/AOP system attained an average NDMA removal rate of 97.4%, or a 1.6 log reduction if 10% of the detection limit is assigned to the non-detect values. The average NDMA removal rate from the AWPF source water (Q1) through the UV/AOP system (UVP) during 2022 was 99.4%, or a 2.2 log reduction (assigning 10% of the detection limit to non-detect values).

In 2022, all FPW NDMA results were below the DDW notification level for NDMA (10 ng/L).The highest NDMA concentration in the Q1 influent, 89.2 ng/L, occurred on November 4, 2022. The NDMA concentration in the FPW on that date was 2.9 ng/L. The UVP NDMA concentration on that day was non-detect (less than 2 ng/L), demonstrating the efficacy of the UV/AOP process. While the Q1 NDMA concentration on that day was elevated and the corresponding UVP NDMA concentration was non-detect, it is suspected that the slightly higher FPW value was due to NDMA rebound occurring after UV treatment in the post-treatment FPW stabilization processes.

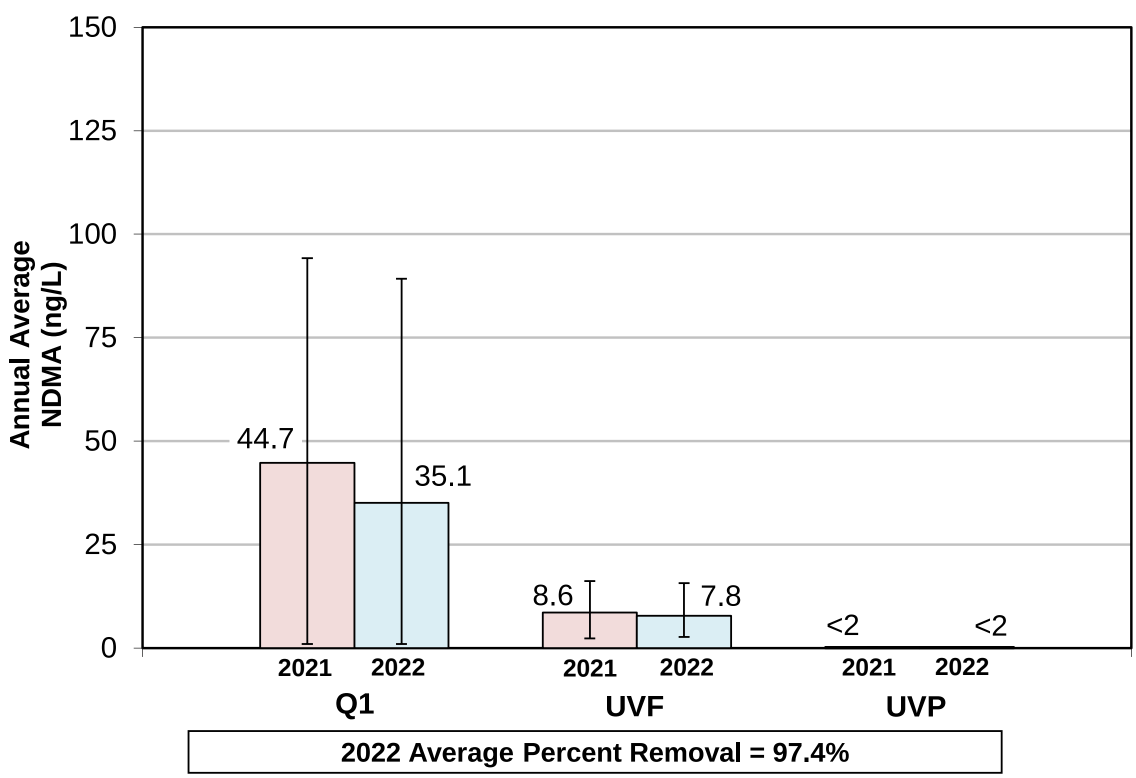
Comparing the available raw data for NDMA concentrations in FPW and UVP revealed that detectable levels were found more frequently in FPW than in UVP. For example, the highest daily concentration of NDMA in the FPW (5.2 ng/L) occurred on April 29, yet NDMA was non-detectable in the UVP stream (less than 2 ng/L). Low concentrations of NDMA in the FPW, below the DDW notification level (10 ng/L), were detected periodically throughout 2022, whereas UVP NDMA concentrations were consistently non-detect throughout the year.

Potential causes for rebound during post-treatment include reformation of NDMA from previously photolyzed NDMA and/or formation of "new" NDMA from precursor compounds, both of which are likely dependent on the combined chlorine (chloramine) concentration. Investigations by OCWD into this NDMA rebound have revealed that the lime used during post-treatment is not a likely source of NDMA or precursor material, but the increase in pH caused by the lime allows for greater formation of NDMA in the presence of combined chlorine and

Table 2-14. 2022 UV/AOP NDMA Removal Performance

Month	NDMA					
	Secondary Effluent Q1		UV Influent UVF		UV Effluent UVP	
	Avg.[1] (ng/L)	Max. (ng/L)	Avg.[1] (ng/L)	Max. (ng/L)	Avg.[1] (ng/L)	Max. (ng/L)
January	28.2	41.2	6.2	9.1	<2	<2
February	44.0	73.3	7.5	9.8	<2	<2
March	31.3	38.9	6.5	6.9	<2	<2
April	38.7	56.1	8.6	10.5	<2	<2
May	21.3	41.4	6.3	7.9	<2	<2
June	33.0	54.0	7.3	10.2	<2	<2
July	43.9	54.2	10.4	13.9	<2	<2
August	33.9	39.4	9.2	11.1	<2	<2
September	33.3	49.9	10.1	12.3	<2	<2
October	35.4	55.0	7.2	8.4	<2	<2
November	47.4	89.2	8.1	15.7	<2	<2
December	30.1	36.4	5.7	8.9	<2	<2
Annual Average	35.1	---	7.8	---	<2	---
Maximum	---	89.2	---	15.7	---	<2
Average % Removal (by UV/AOP)	97.4%					
Average Log Removal (by UV/AOP)	1.6					

[1] Average of weekly grab samples. For purposes of calculating monthly averages, 10% of the Reportable Detection Limit (RDL) was used for all non-detect (ND) values. If all data for the month were ND, then the average is shown as "< RDL".



Note: Black bars represent the range in individual weekly grab samples for the years shown.

Figure 2-22. 2022 UV/AOP NDMA Removal Performance

precursors. Accordingly, the post-treatment pH target of 8.5 attempts to limit NDMA formation while also managing cement mortar-lined distribution pipeline stability and aquifer metals mobilization. It is also believed that removal of NDMA precursors may be a function of RO membrane age.

2.3.6 Decarbonation and Lime System Operation and Performance

Post-treatment systems include decarbonation and lime addition for pH adjustment and corrosivity control prior to recharging the finished product water. Post-treatment is required to stabilize the ROP stream because excess carbon dioxide builds up through the RO system because of the lower ROF pH. The excess carbon dioxide and removal of alkalinity drives down the pH of the ROP water. To remove excess carbon dioxide, which remains through the closed UV/AOP process, a portion of UVP is sent to decarbonation towers. These towers are filled with plastic media and the water being treated is trickled down over the media while a counter-current fan blows air onto the water, off-gassing, or releasing the excess carbon dioxide and yielding decarbonated product water (DPW). To ensure that all carbon dioxide is not removed, a portion of the UVP is bypassed around the decarbonation process and then mixed with the DPW. Adjusting the percentage of UVP that is bypassed around the decarbonation process helps to control the FPW pH and alkalinity.

Following the UV/AOP system, a portion of the excess residual carbon dioxide is removed by forced-draft decarbonators to raise the pH of the FPW. Figure 2-23 shows a decarbonation tower. Six decarbonators were in service until July 2022 when a seventh decarbonator installed with the GWRSFE began operation. The seventh decarbonator expanded the total design capacity of the decarbonation system from 72 to 78 MGD, allowing for part of the UV-disinfected purified water to be treated by the decarbonators and bypassing the remaining flow. Decarbonated water is blended with the bypassed flow prior to lime stabilization in the FPW channel.

Hydrated lime (in the form of calcium hydroxide) addition is the final post-treatment step, adding minerals back into the RO/UV/AOP-treated water in the form of calcium and alkalinity to help stabilize the FPW water, raise pH, and reduce its corrosivity. Figure 2-24 shows a photo of the lime system, which features lime storage silos, slaker mixing tanks, slurry aging tanks, pumps, and saturators that prepare and deliver a saturated lime solution to the FPW channels. The lime system employs gravimetric feeders (based on weight) to control the amount of lime delivered.

A Tekkem lime delivery system began operation in late 2014 replacing the original GWRS lime delivery system. The Tekkem system is gravimetric, meaning that it uses weight to ensure the correct lime slurry concentration is maintained. The lime system consists of several components including: bulk storage of hydrated lime in silos; screw feeders moving dry lime to slaker tanks

Figure 2-23. Decarbonation System

Figure 2-24. Lime Post-Treatment System

where it is mixed with water before being transferred; slurry aging tanks with loop pumps that convey slurry to a dosing assembly that feeds the saturators; polymer feed system to control lime particle carryover; and saturators acting as solids contact clarifiers to feed saturated lime solution to the FPW channel. Anionic polymer is added to the saturators as a coagulant aid to reduce lime particle carryover. The polymer feed system was modified by adding a new bulk storage tank in 2022. Lime sludge is pumped to OC San's Ellis Avenue Interplant Sewer and conveyed to Plant 2 for treatment and disposal.

During 2022, OCWD continued to optimize flow patterns through the decarbonation towers and RO flush supply tanks to stabilize the DPW prior to introducing DPW to the lime stabilization process. Operation of the lime saturators is enhanced by using fully decarbonated DPW because decarbonation expels carbon dioxide which can cause excess calcium carbonate precipitation in the saturators. One RO flush supply tank (A01) receives fully decarbonated DPW and supplies DPW to the RO flush pumps, dilution water for hydrogen peroxide, and dilution water for all lime processes (slurry production, polymer dilution, and saturator dilution). The other RO flush supply tank (A02) receives a blend of decarbonated and bypassed flow. The RO flush tanks discharge to segregated, parallel FPW channels where their respective amounts of lime saturated water are added and mixed. These streams are then blended in the common FPW channel.

The decarbonation bypass flow rate is adjusted for continuous management of the FPW pH (i.e., more bypass decreases the FPW pH; less bypass increases the FPW pH). The lime dose is also reduced to control high FPW pH periods when the decarbonation bypass flow rate cannot be further decreased. The partially decarbonated bypass flow (from RO flush tank A02) is the primary variable used to maintain FPW pH stability; most of the lime-saturated water is added to the partially decarbonated bypass stream under normal operating conditions.

Adjustments to the ROP/decarbonation bypass flow were made from time to time during 2022 by changing the decarbonation tower feed valve settings; the purpose of these adjustments was to limit back pressure on the UV and RO processes while maintaining the FPW pH near the target pH of 8.5. The decarbonation bypass flow ranged from 75% to 90% of the AWPF production in 2022. Prior to December 2022, the decarbonator feed valves were about 45% open to maintain the FPW pH near the target; after December 12, 2022, when P2 TF/SC effluent was delivered to the AWPF as source water and the AWPF production rate was increased up to the permit limit of 130 MGD, the decarbonator feed valves were set at 55-60% open to address the changed water quality, balance the back pressure on the RO process, and target FPW pH near 8.5.

The lime dose averaged 26 mg/L, with brief intermittent reductions to as low as 18 mg/L for FPW pH control. Beginning in mid-December 2022 with the AWPF's increased production capacity (up to 130 MGD), Saturator C, which had been off-line since September 2021, was returned to service. The FPW pH was maintained between 7.7 and 8.8, with an average of 8.3 based on grab samples in 2022.

Beginning in January 2022, one of the decarbonation bypass valves experienced a water intrusion leak in its actuator resulting in erratic operation, causing it to be fixed in a 40.5% open position at times and then returning to normal modulating operation at other times. When it was stuck in a fixed position, other decarbonator bypass valves were used to regulate the flow. A replacement actuator was delivered and waiting to be installed as of December 2022.

2.3.7 Purified Recycled Water Pumping Operation and Performance

Purified recycled water, or FPW, is conveyed by the Barrier Pump Station to the Talbert Barrier and by the Product Water Pump Station to K-M-M-L Basins, MBI Project, and non-potable uses. The Barrier Pump Station features four 600-horsepower pumps discharging FPW to the Talbert Barrier injection wells. The Product Water Pump Station features five 2,250-horsepower pumps discharging FPW to K-M-M-L Basins via the 13-mile GWRS Pipeline. The fifth product water pump was installed with the GWRSFE and began operation in 2022. Laterals from the GWRS Pipeline convey purified recycled water to the MBI Project and two non-potable water customers, Anaheim CPP and ARTIC. A third non-potable water customer, Anaheim Adventure Park, is located at Miraloma Basin. Both pump stations are housed in the building shown in Figure 2-25. Purified recycled water flows discharged to the Talbert Barrier, K-M-M-L Basins, MBI Project, Anaheim CPP, and ARTIC are metered, totalized, and recorded.

Figure 2-25. Barrier and Product Water Pump Stations

2.4 Santa Ana River Discharges

The AWPF did not discharge to the Santa Ana River to provide peak flow relief for OC San at any time during 2022. The emergency peak flow/rain event system was last tested in January 2021, when the AWPF discharged all treated water to the OC San 66-inch diameter Interplant Line, which conveyed it to the OC San ocean outfall. No purified recycled water was produced for recharge during the test.

Discharges to the Santa Ana River are covered by a separate permit, RWQCB Order No. R8-2022-0002 NPDES No. CA8000408, entitled *"Waste Discharge Requirements and National Pollutant Discharge Elimination System Permit for the Orange County Water District Groundwater Replenishment System Advanced Water Treatment Facility Emergency Discharge to Reach 1 of the Santa Ana River,"* which was adopted by the RWQCB on March 18, 2022 (RWQCB, 2022b).

After completion of the GWRSIE in 2015, the AWPF could produce up to 100 MGD of purified recycled water. With completion of the GWRSFE in 2022-2023, the AWPF can produce up to 130 MGD of purified recycled water. Thus, it is feasible for the AWPF to continue normal purified recycled water production and provide emergency peak flow relief for the OC San ocean outfall without having to discharge to the Santa Ana River. The maximum daily purified recycled water production by the AWPF reached 119.9 MGD in late December 2022.

2.5 Non-Potable Water Quality

A small portion of GWRS purified recycled water is used for non-potable use and supplied to three customers as described earlier in this section: Anaheim CPP, ARTIC, and Anaheim Adventure Park. Prior to December 2022, recycled water for non-potable use was regulated under RWQCB Order No. R8-2021-0003 (RWQCB, 2021a). In December 2022, the requirements for non-potable uses were incorporated into the updated RWQCB Order No. R8-2022-0050 (RWQCB, 2022a). The GWRS purified recycled water complied with the requirements for non-potable water use set forth in these permits during 2022. Section 2.2 and Appendix A present the GWRS purified recycled water quality during 2022 including the constituents monitored for non-potable water use.

2.6 Anticipated Changes

The GWRSFE began operation on December 12, 2022. It is anticipated that the construction contractor will complete minor "punch list" items in early 2023 to close out the GWRSFE contract.

The UV/AOP validation test results may require adjustments to the CCP critical limits and setpoints used to operate the UV/AOP system. Approval of the UV/AOP validation test report is pending DDW review and approval.

The OC San Plant 2 reclaimable secondary effluent (P2 TF/SC effluent) has higher salinity than Plant 1 secondary effluent (P1 AS1, P1 AS2, and P1 TF). While forecasted TDS concentrations of the P2 TF/SC effluent TDS were higher than those of P1 AS1, AS2, and TF effluents, the actual values are greater than expected. OCWD plans to work with OC San to evaluate options for managing the TDS concentration of source water from Plant 2.

OCWD also plans to secure a future RWQCB permit to recharge purified recycled water at additional sites which are described in the GWRS Title 22 Engineering Report (OCWD and DDB Engineering, Inc., 2021) and OOP (OCWD and DDB Engineering, Inc., 2022):

- Burris-Riverview Spreading Basins, which will be supplied via a new turnout from the GWRS Pipeline in Anaheim. Planning for the new turnout is underway;
- Santiago System, which consists of Blue Diamond and Bond Spreading Basins and the local Santiago Creek streambed above Hart Park in the City of Orange;
- Lower Santa Ana River, from Carbon Creek Diversion near K-M-M-L Basins to Orangewood Avenue in Anaheim; and
- Lower Santiago Creek, from Hart Park in Orange to the creek's confluence with the Santa Ana River in Santa Ana.

3. TALBERT BARRIER OPERATIONS

Talbert Barrier operations in 2022 focused on optimizing injection of the purified recycled water supply both for preventing seawater intrusion and replenishing the Basin. Operation of the barrier injection facilities is presented in this section:

- Barrier injection facilities;
- Injection water sources;
- Injection water volumes; and
- Barrier operations.

3.1 Barrier Injection Facilities

Table 3-1 lists the Talbert Barrier injection wells with their associated aquifers and injection depths. Sites OCWD-I1 through OCWD-I23 feature nested injection wells with up to four individual casings in one 30-inch borehole, each injecting into a different aquifer. These legacy injection wells are nested as illustrated on Figure 3-1. Site OCWD-I24 is a modern nested injection well. Modern well sites OCWD-I25 and OCWD-I33 through OCWD-I36 are single point wells. Modern injection well sites OCWD-I26 through OCWD-I32 feature clustered injection wells with up to three individual, single-point wells at each site that are spaced approximately 20 feet apart. Figure 3-2 illustrates these newer cluster-type well sites.

Eight of the modern injection well sites (OCWD-I24 and OCWD-I26 through OCWD-I32) each have a deeper Main aquifer injection zone primarily for replenishing the groundwater Basin, in addition to injection zones in shallower aquifers susceptible to seawater intrusion. One of the modern clustered injection well sites (OCWD-I26) is pictured on Figure 3-3.

3.2 Injection Water Sources

Three types of water were injected at the Talbert Barrier during 2022:

1. Purified recycled water produced by the AWPF;
2. Imported potable water from the MWD OC-44 turnout delivered via the City of Huntington Beach; and
3. Fountain Valley (FV) potable water comprised of a blend of groundwater and imported water.

The injection supply was predominantly GWRS purified recycled water conveyed to the injection wells from the AWPF by the barrier pump station and pipeline. Negligible volumes of OC-44 and FV potable water were used periodically during AWPF shutdowns, which are described in Appendix F. Both OC-44 and FV water are potable drinking water sources approved by DDW.

Table 3-1. Talbert Barrier Injection Well Design Criteria

Aquifers and Perforated Intervals at Talbert Barrier						
Injection Well No.	No. of Casings	Aquifers and Perforated Interval Depth in feet below ground surface (ft bgs)				
		Talbert	Alpha	Beta	Lambda	Main
OCWD-I1	4	65-100	150-200	235-350	365-400	---
OCWD-I2	4	64-96	147-210	225-325	350-390	---
OCWD-I3	4	65-96	145-200	225-325	340-380	---
OCWD-I4	4	65-95	120-190	215-310	330-355	---
OCWD-I5	4	70-90	115-180	210-265	320-245	---
OCWD-I6	4	70-100	120-175	195-250	315-335	---
OCWD-I7	4	70-95	110-150	165-250	315-336	---
OCWD-I8	4	60-95	110-165	180-240	300-325	---
OCWD-I9	4	65-90	110-150	175-235	300-330	---
OCWD-I10	4	60-90	105-185	205-290	305-330	---
OCWD-I11	3	65-95	115-180	200-225	---	---
OCWD-I12	4	60-95	110-165	180-260	290-310	---
OCWD-I13	4	77-100	120-160	175-250	280-305	---
OCWD-I14	4	70-95	115-150	175-250	265-300	---
OCWD-I15	4	70-93	115-145	70-235	262-285	---
OCWD-I16	3	63-120	---	145-210	245-285	---
OCWD-I17	3	62-130	---	150-215	250-275	---
OCWD-I18	3	57-125	---	150-210	260-275	---
OCWD-I19	3	57-127	---	145-200	235-270	---
OCWD-I20	3	90-125	---	140-170	230-250	---
OCWD-I21	3	55-125	---	150-170	230-250	---
OCWD-I22	2	60-160	---	---	250-275	---
OCWD-I23	2	70-155	---	---	215-252	---
OCWD-I24	2	---	120-330			420-605
OCWD-I25	1	---	120-320			---
OCWD-I26	3	56-195		271-400		476-660
OCWD-I27	3	78-148		210-260		355-420
OCWD-I28	3	80-140		185-235		360-460
OCWD-I29	3	---	90-120	200-250		365-475
OCWD-I30	3	---	95-160	230-295		425-650
OCWD-I31	3	---	90-165	235-295		440-590
OCWD-I32	3	---	90-155	226-295		425-670
OCWD-I33	1	61-156	---	See Note 1		---
OCWD-I34	1	60-135	---	See Note 1		---
OCWD-I35	1	60-115	---	See Note 1		---
OCWD-I36	1	60-110	---	See Note 1		---

[1] OCWD-I33 through OCWD-I36 each has one casing perforated in the merged Talbert/Beta/Lambda Aquifers

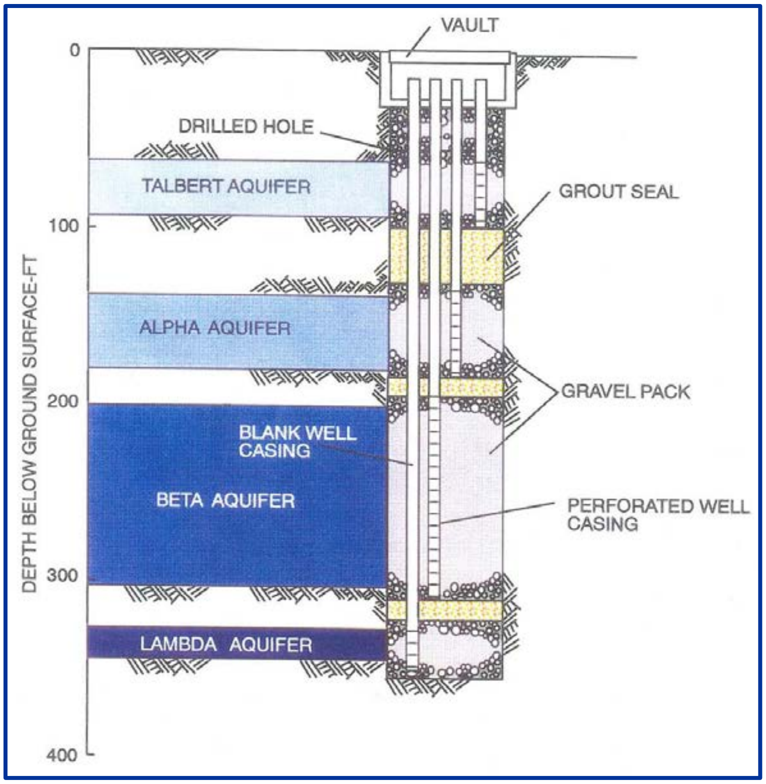


Figure 3-1. Typical Legacy Injection Well

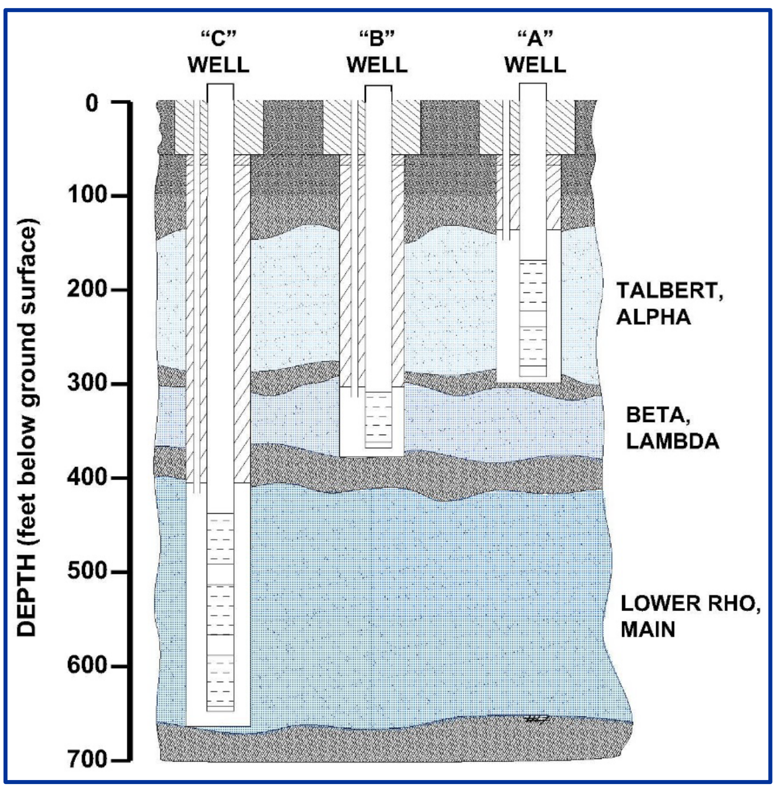


Figure 3-2. Typical Modern Cluster-Type Injection Well

Figure 3-3. Modern Injection Well Site OCWD-I26

OC-44 import water was supplied via a reduced pressure principle backflow prevention device and a pressure reducing valve into the barrier pipeline supplying the injection wells. A limited volume of OC-44 import water was used on five days in 2022, primarily to keep the barrier pipeline pressurized and to maintain small injection flow into selected wells for operational purposes. A limited volume of FV potable water was utilized to pressurize the barrier pipeline on 23 days in 2022. During 2022, FV potable water was used preferentially for this purpose over OC-44 import water due to its lower cost; however, OC-44 import water is delivered at a greater flow rate than FV potable water and was used when necessary to fulfill barrier demand requirements. OC-44 and FV water use in 2022 is summarized in Table 3-2.

Table 3-2. 2022 OC-44 and FV Potable Water Use at Talbert Barrier

Month	Duration	Cause(s) for Potable Water Use
OC-44 Potable Water (Imported Water)		
August	1 day	AWPF shutdown due to unscheduled power outage
September	2 days	AWPF reduced flow following electrical demand response notification and subsequently shutdown and experienced equipment restart issues
November	2 days	AWPF shutdown due to unscheduled power outage
Fountain Valley Potable Water (Blend of Imported Water and Groundwater)		
April	9 days	GWRSFE construction
June	2 days	GWRSFE construction
September	4 days	AWPF reduced flow following electrical demand response notification and subsequently shutdown and experienced equipment restart issues; and GWRSFE construction
November	2 days	AWPF shutdown due to unscheduled power outage
December	6 days	GWRSFE startup testing and commissioning (FPW discharged to waste)

The highest daily usage of OC-44 import water was 0.69 MG on September 7 during an electrical demand response notification that caused the AWPF to reduce production, and then shutdown, followed by restart issues. The highest daily usage of FV potable water was 0.88 MG on December 5 when the AWPF discharged FPW to waste during the GWRSFE startup and commissioning period. Note that Table 3-2 rounds the periods of potable water use to the next integer day (i.e., potable water use of 2 hours would be construed as 1 day). However, the actual period of potable water usage may have been less than shown.

3.3 Injection Water Volumes and Flow Rates

The volume of water injected at the Talbert Barrier in 2022 is presented below and compared with historical barrier injection.

3.3.1 2022 Injection Water Volumes and Flow Rates

The total annual average daily flow rate of all sources (purified recycled water, OC-44 import water and FV potable water) injected at the Talbert Barrier in 2022 was 20.28 MGD (including periods of low or no injection during AWPF outages). On a volumetric basis, a total volume of approximately 7,404 MG (22,721 AF) of purified recycled water, OC-44 import water, and FV potable water was injected at the Talbert Barrier during 2022.

Figure 3-4 illustrates the volumes and average daily flow rates of each of the water sources injected at the Talbert Barrier during 2022. As noted above, essentially all the barrier injection, approximately 20.26 MGD on average (rounded to 7,396 MG or 22,696 AF), was GWRS purified recycled water. Less than 0.01 MGD on average (rounded to 1.2 MG or 3.7 AF) of OC-44 potable water was injected at the barrier during 2022. Nearly 0.02 MGD on average (rounded to 7.1 MG or 21.7 AF) of FV potable water was injected at the barrier during 2022.

Table 3-3 summarizes the 2022 monthly average daily flow rates and quantities of purified recycled water and potable water injected at the barrier, and Figure 3-5 illustrates the monthly 2022 injection water supply volumes and average daily flow rates. As discussed above, potable water was used when the AWPF was temporarily off-line due to brief shutdowns to keep the barrier pipeline pressurized until purified recycled water production resumed.

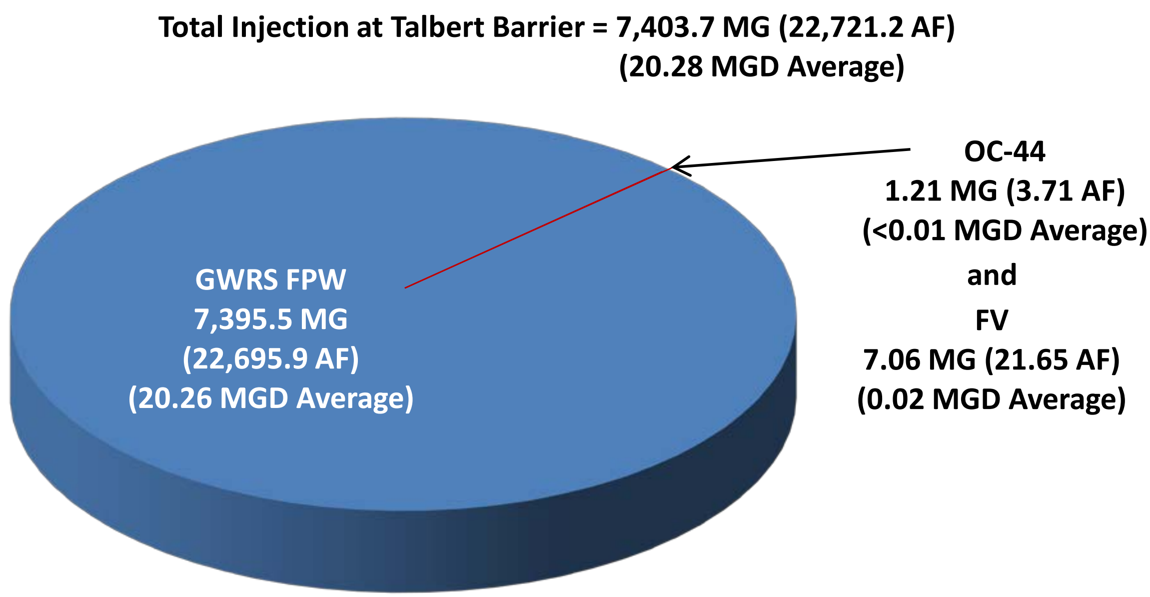


Figure 3-4. 2022 Talbert Barrier Injection Water Sources: Volumes and Flow Rates

Table 3-3. 2022 Monthly Injection Water Quantity at Talbert Barrier

Month	GWRS FPW		OC-44		FV		Total Injection Flow Rate and Volume			
	(Avg. MGD)	(MG)	(Avg. MGD)	(MG)	(Avg. MGD)	(MG)	(Avg. MGD)	(MG)	(AF)	(m^3)
January	18.94	587.14	0.00	0.00	0.00	0.00	18.94	587.14	1,801.88	2,222,588
February	20.16	564.60	0.00	0.00	0.00	0.00	20.16	564.60	1,732.68	2,137,238
March	20.16	624.83	0.00	0.00	0.00	0.00	20.16	624.83	1,917.53	2,365,249
April	15.21	456.38	0.00	0.00	0.00	2.24	15.21	458.61	1,407.43	1,736,044
May	21.34	661.49	0.00	0.00	0.00	0.00	21.34	661.49	2,030.03	2,504,011
June	21.59	647.83	0.00	0.00	0.02	0.48	21.61	648.31	1,989.60	2,454,138
July	23.64	732.94	0.00	0.00	0.00	0.00	23.64	732.94	2,249.30	2,774,479
August	23.76	736.49	0.00	0.05	0.00	0.00	23.76	736.54	2,260.35	2,788,107
September	22.89	686.66	0.03	0.95	0.00	0.91	22.92	688.52	2,112.98	2,606,335
October	22.17	687.13	0.00	0.00	0.00	0.00	22.17	687.13	2,108.71	2,601,058
November	17.97	539.02	0.01	0.21	0.01	0.15	17.98	539.38	1,655.28	2,041,766
December	15.19	470.99	0.00	0.00	0.11	3.28	15.30	474.26	1,455.45	1,795,278
Total	**20.26**	**7,395.48**	**0.00**	**1.21**	**0.02**	**7.06**	**20.28**	**7,403.74**	**22,721.22**	**28,026,289**

Abbreviations:

GWRS FPW	Groundwater Replenishment System Finished Product Water (Purified Recycled Water)
OC-44	MWD Turnout OC-44 via Huntington Beach (Imported Potable Water)
FV	City of Fountain Valley (Potable Water - groundwater and imported water)
MGD	Million Gallons per Day shown as an average (avg.) flow rate
MG	Million Gallons
AF	Acre-feet
m^3	Cubic Meters

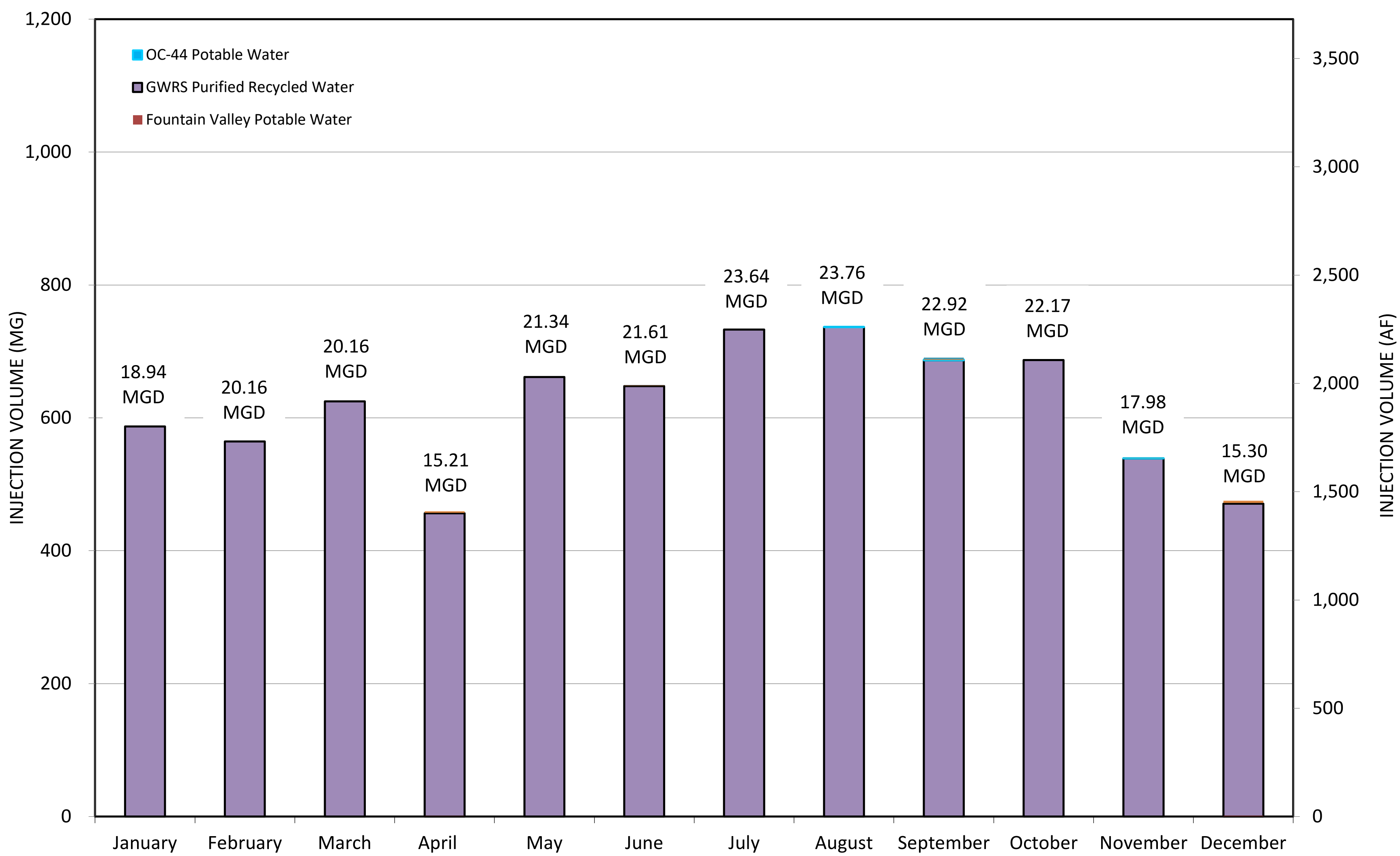


Figure 3-5. 2022 Monthly Injection Water Quantity at Talbert Barrier

3.3.2 Historical Injection Water Quantity

OCWD has operated the Talbert Barrier, injecting recycled water and potable water, since 1976. OCWD has historically injected water from six sources at the Talbert Barrier. Recycled water produced by WF-21, IWF-21, and the GWRS AWPF has been injected at the barrier. Diluents injected at the barrier have included (1) deep well groundwater, (2) potable blend of groundwater and imported water from the City of Fountain Valley, and (3) imported potable water from the MWD OC-44 turnout.

Table 3-4 and Figure 3-6 summarize the history of annual quantities of water from the six available sources that have been injected at the Talbert Barrier since the OCWD water reclamation projects began operation. In the 15 years since GWRS has been in operation, the average total injection at the Talbert Barrier has been approximately 28,970 AFY, with the annual total injection volumes ranging from a low of 22,721 AF in 2022 to a high of 38,531 AF in 2010. Maintaining groundwater elevations above protective levels (3 feet above mean sea level) drives the demand for injection water at the Talbert Barrier, and these demands can vary seasonally and annually based on both the Basin accumulated overdraft condition and local groundwater pumping demands. Overall, the annual injection volumes from 2008 through 2022 have been significantly greater than pre-GWRS injection volumes.

The injection wells were supplied high quality recycled water by WF-21 from 1976 to 2004. Purified recycled water from IWF-21 was injected at the Talbert Barrier from 2004 to 2006. Injection of GWRS purified recycled water began in January 2008. The specific treatment processes of these water reclamation facilities differed as follows:

1. **AWT water** – WF-21 recycled water consisting of secondary effluent treated by lime clarification, ammonia stripping (discontinued in 1987), recarbonation, filtration, GAC, and chlorination (all WF-21 treatment processes, except for ammonia stripping after 1987 and not including RO); AWT water produced by WF-21 was injected from 1976 to 2000.

2. **RO product water** – recycled water consisting of WF-21 AWT product water that bypassed GAC and was treated instead by RO at WF-21 from 1977 until 2004, and later recycled water produced by IWF-21 from 2004 to 2006. After mid-1981, GAC was not used for RO pretreatment because the fine carbon particles clogged the RO membranes and RO demonstrated superior organics removal compared to GAC. From 1981 until 2001, the WF-21 RO treatment train was comprised of lime clarification, ammonia stripping (1981-1987), recarbonation, chlorination, filtration, and RO. In 2001, a UV/AOP unit was added downstream of the RO process, replacing chlorination for disinfection and adding treatment for the removal of low molecular weight organics. From 2004 until 2006, MF replaced the pretreatment train upstream of RO when the IWF-21 facility supplied the barrier.

Table 3-4. Historical Injection Water Quantity at Talbert Barrier

Year	Injection Quantity								Q-10 [1] or GWRS Average Quality [4] (mg/L)		OC-44 [2] Average Quality [4,8] (mg/L)		FV [3] Average Quality [4.8] (mg/L)		Total Flow-Weighted Average Quality [4] (mg/L)	
	AWT (MG)	RO (MG)	GWRS (MG)	Well (MG)	FV (MG)	OC-44 (MG)	Total (MG)	Total (AF)	Cl-	TDS	Cl-	TDS	Cl-	TDS	Cl-	TDS
1976	290.15	0.00		542.80			832.95	2,556.06								
1977	1,192.30	235.30		2,875.30			4,302.90	13,204.25	80	415					80	415
1978	1,760.60	1,368.20		1,575.40			4,704.20	14,435.71	103	442					103	442
1979	1,695.20	1,338.50		1,487.00			4,520.70	13,872.61	78	400					78	400
1980	258.50	1,311.00		1,054.30			2,623.80	8,051.62	57	231					57	231
1981	90.60	1,107.30		1,344.30			2,542.20	7,801.21	50	204					50	204
1982	4.60	1,179.90		1,166.90			2,351.40	7,215.71	47	174					47	174
1983	0.00	1,220.56		1,173.21			2,393.77	7,345.73	37	154					37	154
1984	231.71	313.22		488.40			1,033.33	3,170.97	79	339					79	339
1985	476.18	568.12		577.26			1,621.56	4,976.06	103	389					103	389
1986	630.73	519.38		772.42			1,922.53	5,899.64	102	379					102	379
1987	408.50	469.46		590.04			1,468.00	4,504.83	93	366					93	366
1988	968.37	1,187.03		1,213.41			3,368.81	10,337.82	89	319					89	319
1989	949.27	1,098.75		1,814.02			3,862.04	11,851.39	87	342					87	342
1990	785.13	1,267.19		1,837.44			3,889.76	11,936.45	90	320					90	320
1991	1,084.19	1,226.75		2,967.16			5,278.10	16,196.83	109	380					109	380
1992	1,257.92	1,338.84		2,413.57			5,010.33	15,375.13	89	336					89	336
1993	860.11	1,494.87		2,026.14			4,381.12	13,444.28	85	328					85	328
1994	157.31	947.22		896.85			2,001.38	6,141.61	50	248					50	248
1995	203.47	655.98		740.20			1,599.65	4,908.82	49	243					49	243
1996	56.73	741.22		521.84			1,319.79	4,050.02	26	151					26	151
1997	16.40	690.27		545.54			1,252.21	3,842.64	22	129					22	129
1998	5.44	776.08		578.51			1,360.03	4,173.51	23	127					23	127
1999	450.08	1,327.24		1,191.98			2,969.30	9,111.85	57	239					57	239
2000	207.50	771.75		1,863.75			2,843.00	8,724.27	37	233					37	233
2001		1,071.62		2,166.06	1,350.83		4,588.51	14,080.70	33	252					33	252
2002		1,367.55		1,180.56	1,576.61		4,124.72	12,657.47	34	226					34	226
2003		1,053.38		751.59	1,591.85	33.73	3,430.55	10,527.28	38	237	98	374			39	238
2004 [5]		935.30		421.22	1,321.64	2,559.46	5,237.62	16,072.61	32	230	93	390			62	308
2005		1,238.02		4.84	953.44	2,703.43	4,899.73	15,035.73	24	177	78	464			54	336
2006 [6]		663.01			551.37	1,658.75	2,873.13	8,816.73	19	127	67	386			47	276
2007					0.00	2,245.52	2,245.52	6,890.80			89	474			89	474
2008 [7]			7,247.08		0.00	1,712.25	8,959.33	27,493.37	4	40	97	560			21	140
2009			11,011.23		0.00	55.21	11,066.44	33,959.43	5	46	97	653			5	49
2010			12,465.25		0.00	44.62	12,509.86	38,393.98	4	43	89	532			5	45
2011			8,384.84		0.15	2.27	8,387.26	25,741.30	5	43	83	539	54	391	5	44
2012			7,978.15		0.09	0.97	7,979.21	24,488.96	7	45	83	479	67	410	7	45
2013			9,804.46		0.00	1.83	9,806.30	30,096.46	7	50	84	559			7	50
2014 [8]			10,734.25		0.00	2.46	10,736.71	32,949.80	7	54	na	na			7	54
2015			11,820.22		0.00	5.52	11,825.74	36,291.90	11	64	na	na			11	64
2016			11,288.83		0.36	2.39	11,291.58	34,652.64	7	57	na	na	na	na	7	57
2017			8,554.73		0.00	5.06	8,559.78	26,269.04	5	50	na	na			5	50
2018			8,096.61		0.00	7.38	8,103.99	24,870.25	5	53	na	na	na	na	5	53
2019			8,613.03		0.13	1.83	8,614.98	26,438.44	5	49	na	na	na	na	5	49
2020			7,865.47		0.45	5.12	7,871.05	24,155.33	6	55	na	na	na	na	6	55
2021			8,374.46		0.59	2.27	8,377.32	25,709.01	5	50	na	na	na	na	5	50
2022			7,395.48		7.06	1.21	7,403.74	22,721.22	7	53	na	na	na	na	7	53
TOTALS	**14,040.99**	**29,483.01**	**139,634.08**	**36,782.01**	**7,354.57**	**11,051.27**	**238,345.93**	**731,441.50**								

Abbreviations:

- AWT - Granular Activated Carbon Effluent disinfected using chlorine (Recycled Water) at Water Factory 21
- RO - Reverse Osmosis Effluent disinfected using chlorine prior to March 2001 at Water Factory 21 and using UV/AOP from March 2001 until August 2006 (Recycled Water) at Interim Water Factory 21
- GWRS - Groundwater Replenishment System Finished Product Water (Purified Recycled Water)
- Well - Deep Well Water (Colored Groundwater)
- FV - City of Fountain Valley Potable (Domestic) Water (groundwater and imported water)
- OC-44 - MWD Turnout OC-44 Potable Imported Water (via City of Huntington Beach and Southeast Barrier Pipeline)
- Cl- - Chloride
- TDS - Total Dissolved Solids
- mg/L - milligrams per liter
- MG - million gallons
- AF - acre-feet
- na - not analyzed (because blending is no longer required)

Notes:

[1] Q-10 water was mixed in the Water Factory 21 and Interim Water Factory 21 blending reservoir from multiple sources prior to injection into the barrier: AWT, RO, Well and FV.

[2] OC-44 water is provided directly into the barrier (via backflow prevention and pressure reduction devices).

[3] FV water is provided directly into the barrier (via backflow prevention device and a pressure reduction valve).

[4] Chloride and TDS concentrations shown for each year are based on a 12-month flow-weighted average of available samples.

[5] Water Factory 21 ceased operation on January 15, 2004. Interim Water Factory 21 began operation on June 21, 2004

[6] Interim Water Factory 21 ceased operation on August 8, 2006.

[7] GWRS began operation on January 10, 2008.

[8] Blending was not required for Talbert Barrier injection after December 2009. Beginning in December 2009, injection water quality was essentially the same as GWRS water because only limited volumes of OC-44 and FV water were used. OC-44 and FV water quality not analyzed beginning in 2014 because blending no longer required.

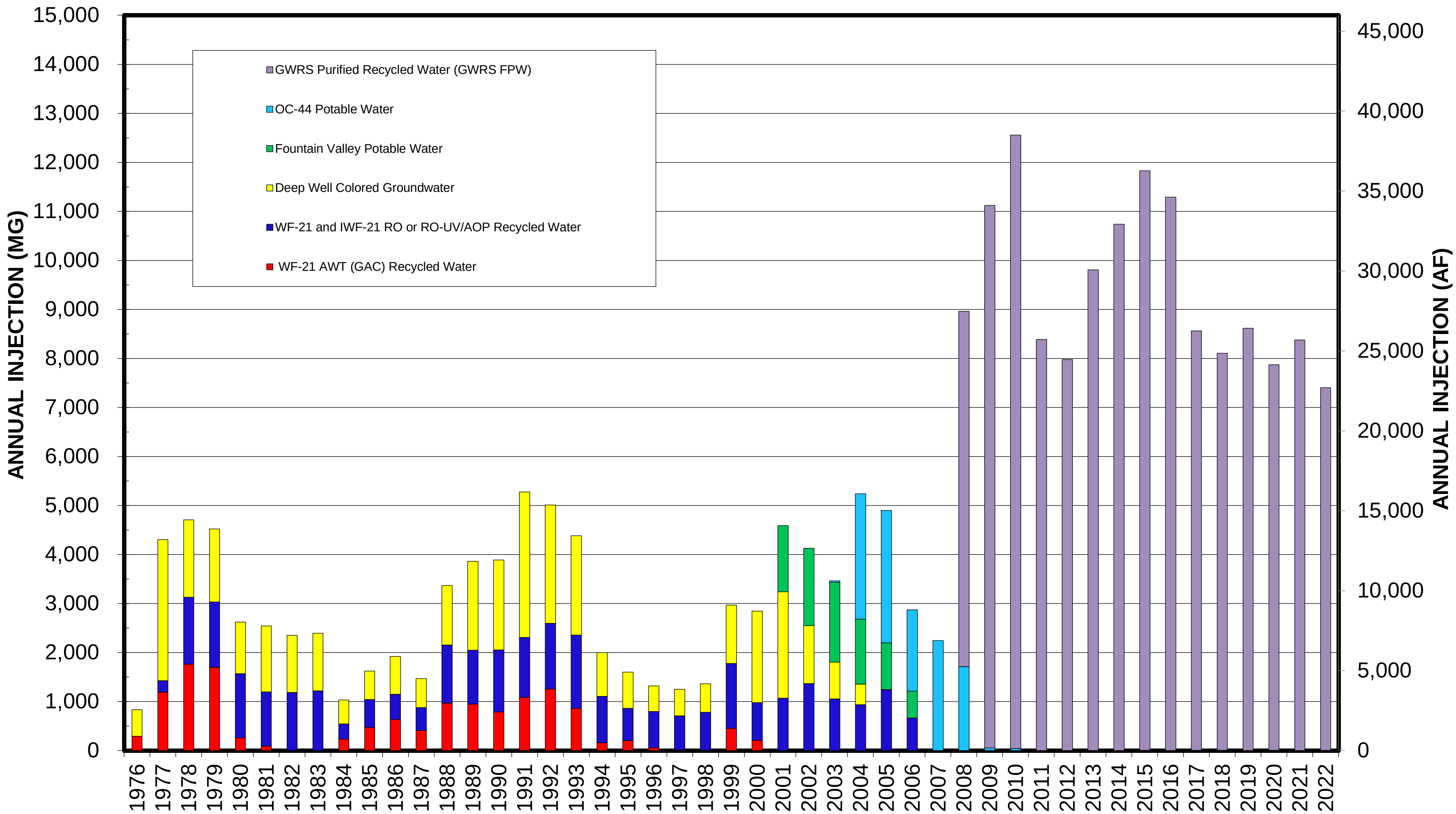


Figure 3-6. Historical Injection Water Quantity at Talbert Barrier

3. **GWRS water** – purified recycled water consisting of secondary effluent treated by MF, RO, UV/AOP, decarbonation and lime stabilization (GWRS AWPF FPW); injection of GWRS water produced by the AWPF began in January 2008.

The three diluent water sources that have been historically injected at the barrier are listed below:

1. **Deep Well water** – groundwater that is low in salts but high in color and TOC and produced from deep aquifers that are not susceptible to seawater intrusion; deep well water was injected from 1976 to 2005.

2. **Potable water from the City of Fountain Valley** – variable blend of groundwater and surface imported water that was injected primarily from 2001 to 2006. Since then, small amounts of potable water from the City of Fountain Valley have been sporadically used to maintain pressure in the injection conveyance system when purified recycled water was unavailable during brief periods when the AWPF was off-line. Negligible volumes of this water source (less than 1 MG) were used during 2011, 2012, 2016, and 2019 through 2021. Significantly more (over 7 MG) City of Fountain Valley potable water was used during 2022 because it was used preferentially over OC-44 import water due to its availability throughout the year without financial penalty.

3. **Potable water from the MWD OC-44 turnout** – imported water from the MWD OC-44 turnout delivered via the City of Huntington Beach that was injected from late 2003 through 2022. As shown in Table 3-4, only minor amounts of MWD OC-44 water (less than 8 MG/year) have been used over the last 12 years, primarily for maintaining pressure in the barrier pipeline during AWPF shutdowns.

3.4 Barrier Operations

Injection of purified recycled water produced by the AWPF began on January 10, 2008. During 2022, AWPF purified recycled water was the primary injection water source, comprising essentially 100% of the water injected. Imported water from the MWD OC-44 and FV connections was used as back-up injection supplies during AWPF and Barrier Pump Station (BPS) shutdowns and for refilling and pressurizing the barrier distribution system just prior to plant startup after such shutdowns. During calendar year 2022, the MWD OC-44 connection was used for brief periods on five days and the FV connection was used on 23 days during or immediately following AWPF shutdowns, which were primarily related to GWRSFE construction and short-term power outage or operational issues. For both the OC-44 and FV connections since 2009, minimal volumes of potable water have been used for filling and pressurizing the barrier pipeline, as shown by the small annual totals discussed in Section 3.3.1.

Annual barrier injection in 2022 was 22,721 AF, representing a decrease of 11.6% from the prior year and the lowest barrier injection since the GWRS came on-line in 2008. Injection demand was relatively low during 2022 due to relatively high groundwater conditions throughout the Basin, as well as in the Talbert Gap area where groundwater levels were effectively maintained at or above protective elevations seaward of the barrier without becoming excessively high or above ground surface. Like in 2021 when annual barrier injection was reduced due to being off-line for 21 days, annual barrier injection during 2022 was reduced due to being completely off-line for a total of 11 days, including seven days in April due to a planned AWPF shutdown for GWRSFE construction activities. As shown in Figure 3-6, annual barrier injection has remained relatively stable for the last five years due to higher Basin conditions resulting from above average rainfall in 2016-17, a Basin-wide In-Lieu Program in 2017-18, above average rainfall again in 2018-19, and reduced Basin pumping in 2019-20, 2020-21, and 2021-22 due to wells taken offline due to per- and polyfluoroalkyl substances (PFAS). During an In-Lieu Program, local retail water agencies take additional direct deliveries of treated MWD potable water in lieu of pumping groundwater, thereby increasing groundwater stored in the Basin.

The 11.6% decrease in annual barrier injection from 2021 to 2022 was primarily due to significantly less coastal pumping in 2022 than in 2021, causing local groundwater levels in the vicinity of the barrier to be slightly higher than the relatively high sustained levels in 2021. From June 2021 to June 2022, groundwater levels in the Talbert Barrier area increased approximately 0-2 feet in the Shallow aquifer and approximately 3-5 feet in the Principal aquifer despite overall Basin storage decreasing by 10,000 AF. The Basin accumulated overdraft was 258,000 AF as of June 30, 2022, representing a favorable Basin condition approximately at the midpoint of the District's operating range. Groundwater elevations were maintained slightly above mean sea level seaward of the barrier throughout 2022 to protect against seawater intrusion, as discussed in more detail in Section 4.

Operation of the barrier was consistent and stable during 2022 due to a constant, reliable AWPF water supply with very low turbidity. As discussed in the previous section, an insignificant volume of potable water was used on 5 days from the MWD OC-44 connection and 23 days from the FV connection due to brief AWPF shutdowns. During 2022, there were five instances of planned AWPF shutdowns related to GWRSFE construction activities: April 15-23, June 8, September 19-20, December 4-6, and December 26-28. Each of the planned AWPF shutdowns lasted longer than one day except for the shutdown on June 8, which lasted 10.5 hours. FV potable water was used exclusively to pressurize the barrier distribution system during each of the planned shutdowns. There were also four instances of unplanned AWPF shutdowns during 2022, all related to unscheduled power outages and all lasting less than 24 hours: August 1, September 6, November 8, and November 19.

As shown in Table 3-3 and on Figure 3-5 presented earlier, monthly injection flow rates during 2022 ranged from a low daily average flow rate of 15.21 MGD in April to a high daily average flow rate of 23.76 MGD in August, with the highest monthly injection volume occurring in August (736.54 MG or 2,260.36 AF). Typically, the volume of injection required to achieve and maintain protective groundwater elevations is greater in the summer months when groundwater pumping is greater. This was the case in 2022, with the highest average flow rates occurring during July, August, September, and an unseasonably warm October. Excluding the planned shutdown periods of over one day in April, September, and December, the average daily injection flow rate when the Barrier was on-line in 2022 was 20.91 MGD.

Operationally, injection was maintained at relatively high rates at the operating injection wells during 2022. Like 2021 however, many injection wells were kept off-line on stand-by for several months or the entire year during 2022 because they were not needed to maintain protective elevations for seawater intrusion control. Taking injection wells off-line for these reasons usually occurs in the winter and early spring months when groundwater levels are typically higher, and such was the case during 2022, but like 2021 several legacy wells were not needed at all and thus remained off-line on stand-by throughout 2022.

In some years when injection requirements are relatively high due to low groundwater levels, a few injection wells must be taken off-line during the peak injection summer months because of hydraulic restrictions in the barrier pipeline. Typically, these include I30C, I31C, and I32C, which are used for replenishing the Basin rather than seawater intrusion control and are at a higher ground surface elevation on the Huntington Beach Mesa along the west end of the barrier. During 2022 however, no wells were taken off-line for hydraulic restrictions. When Talbert Barrier injection is reduced due to high groundwater elevations as during 2022, the surplus GWRS water can generally be pumped up to K-M-M-L Basins for surface recharge and to the five MBI wells to maintain the AWPF operating at or near full capacity.

3.4.1 Vertical Distribution of Injection

Figure 3-7 shows the monthly amount of injection into each aquifer zone. For operational reasons related to the hydrogeology of the area, the aquifer zones that receive injection have been grouped into three major categories:

- Shallow Zone: Talbert and Alpha aquifers;
- Intermediate Zone: Beta, Lambda, Omicron, and Upper Rho aquifers; and
- Deep Zone: Lower Rho and Main aquifers.

These aquifers are described in more detail in Section 4 – Groundwater Monitoring at the Talbert Barrier. The shallow and intermediate zones are both susceptible to seawater intrusion. The 23 legacy injection well sites only inject into the shallow and intermediate zones. Most of the modern injection well sites constructed since 2000 inject into all three zones, with deep zone injection being primarily intended for replenishing the Basin rather than for seawater intrusion control. Therefore, injection into the deep zone is a lower priority when surplus injection supply and pipeline capacity are available over and above what is needed for seawater intrusion control in the shallow and intermediate zones.

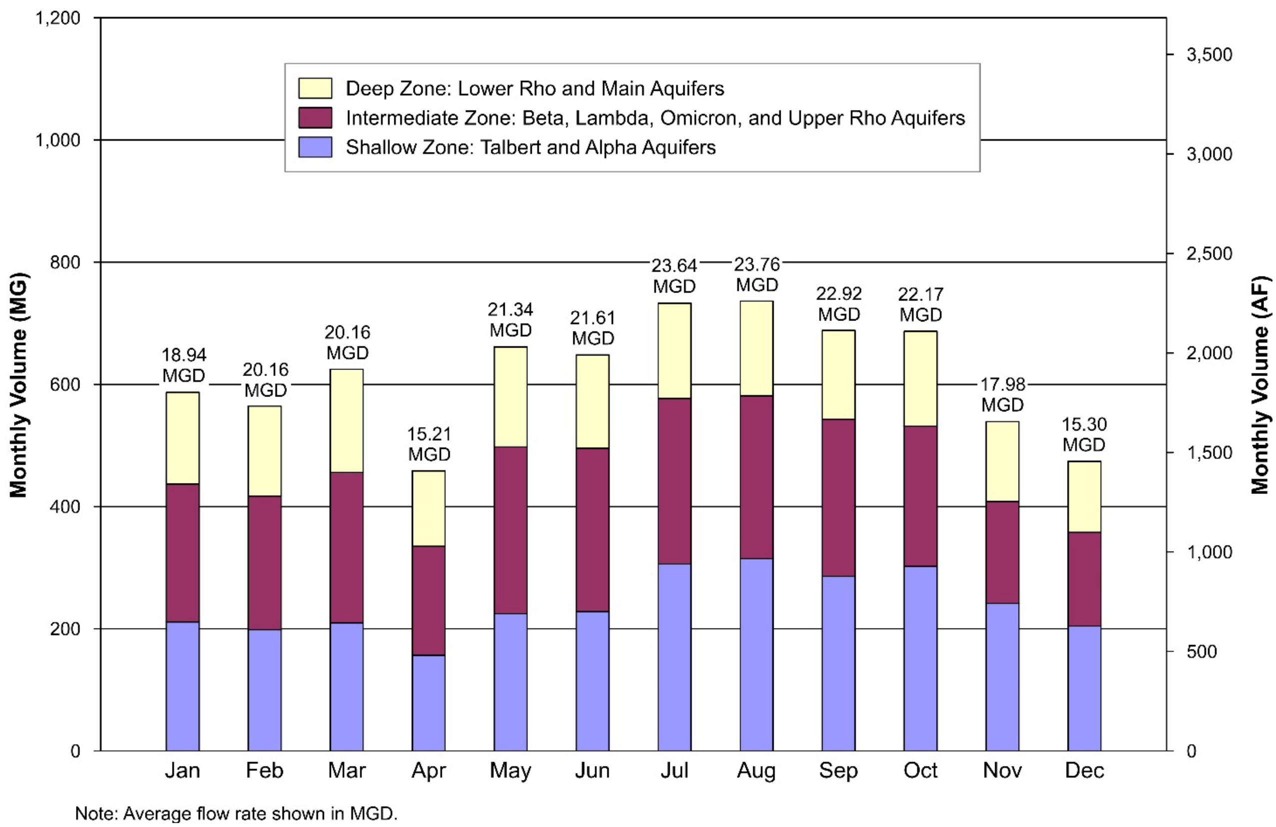


Figure 3-7. 2022 Talbert Barrier Monthly Injection Quantity by Aquifer Zone

As shown on Figure 3-7, 2022 monthly injection into the combined shallow and intermediate zones was relatively low throughout the winter and early spring months from January through April. Monthly injection into the combined shallow and intermediate zones was steadily increased over the late spring and summer months beginning in May and reached an annual high of approximately 735 MG (2,260 AF) in August. Monthly injection into the combined shallow and intermediate zones remained high in September and through the unseasonably warm October, then declined slightly for the remaining two months of the year as the weather cooled and coastal area pumping declined. The lower injection volumes during the January through April period were attributable to higher groundwater elevations in the shallow and intermediate zones during those months in which a few shallow zone modern injection wells and several legacy wells were secured and placed on stand-by to prevent unnecessarily elevated shallow groundwater elevations in low-lying areas. The injection volume was diminished further in April by the one-week planned AWPF shutdown for GWRSFE construction activities. During the May through October period, more of the injection wells were on-line and injection into the combined shallow and intermediate zones was increased to keep pace with lower or falling groundwater levels as pumping increased during these warmer months. However, the May through October monthly injection volumes were still low relative to previous years, as several legacy wells were off-line on stand-by all year during 2022 since they were not needed to achieve protective elevations. The injection volume in November and December was reduced due to the typical seasonal reduction in coastal pumping, especially since both months experienced over two inches of rainfall. The injection volume in December was further diminished by the barrier being off-line for three days due to GWRS Final Expansion start-up testing and commissioning.

As shown on Figure 3-7, injection into the deep zone for Basin replenishment remained relatively constant during 2022, as ample pipeline capacity existed throughout the year to supply the lower priority deep zone injection wells due to the lower shallow and intermediate zone injection totals. Deep zone groundwater elevations are typically lower than in the shallow and intermediate zones, and therefore, deep zone injection rates can often be maintained year-round.

During 2022, 39% of all injection was into the shallow zone, 37% into the intermediate zone, and 24% into the deep zone, as shown on Figure 3-8. Therefore, 76% of barrier injection during 2022 was collectively into the shallow and intermediate zones for the primary purpose of seawater intrusion control, slightly decreased from 78% in 2021. Barrier injection into the deep zone

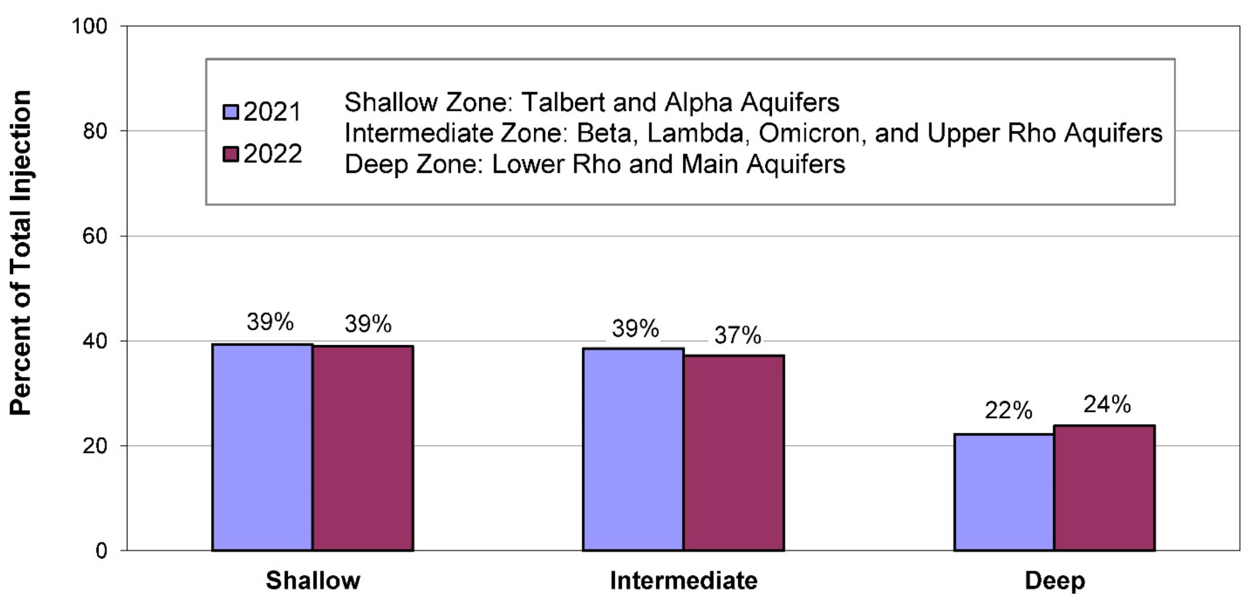


Figure 3-8. 2021 and 2022 Annual Average Injection Percentages for Each Depth Zone

during 2022 correspondingly increased 2% relative to 2021 because all deep zone injection wells except I24/2 were on-line throughout 2022, while several shallow and intermediate zone injection wells were off-line on stand-by throughout much the year due to the relatively high groundwater conditions. As mentioned previously, deep zone injection can typically be maintained year-round during relatively high groundwater conditions due to its groundwater levels being generally lower than in both the shallow and intermediate zones.

3.4.2 Spatial Distribution of Injection along the Barrier

During 2022, injection rates and daily injection volumes at every injection point were measured using the process control system (PCS) that was installed as part of the GWRS. Flow was continuously monitored for each injection well so that precise daily and monthly injection volumes were directly obtained for each injection well casing. The monthly volumes for each injection well casing were downloaded to spreadsheets, checked, adjusted slightly to match reported total barrier injection, and uploaded to the OCWD Water Resources Management System (WRMS) database.

Table 3-5 shows the annual volume injected into each of the 36 injection well sites during 2022. Each well site consists of one to four discretely measured injection casings (installed at different depth zones). Table 3-5 is a summary of the total injection at each site but is divided into the three different aquifer zones that were previously described above (shallow, intermediate, and deep). The flow volumes in Table 3-5 represent adjusted values. The measured monthly per well casing flow volumes were adjusted so that the sum of all individual wells for each month exactly equals the total barrier injection reported in Table 3-3 for that month (recorded from the AWPF Barrier Pump Station flow meter). For all injection well points, the raw transmitter injection measurements were multiplied by a small correction factor each month to obtain the values shown in Table 3-5. For a given month, all well points were adjusted by the same factor. During 2022, the monthly adjustments ranged from approximately 1.0% to 2.2% and were within expected standards for comparing the Barrier Pump Station flow meter totals with the sum of all individual injection well transmitter readings over the course of each month. To keep the discrepancy acceptably small, OCWD staff frequently run diagnostic checks on flow meters and transmitters and re-calibrate them, as necessary.

Table 3-5. 2022 Injection Quantity at Talbert Barrier Well Sites

	Well Site	Shallow Zone [1] (AF)	Intermediate Zone [2] (AF)	Deep Zone [3] (AF)	Total [4] (AF)	Total [4] (MG)
West	I32	952.92	464.15	887.87	2,304.94	751.07
	I31	535.29	565.88	834.99	1,936.16	630.90
	I30	837.11	568.74	974.86	2,380.72	775.76
	I29	38.63	634.86	461.92	1,135.41	369.98
	I23	0.00	0.00	–	0.00	0.00
	I28	416.34	660.00	917.30	1,993.65	649.63
	I27	287.75	612.19	708.43	1,608.38	524.09
	I22	11.70	8.27	–	19.97	6.51
	I21	–	81.92	–	81.92	26.69
	I20	81.27	122.02	–	203.28	66.24
	I19	–	86.56	–	86.56	28.21
	I18	0.33	7.95	–	8.27	2.70
	I17	289.23	348.74	–	637.98	207.88
	I16	0.00	0.00	–	0.00	0.00
	I15	0.00	0.00	–	0.00	0.00
	I14	129.89	20.23	–	150.11	48.91
	I13	428.43	342.11	–	770.53	251.08
	I12	461.14	262.97	–	724.12	235.95
	I11	575.49	150.72	–	726.20	236.63
	I10	0.00	0.00	–	0.00	0.00
	I9	0.00	0.00	–	0.00	0.00
	I8	0.00	0.00	–	0.00	0.00
	I7	818.19	216.16	–	1,034.36	337.05
	I6	0.00	0.00	–	0.00	0.00
	I5	428.38	698.63	–	1,127.01	367.24
	I25	–	822.44	–	822.44	267.99
	I24	–	0.00	0.00	0.00	0.00
	I4	352.72	790.74	–	1,143.46	372.60
	I3	0.00	0.00	–	0.00	0.00
	I2	0.00	173.81	–	173.81	56.64
	I1	301.26	246.81	–	548.07	178.59
East	I26	614.97	564.48	630.53	1,809.98	589.78
Southeast Barrier	I33	209.58	–	–	209.58	68.29
	I34	178.14	–	–	178.14	58.05
	I35	469.93	–	–	469.93	153.13
	I36	436.37	–	–	436.37	142.19
	Total:	8,855.07	8,450.39	5,415.90	22,721.37	7,403.77
	Percent:	38.97%	37.19%	23.84%		

1. Shallow Zone: Talbert and Alpha aquifers.
2. Intermediate Zone: Beta, Lambda, Omicron, and Upper Rho aquifers.
3. Deep Zone: Lower Rho and Main aquifers
4. Per well injection totals above represent adjusted values (by month) to reconcile with the reported total barrier injection in Table 3-1.

AF: Acre-feet; MG: Million Gallons; –: Well not screened to inject into this zone.

Figure 3-9 graphically depicts the annual volume injected into each of the 36 injection well sites during 2022. The injection volumes are divided into the same three depth zones described above: shallow, intermediate, and deep. The 36 well sites on Figure 3-9 are generally ordered geographically from west to east (left to right) on the bar graph (rather than by well number) to give a visual sense of how the injection is spatially distributed along the barrier alignment. Notice the large annual injection amounts for the west-end modern well sites I27, I28, I30, I31, and I32, as is characteristic every year. East-side modern well I26 also had a large annual injection volume that was evenly distributed throughout the zones at that site, while east-side modern well I25 had the highest intermediate zone injection of any wells. Amongst the legacy wells, I4, I5, and I7 were the top performers with the highest annual injection totals, each all over 1,000 AF, while I1, I11, I12, I13, and I17 also had relatively high injection totals during 2022.

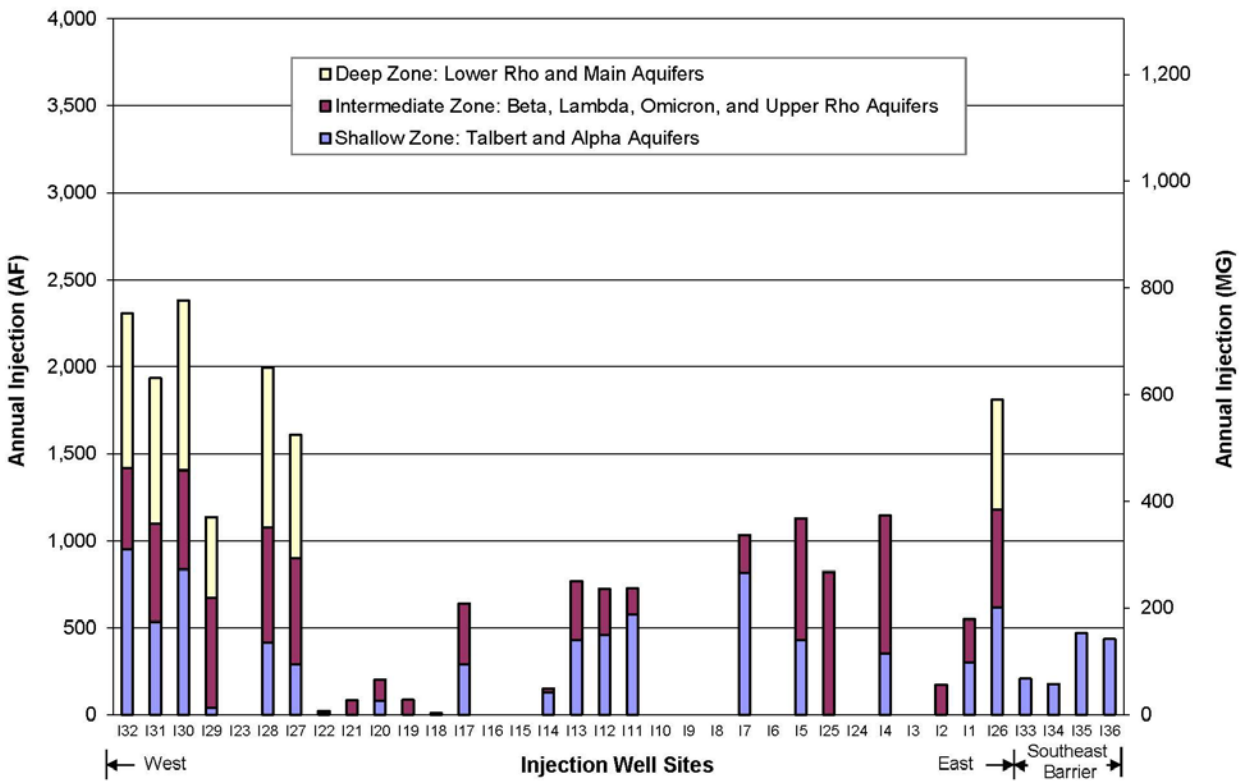


Figure 3-9. 2022 Talbert Barrier Injection Quantity at Each Well Site

As shown on Figure 3-9, west-end modern injection well I29 had very low shallow zone injection during 2022 because I29A was only on-line for 4 weeks. I29A was off-line for most of 2022 for three weeks of maintenance and the remainder of the year on stand-by since it was not needed to maintain groundwater levels above protective elevations and to avoid groundwater levels from becoming unnecessarily elevated in the low-lying area farther to the west near Huntington Lake.

Southeast barrier modern injection wells I33 and I34 had lower annual injection totals than I35 and I36 during 2022 because they were both off-line on stand-by for approximately 5.5 months, whereas I35 was on stand-by less than 3 months and I36 was on-line all year. The stand-by time at the southeast barrier wells was during the winter and spring months as they were not needed then to maintain protective elevations due to higher groundwater levels.

The older legacy well sites (I1 through I23) tend to have lower injection capacities than the modern wells. However, I4, I5 and I7 performed comparably with combined shallow and intermediate zone injection totals at the modern injection wells during 2022 (Figure 3-9). Of all the legacy wells active during 2022, I4 had the highest combined shallow and intermediate zone annual injection of nearly 1,150 AF, slightly outperforming I5 which had annual injection of nearly 1,130 AF. I4 and I5 were both off-line only during AWPF shutdowns and I4 was off-line for an additional three weeks in February for GWRSFE construction dewatering. The two wells were on-line the remainder of the year, equating to daily average injection into the combined shallow and intermediate zones of 1.0 MGD at both I4 and I5. During 2022, I1, I11, I12, I13, and I17 also had relatively high combined shallow and intermediate annual injection ranging from approximately 550 to 775 AF, while the other legacy injection wells had relatively low combined shallow and intermediate zone annual injection volumes ranging from zero to 200 AF, with the lower end of this range mostly due to legacy wells being off-line on stand-by for several months or for the entire year.

Similar to 2021, legacy wells I2 and I21 had very low annual injection in 2022 of approximately 175 and 80 AF, respectively, even though they were both on-line all year; these two wells, in addition to I3 which was off-line during 2022, are poor performers and have lost capacity over the years due to leaky well seals and/or irreversible clogging. These three wells are planned to be replaced within the next few years. A total of 10 legacy wells had zero or negligible injection during 2022 (I3, I6, I8, I9, I10, I15, I16, I18, I22, and I23) as compared to seven wells in 2021; these wells were off-line on stand-by nearly the entire year and were not needed to maintain protective elevations (Figure 3-9). In the case of I8, it is typically not used since its access hatch is in the traffic lane on Ellis Avenue, making access both difficult and unsafe for OCWD Barrier Operations staff.

Table 3-6 shows which wells were off- or on-line on a weekly basis during 2022, including an explanation for inactive status. An injection well site is only shown to be off-line if it was secured for the majority of the specified week (4 days or more). Since the legacy wells are each typically operated with all zones at that site being on or all zones off (except for I2 in which only the intermediate zones are operable), Table 3-6 only shows a status entry for each entire legacy site. For the modern injection well sites I26 through I32 featuring a cluster of three separate injection wells (shallow “A”, intermediate “B”, and deep “C”), each individual injection zone is operated

Table 3-6. 2022 Talbert Barrier Injection Wells Operational Status

	Well	JAN				FEB				MAR				APR				MAY				JUN				JUL				AUG				SEP				OCT				NOV				DEC			
West	I32A															Z																																	
	I32B															Z																																	
	I32C															Z																																	
	I31A															Z																																	
	I31B															Z																																	
	I31C															Z																																	
	I30A															Z																																	
	I30B															Z																																	
	I30C															Z																																	
	I29A	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S				M	M	M	S		S	S	S	S	S	S	S	S	S	S
	I29B															Z																																	
	I29C															Z																																	
	I23	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
	I28A	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	S	S	S	S	S	S	S	S																				S	S		S	S	S
	I28B															Z																																	
	I28C															Z																																	
	I27A	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	S	S	S	S	S	S	S	S	S																	S	S	S	S	S	S	S	S
	I27B															Z																																	
	I27C															Z																																	
	I22	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S		S	S	S	S	S	S	S	S	S	S	S
	I21																																																
	I20	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S		S				S	S	S	S						
	I19	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S								S	S	S	S	S	S				
	I18	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S		S	S	S	S	S	S	S	S	S	S	S
	I17															Z																																	
	I16	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
	I15	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
	I14	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S													S	S	S	S	S	S
	I13															Z																																	
	I12															Z																																	
	I11															Z																																	
	I10	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
	I9	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
	I8	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
	I7															Z																																	
	I6	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
	I5															Z																																	
	I25/1															Z																				M	M	M	M	M	M	M	M	M	M	M	M	M	M
	I24/1	M	M	M	M	M	M	M	M	M	M	M	M	M	M	Z	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
	I24/2	M	M	M	M	M	M	M	M	M	M	M	M	M	M	Z	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
	I4					C	C	C								Z																																	
	I3	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
	I2									M	M																																						
	I1															Z																																	
	I26A															Z																																	
	I26B															Z																																	
East	I26C															Z																																	
Southeast Barrier	I33A	S	S	S	S	S	S	s	S	S	S	S	S	S	S	Z	S	S	S	S	S	S	S																									S	S
	I34A	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	S	S	S	S	S	S	S																									S	S
	I35A		S		S					S	S	S	S	S	S	Z		S	S	S																													
	I36A															Z																																	

☐ Well in Operation: GWRS Recycled Water
■ Well in Operation: OC-44 Potable Water (cyan)
■ Well in Operation: City of Fountain Valley (yellow)
M Maintenance Repair
R Redevelopment
Z GWRS off-line
P Pipeline Restriction
C Construction
S Stand-by

Wells were specified as off-line if non-operational for the majority of the specified week or longer.
Letters designate the reason for the well being off-line (not all letters are used in every year).

independently. Modern well I24 features I24/1 for the upper casing (intermediate zone) and I24/2 for the lower casing (deep zone) due to its nested well construction with two casings in the same borehole but both can be operated independently. Modern well I25 is a single-point well screened primarily in the intermediate zone and is designated I25/1. Therefore, Table 3-5 shows a separate status entry for each individual injection zone for these modern wells. As described above, several legacy injection wells remained off-line for either all or a major portion of 2022 due to relatively high groundwater conditions. Ten legacy wells were on-line for the majority of 2022: I1, I2, I4, I5, I7, I11, I12, I13, I17, and I21, as indicated in Table 3-6. Protective elevations were maintained throughout the year with the use of these ten legacy wells, intermittent use of other legacy wells, and most of the modern injection wells.

Due to the reduced injection into the shallow and intermediate zones during 2022, all deep zone modern injection wells were on-line throughout 2022, except for I24/2 which was off-line all year due to maintenance issues. In years with lower groundwater levels and a higher injection requirement for seawater intrusion control in the shallow and intermediate zones, deep zone modern injection wells commonly need to be taken off-line during peak summer months due to pipeline hydraulic restrictions, i.e., to maintain safe flow velocities at critical points along the barrier pipeline identified as bottlenecks based on operational data. Barrier pipeline improvements are currently planned to remove these bottlenecks to maximize injection during years with lower Basin conditions and higher injection requirements.

3.4.3 Injection Well Repairs and Redevelopment

The Talbert Seawater Intrusion Barrier consists of 109 individual injection well points arranged into 36 injection well sites. During 2022, 28 of the 36 injection well sites were operated over the course of the year, with 8 of the 23 legacy well sites off-line on stand-by for the entire year since they were not needed to maintain protective elevations and modern injection well site I24 was off-line all year due to maintenance issues. In general, various injection wells are typically placed off-line for either brief or extended periods during the year for the following reasons:

- Well redevelopment and backwash pumping to restore and improve injection rates;
- Maintenance repairs (plumbing, electrical, communications, well vaults, pipeline, etc.);
- Availability of injection water supply, including AWPF shutdowns;
- Optimize distribution of injection for controlling seawater intrusion and maintaining protective groundwater elevations;
- Reduce or redistribute injection to avoid overly high groundwater conditions;
- Hydraulic restrictions on the barrier pipeline and appurtenances (bottlenecks); and
- OCWD and OC San construction activities requiring localized dewatering in the vicinity of the injection barrier.

As shown in Table 3-6, I2, I24/1, I24/2, I25/1, and I29A were off-line for various periods due to maintenance issues during 2022. On-site modern injection wells I24/1, I24/2 have down-hole flow control valves that were inoperable for the entire year. On-site modern injection well I25/1 has the same type of valve as I24/1 and I24/2 and it also became inoperable in mid-September 2022. Replacement with a more reliable type of flow control valve used on most of the other modern injection wells is planned, along with upsizing the drop pipe within the well. These three wells were off-line through the end of the year because the required maintenance repairs are currently on hold due to access issues related to GWRSFE construction activities. Table 3-6 also shows that legacy well I4 was off-line for the first three weeks in February 2022 due to GWRSFE construction activities requiring localized dewatering in the vicinity.

During 2022, minor maintenance repairs were conducted on other injection wells while those wells were off-line on stand-by, thus not requiring any injection downtime. For selected modern injection wells, replacement of the flow tube on the flow sensor apparatus continued during 2022, as the flow tube polypropylene linings continued to wear out. The new flow tubes have a Teflon lining. To date, a total of nine modern injection wells have had flow tube replacements.

No legacy wells were redeveloped from 2020 to 2022. All legacy wells except I2 and I8 were redeveloped during 2018/19; I2 is a perennial poor performer and is planned to be replaced, and I8 is rarely used due to traffic control access issues. Since implementing GWRS purified recycled water as the primary injection source, a legacy redevelopment cycle of approximately 2 to 3 years of on-line run time has been sufficient to maintain injection flow rates without significant reductions in well efficiency and thus maintain overall barrier capacity. Redevelopment of legacy wells is currently planned for 2023.

Redevelopment of each legacy well typically takes one day per well casing, or less than one week to complete each well site. Legacy well redevelopment requires disassembly of the injection well header plumbing, followed by airlift pumping and surging to remove accumulated fine material that causes well clogging near the formation interface with the gravel pack. Airlift pumping flows are discharged to the sewer after settling tanks sufficiently remove the fine-grained material.

None of the modern injection wells have required extensive redevelopment to date. Modern injection well sites I24, I25, and I26 were constructed and placed on-line over 20 years ago in 1999-2000, while I27 and I28 went on-line in 2004, and finally I29 through I36 went on-line in 2008 with the commencement of GWRS. Sustained injection capacity over the life of these wells thus far has largely been attributed to regularly scheduled short duration backwash pumping of these injection wells, either by the airlift pumping method using a portable compressor (most modern wells) or backwash pumping with dedicated submersible pumps (only I24 and I25 sites). Airlift pumped flows from the modern injection wells are discharged to the storm drain under a "*de minimis*" permit from the RWQCB (RWQCB, 2020b), whereas backwash pumping from the on-site modern injection wells (I24/1, I24/2, and I25/1) is desilted and discharged to the AWPF RO concentrate (brine) line sending flows to the OC San outfall.

The three on-site modern injection wells (I24/1, I24/2, and I25/1) are equipped with dedicated submersible pumps allowing for regular backwash pumping. The submersible pump backwash frequency is based on the cumulative volume injected similar to the other injection wells. During the first few years of GWRS operations, the volume injected between submersible pump backwash events was only 9 to 10 MG. More recently, the backwash frequency has been extended and ranges from an injection volume of 20 to 40 MG between backwash events. This typically translates to a frequency of approximately one to two months. Backwash pumping is controlled by OCWD Operations staff from the AWPF control room. A relatively short duration of 5-15 minutes is typically required for each submersible pump backwash event to restore the well's injection capacity. The submersible pump backwash pumping rate is maintained considerably higher than each well's rate of injection to better remove any particulate material that may have been introduced into the gravel pack or out into the formation. During 2022, the submersible backwash pumping rate for I25/1 was approximately 2,100 gpm, while I24/1 and I24/2 were off-line all year and therefore not backwashed.

The other modern injection wells (sites I26 through I36) are equipped with dedicated air lines and are regularly backwashed by OCWD staff using the airlift pumping method, which requires a portable air compressor to be transported to each site.

Since 2011, OCWD Barrier Operations staff have used a 750 cubic feet per minute (cfm) 200 pounds per square inch air compressor to regularly airlift backwash these modern wells lacking dedicated pumps.

The airlift backwash frequency for these modern injection wells is also based on the cumulative volume injected since the previous backwash and varies considerably from well to well. Well performance is monitored closely to determine the optimal time to backwash. The volume injected between modern well airlift backwash events typically varies from 15 to 40 MG, which usually translates to a frequency ranging from one to two months. Modern wells that are airlift backwashed require minimal header plumbing disassembly and typically take one day per injection well site to complete. Therefore, these backwash events are not typically shown on the injection well status table (Table 3-6) since each well site is only off-line for one day.

Historically, there has been some evidence of erosion of the barrier distribution pipeline materials via the presence of measurable amounts of sand found during maintenance blow-off activities and on in-line bypass filters. In fact, I32C located at this west-end terminus of the barrier pipeline is the first modern injection well showing initial signs of requiring more extensive redevelopment, since ongoing airlift pumping may not be removing all the injected fine-grained material from the lower portion of its screened interval.

To help limit potential pipeline erosion, the quality of the lime used during post-treatment operations has been improved and specific post-treatment stability targets have been adjusted. Barrier Operations and AWPF Operations staff continue to closely monitor the lime post-treatment process and operating parameters (e.g., pH) to help minimize the potential for well clogging.

The AWPF began receiving water from OC San Plant 2 in mid-December 2022. The additional source increased the overall TDS of the combined influent, requiring a slight adjustment to the decarbonation bypass volume but no significant changes to the post-treatment process or the associated operating parameters. However, as discussed in Section 2, the monthly average TDS of GWRS-FPW increased slightly as well as the monthly chloride concentration from 4-9 mg/L during January through November to 12 mg/L in December.

Bypass filter monitoring at I32 and the AWPF will continue during 2023.

4. GROUNDWATER MONITORING AT THE TALBERT BARRIER

OCWD has maintained a comprehensive groundwater monitoring program in the vicinity of the Talbert Barrier for decades as part of the operation of its water recycling program as well as the assessment of the effectiveness of the barrier in preventing seawater intrusion. This section presents the following for 2022:

- Description of Talbert Gap aquifers;
- Overview of groundwater monitoring program;
- Groundwater elevations and directions of flow; and
- Groundwater quality.

4.1 Talbert Gap Aquifers

Earlier studies (DWR, 1966) delineated numerous discrete aquifer units comprising the Talbert Gap area of the Orange County Groundwater Basin. In general, from shallowest to deepest, these include:

- Talbert aquifer;
- Alpha aquifer;
- Beta aquifer;
- Lambda aquifer;
- Omicron aquifer;
- Upper Rho aquifer;
- Lower Rho aquifer;
- Main aquifer; and
- Lower Main aquifer.

The Talbert aquifer is the primary conduit for inland migration of seawater. Being the shallowest of the potable aquifers listed above, it is also the youngest and therefore has not been appreciably folded or uplifted by the Newport-Inglewood Fault system that runs roughly parallel to the coastline through the Talbert Gap area as shown on Figure 4-1. Therefore, the Talbert aquifer is relatively horizontal, continuous, and in direct hydraulic connection with the Pacific Ocean. The Talbert aquifer is approximately 50 to 80 feet thick within the Talbert Gap area and is comprised of relatively coarse sands and gravels that were deposited by the ancestral SAR. The Talbert Gap was formed by the contemporaneous erosional processes of the ancestral SAR between the uplifted areas now known as the Huntington Beach Mesa and the Newport Mesa. Therefore, the Talbert aquifer is non-existent beneath these mesas.

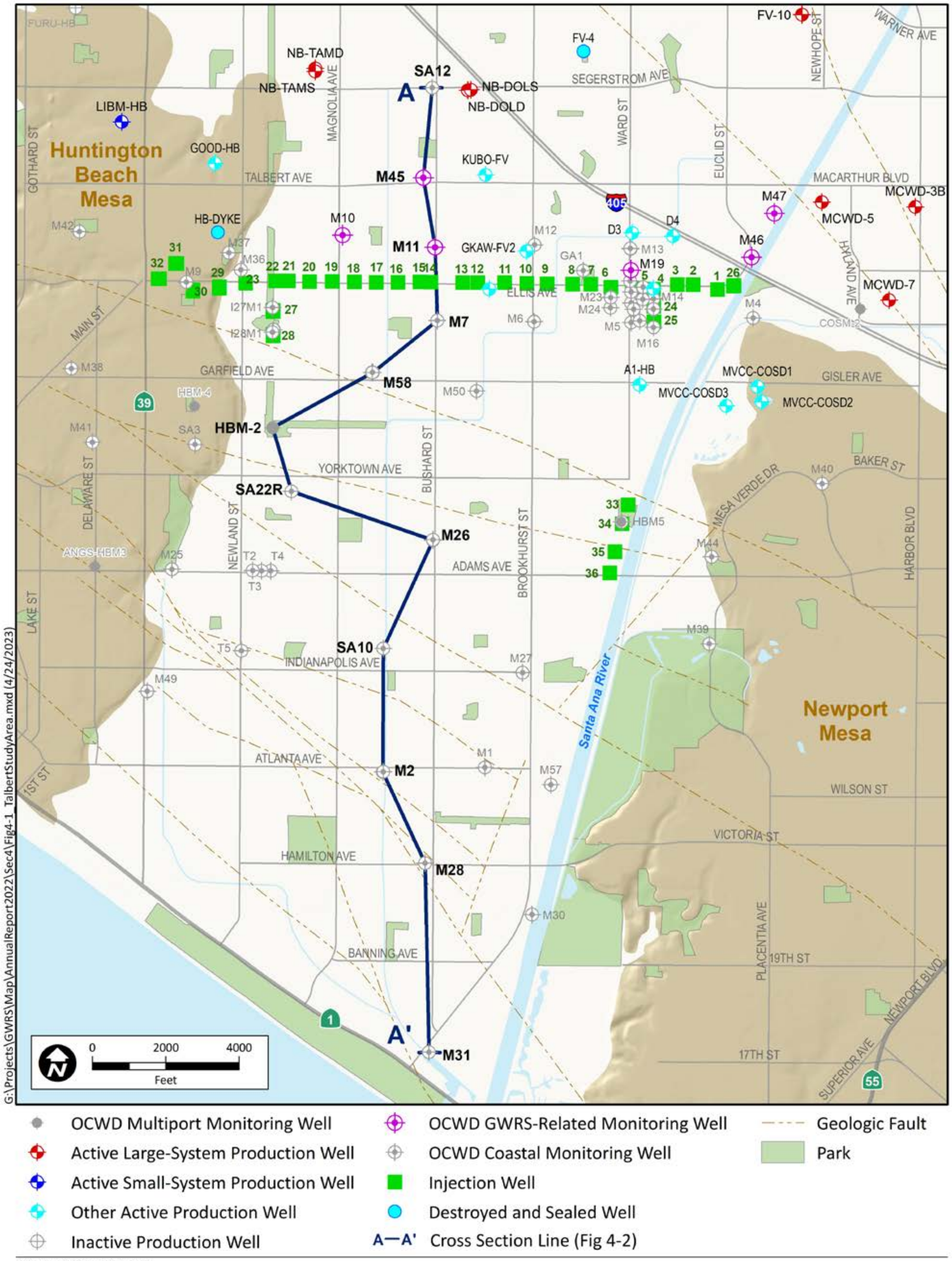


Figure 4-1. Talbert Gap Study Area and Well Location Map

The aquifers below the Talbert aquifer are considerably older and have thus been uplifted and offset to varying degrees by the Newport-Inglewood Fault system illustrated on Figure 4-2. Unlike the Talbert aquifer, these deeper aquifers exist not only within the Talbert Gap but also extend beneath the mesas. As discussed later in this section, the Alpha, Beta, Lambda, Omicron, and Upper Rho zones are all susceptible to seawater intrusion via hydraulic connection with the Talbert aquifer. That is, seawater migrating inland within the Talbert aquifer can flow into deeper aquifers via mergence zones where there is no depositional or hydraulic separation between horizontally or vertically adjacent (i.e., merged) aquifers.

The Main and Lower Main aquifers were not previously considered to be susceptible to seawater intrusion within the Talbert Gap area due to their considerable depth and vertical isolation from the shallower aquifers (DWR, 1966). Furthermore, due to the higher degree of faulting and offset, the Lower Main aquifer is thought to be non-existent seaward of approximately Yorktown Avenue. The Main aquifer is discontinuous and offset across the Newport-Inglewood Fault system, and thus largely hydraulically isolated from the ocean. Seaward of this fault zone, the Main aquifer is brackish and isolated from the inland portion of the Basin. However, with increased groundwater withdrawals from the Main aquifer in the coastal area over the last 20 to 30 years, lower groundwater elevations in the coastal area could increase the potential for leakage of saline water inland across the Newport-Inglewood Fault system within the Main aquifer (Herndon and Bonsangue, 2006).

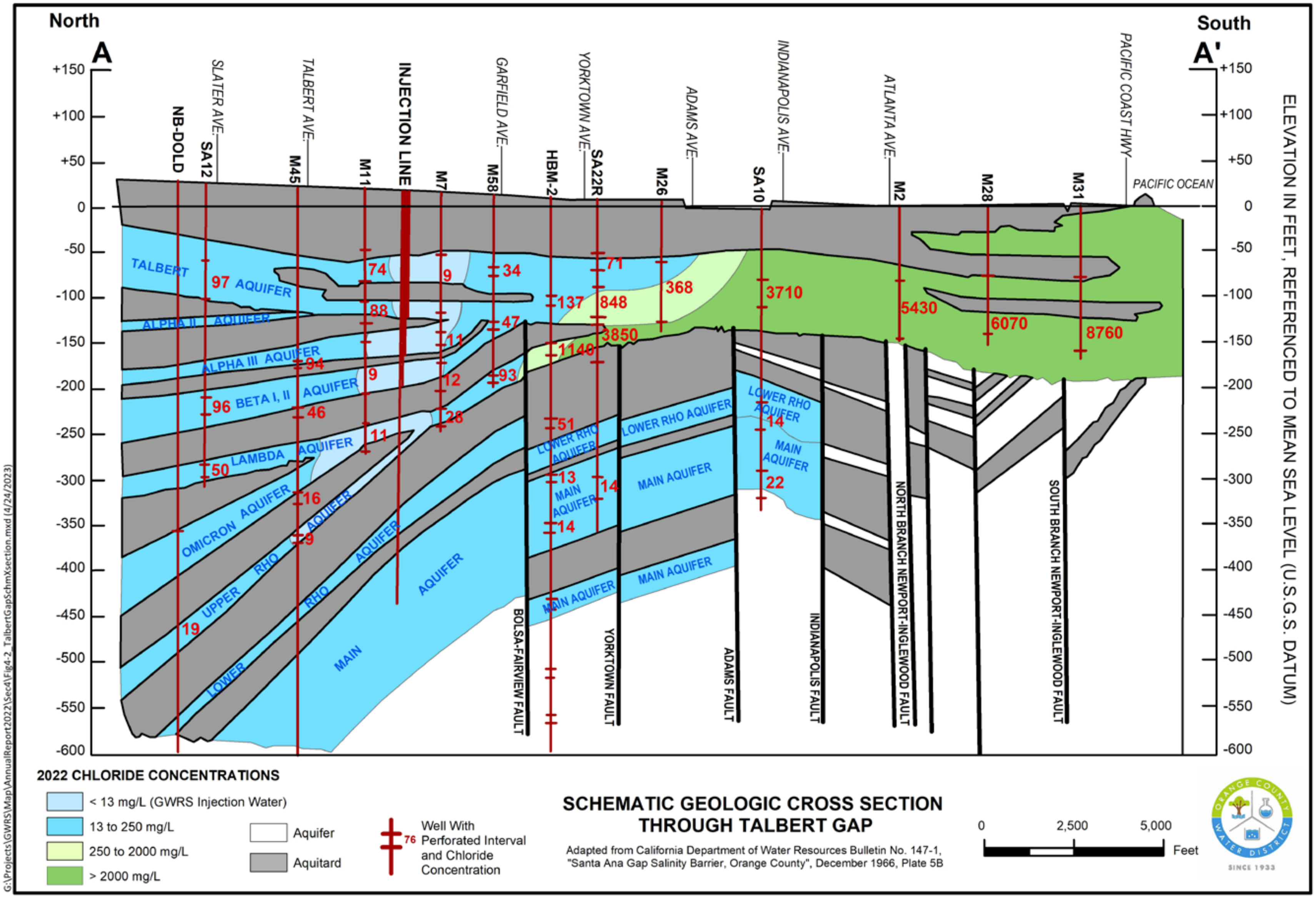


Figure 4-2. Schematic Geological Cross Section Through Talbert Gap

4.2 Groundwater Monitoring Program

As part of the groundwater monitoring program required by the permit for the GWRS (RWQCB, 2020a, 2022a), OCWD-owned monitoring wells and several municipal and private wells in the Talbert Barrier area were sampled in 2022. OCWD performs coastal groundwater monitoring at numerous additional wells on a semi-annual basis for the purposes of monitoring seawater intrusion. The locations of OCWD's GWRS permit compliance wells, other coastal monitoring wells, private wells, and municipal production wells in the Talbert Gap area are shown on Figure 4-1.

Under the previous WF-21 permit, OCWD monitoring well sites M9, M10, and M19 were sampled monthly. These wells were constructed between 1967-68, prior to injection of WF-21 recycled water. Under the current GWRS permit, quarterly compliance monitoring is required from OCWD monitoring well sites M10, M11, M45, M46, and M47. The three newer GWRS compliance monitoring wells M45, M46, and M47 were constructed during 2004-05. The GWRS monitoring program began in mid-2004. Table 4-1 summarizes the screened interval depths and aquifer zones for the five compliance monitoring wells and M19.

On December 2, 2022, a new GWRS permit was issued by the RWQCB (RWQCB, 2022). The constituents list for Talbert Barrier compliance monitoring is slightly different under the new permit than described here. However, reporting under the new permit will not go into effect until January 1, 2023, and therefore changes will largely be captured in the 2023 GWRS Annual Report.

Sampling of monitoring well site M19 is not required under the GWRS permit. However, this monitoring well site continued to be monitored voluntarily through 2022, and the associated data for M19 are reported herein because this well is in a strategic location just north of the Talbert Barrier near the east end. At monitoring well site M19, only Zone 3 (M19/3) is tested quarterly like GWRS compliance wells and annually for the full comprehensive suite of analytes; Zones 1 and 2 (M19/1 and M19/2) are tested twice a year for a reduced set of analytes for the assessment of seawater intrusion.

Monitoring well site M45 is located approximately halfway between the Talbert Barrier Ellis Avenue alignment and the City of Newport Beach municipal wells (NB-TAMS, NB-TAMD, NB-DOLS, and NB-DOLD) located north of the barrier (Figure 4-1). Well sites M46 and M47 are located approximately one-quarter and one-half the distance, respectively, between injection well site I26 and the nearest municipal production well MCWD-5, which is owned and operated by Mesa Water. These three newer compliance monitoring wells were each constructed with five nested casings designed to monitor the individual aquifers tapped by the nearby production wells.

4.3 Groundwater Elevations and Directions of Flow

Groundwater flow directions in the vicinity of the Talbert Barrier vary considerably due to barrier injection and seasonal fluctuations in coastal pumping as well as historical changes in pumping patterns, such as new well fields coming on-line. Also, due to the vertical distribution of coastal pumping, each of the aquifers receiving injection water has a somewhat different groundwater flow path.

To evaluate groundwater flow directions in the vicinity of the Talbert Barrier for the assessment of seawater intrusion control, observed groundwater elevations are contoured at the end of each water year (end of June). Groundwater elevation contour maps are prepared for the Shallow aquifer (Talbert and Alpha aquifers), intermediate-depth Lambda aquifer, and deeper Main aquifer, as described in Sections 4.3.1, 4.3.2, and 4.3.3, respectively. Seaward of the barrier, monitoring wells screened in the Talbert, Alpha, and to a lesser extent Lambda aquifer have historically been intruded by seawater. Therefore, the observed end of June groundwater elevations used to construct those contour maps were first adjusted to freshwater equivalent elevations (heads) for wells with elevated salinity having chloride concentrations greater than 250 mg/L. For wells with chloride concentrations less than 250 mg/L, the freshwater equivalent adjustment is negligibly small. This adjustment accounts for the difference in density between fresh groundwater and the heavier saline groundwater, with the freshwater equivalent heads ranging from 0-2.5 ft higher than the observed groundwater elevations seaward of the Talbert Barrier. This upward adjustment is larger for higher levels of salinity and greater well depths. The freshwater equivalent head adjustment is necessary to accurately infer the variable-density groundwater flow direction and is based on the principle that an equivalent weight of water column in a monitoring well has a greater water column height if fresh than if saline (Guo and Langevin, 2002).

The freshwater equivalent head was calculated for monitoring wells seaward of the Talbert Barrier having elevated salinity using the formula below:

$h_f = h_w + z_f$ where:

h_f = freshwater equivalent head (ft msl)

h_w = head in well (observed groundwater elevation, ft msl)

z_f = freshwater equivalent head adjustment (ft)
= (0.025 x seawater fraction in well) x (water column height in well)
= 0.025 x (well chloride/seawater chloride) x (bottom screen depth – depth to water)

The above formula uses the chloride concentration of the pumped well sample closest to the date of the water level measurement as a reasonable approximation of the average chloride concentration throughout the entire water column in the well at the time of the water level

Table 4-1. Monitoring Wells at the Talbert Barrier

OCWD Well Name	Date Completed	Nearest Injection Well [1]	Approximate Distance and Direction from Barrier	Nearest Drinking Water Well(s)	Well Depth (ft bgs)	Aquifer Name(s)
OCWD-M10/1	11/01/1967	OCWD-I19	1,300 ft N	NB-TAMS, NB-TAMD	80-160	Talbert and Alpha
OCWD-M10/2	11/01/1967	OCWD-I19	1,300 ft N	NB-TAMS, NB-TAMD	175-195	Beta
OCWD-M10/3	11/01/1967	OCWD-I19	1,300 ft N	NB-TAMS, NB-TAMD	215-240	Beta
OCWD-M10/4	11/01/1967	OCWD-I19	1,300 ft N	NB-TAMS, NB-TAMD	280-305	Lambda, Omicron and Upper Rho
OCWD-M11/1	10/01/1967	OCWD-I14	950 ft N	NB-DOLS, NB-DOLD	70-105	Talbert
OCWD-M11/2	10/01/1967	OCWD-I14	950 ft N	NB-DOLS, NB-DOLD	125-150	Talbert and Alpha
OCWD-M11/3	10/01/1967	OCWD-I14	950 ft N	NB-DOLS, NB-DOLD	170-225	Beta
OCWD-M11/4	10/01/1967	OCWD-I14	950 ft N	NB-DOLS, NB-DOLD	260-290	Lambda and Omicron
OCWD-M19/1[2]	01/01/1968	OCWD-I5	500 ft N	MCWD-5	60-110	Talbert
OCWD-M19/2[2]	01/01/1968	OCWD-I5	500 ft N	MCWD-5	130-195	Alpha
OCWD-M19/3[2]	01/01/1968	OCWD-I5	500 ft N	MCWD-5	215-265	Beta
OCWD-M45/1	02/28/2005	OCWD-I15	2,900 ft N	NB-DOLS, NB-DOLD	195-205	Alpha and Beta
OCWD-M45/2	02/28/2005	OCWD-I15	2,900 ft N	NB-DOLS, NB-DOLD	250-260	Beta
OCWD-M45/3	02/28/2005	OCWD-I15	2,900 ft N	NB-DOLS, NB-DOLD	335-345	Omicron
OCWD-M45/4	02/28/2005	OCWD-I15	2,900 ft N	NB-DOLS, NB-DOLD	380-390	Upper Rho
OCWD-M45/5	02/28/2005	OCWD-I15	2,900 ft N	NB-DOLS, NB-DOLD	780-790	Main
OCWD-M46A/1	11/02/2005	OCWD-I26	900 ft NE	MCWD-5	350-370	Lambda and Omicron
OCWD-M46/2	07/29/2004	OCWD-I26	900 ft NE	MCWD-5	420-430	Upper Rho
OCWD-M46/3	07/29/2004	OCWD-I26	900 ft NE	MCWD-5	515-535	Lower Rho
OCWD-M46/4	07/29/2004	OCWD-I26	900 ft NE	MCWD-5	640-660	Main
OCWD-M46/5	07/29/2004	OCWD-I26	900 ft NE	MCWD-5	890-910	Main
OCWD-M47/1	05/13/2005	OCWD-I26	2,250 ft NE	MCWD-5	355-375	Beta
OCWD-M47/2	05/13/2005	OCWD-I26	2,250 ft NE	MCWD-5	470-480	Upper Rho
OCWD-M47/3	05/13/2005	OCWD-I26	2,250 ft NE	MCWD-5	580-600	Lower Rho
OCWD-M47/4	05/13/2005	OCWD-I26	2,250 ft NE	MCWD-5	745-765	Main
OCWD-M47/5	05/13/2005	OCWD-I26	2,250 ft NE	MCWD-5	940-960	Main

[1] The closest injection well is not necessarily the fastest source of injection water based on estimated arrival times and inferred groundwater flow directions.
[2] Monitoring well site OCWD-M19 is not a compliance well per the existing GWRS permit but is monitored voluntarily.

measurement. This approximation was verified at a couple of selected brackish monitoring wells to yield acceptably close estimates of the freshwater equivalent head adjustment calculated by using the weighted average of depth-specific field EC values measured in-situ at 10-ft intervals throughout the entire water column of each well.

4.3.1 Talbert and Alpha Aquifers

Figure 4-3 shows interpreted groundwater elevation contours and inferred groundwater flow directions within the shallow Talbert and Alpha aquifers for June 30, 2022, in the Talbert Gap area. The contours not overlying the Huntington Beach and Newport Mesas (i.e., within the Talbert Gap) represent groundwater elevations for the Talbert aquifer. A more-detailed one-foot contour interval was used in the Talbert Barrier area and seaward to better illustrate the groundwater flow patterns. On the mesas, the contours represent Alpha aquifer groundwater elevations since the Talbert aquifer does not exist beneath the mesas as was described earlier in Section 4.1; however, the Talbert aquifer is in lateral hydraulic connection with the Alpha aquifer beneath the Huntington Beach Mesa, such that they behave as one aquifer system. Figure 4-3 also shows the Talbert aquifer mergence zones, which can act as drains transmitting water from the Talbert aquifer into the deeper Alpha, Beta, and Lambda aquifers due to a typically downward vertical gradient.

As shown on Figure 4-3, groundwater elevations in the Talbert aquifer were at or above mean sea level both along Ellis Avenue near the barrier as well as farther seaward near the southeast portion of the barrier and along Adams Avenue. Groundwater elevations were approximately 6 feet above mean sea level at the southernmost end of the southeast barrier injection wells near the intersection of Adams Avenue and the Santa Ana River. Seaward of Adams Avenue, Talbert aquifer groundwater elevations within the Talbert Gap were 3 to 4 feet above mean sea level, indicating no inland migration of seawater during the June 2022 time frame.

The Shallow aquifer groundwater elevations shown on Figure 4-3 for June 2022 were similar to the prior year for June 2021, due to similar barrier injection and relatively high coastal groundwater conditions. The only notable differences are: (1) the lack of a pronounced mound surrounding the injection wells on the western portion of the Barrier near the intersection of Garfield Avenue and Newland Street, where groundwater elevations were approximately 2 ft lower in June 2022 than in June 2021 due to the shallow zone at those two injection wells being off-line on stand-by for the first half of 2022, and (2) a related flat area about 1 mile south of the Garfield-Newland intersection at 2 ft msl, which was about one foot lower than in June 2021.

During both 2021 and 2022, sustained barrier injection resulted in a local hydraulic mound above mean sea level and thus helped to minimize brackish water seaward of Adams Avenue from migrating and draining into the mergence zones, thus preventing it from migrating inland.

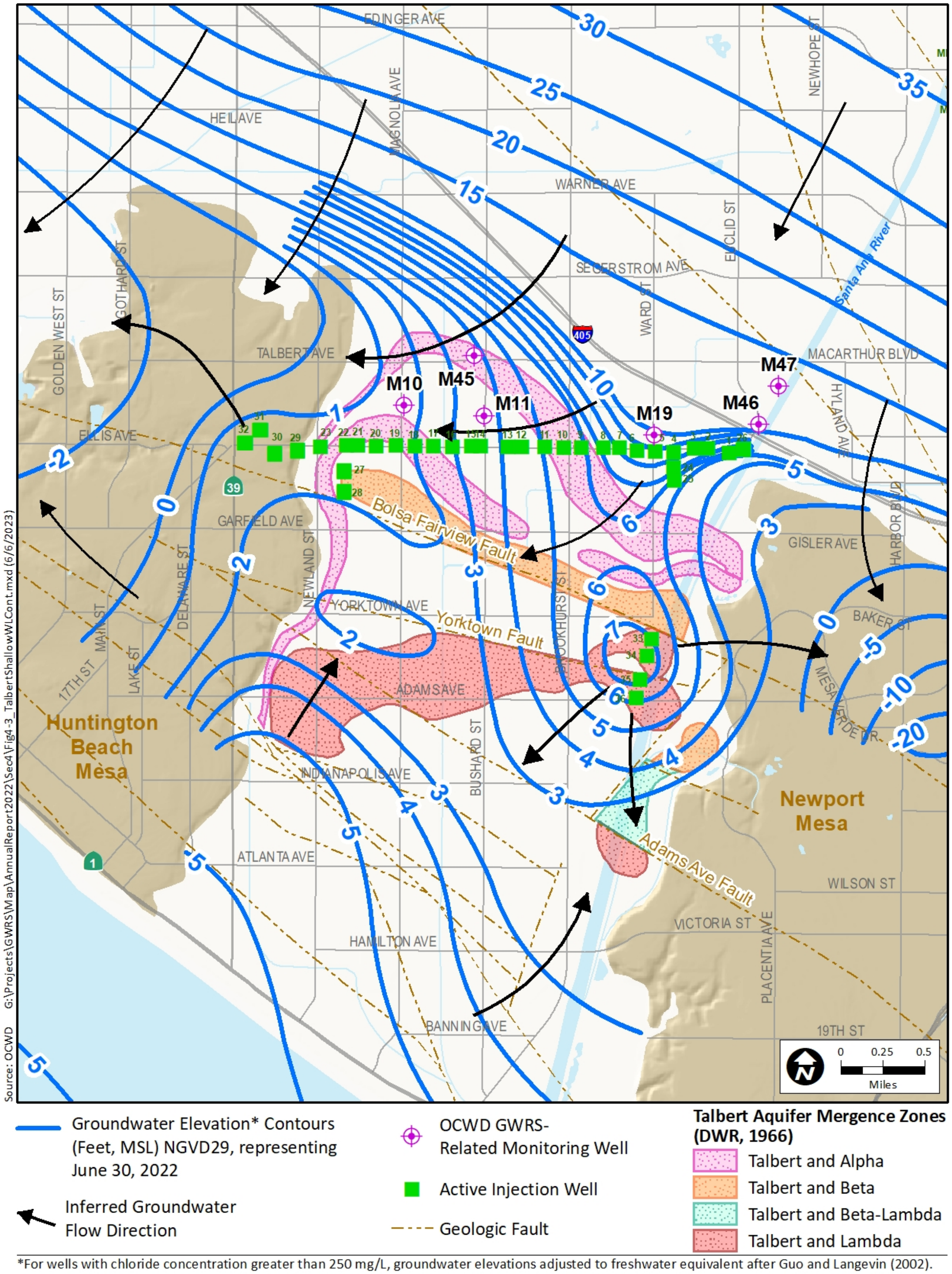


Figure 4-3. Shallow Aquifer Potentiometric Surface with Inferred Groundwater Flow Directions in the Talbert Gap Area During 2022

Without sustained Talbert Barrier injection, a below sea level depression within the Shallow aquifer in the Talbert Gap would occur seaward of Ellis Avenue due to the draining effect of the mergence zone; this condition occurred more regularly prior to the operation of the GWRS facilities and was also evident temporarily during June 2014 when the barrier was off-line for approximately one month due to GWRS Initial Expansion construction activities (Figure 4-3 of 2014 Annual Report). Without the Talbert Barrier supplied by GWRS, such a depression would be a more permanent condition, thereby drawing inland migrating seawater into potable aquifers tapped by municipal production wells farther inland. Figure 4-3 also shows groundwater flow directions inferred from the groundwater elevation contours for the shallow Talbert and Alpha aquifers for June 2022. The inferred groundwater flow direction was predominantly to the southwest, or seaward, within the Talbert Gap area, except for the western half of the Talbert Barrier along Ellis Avenue just north of the injection wells where the inferred groundwater flow direction in the Talbert aquifer was to the west and northwest towards the Huntington Beach Mesa and was likely caused by local mergence between the Talbert and Alpha aquifers. The inferred flow directions shown on Figure 4-3 for the Shallow aquifer during June 2022 were very similar to those the prior year during June 2021 and are representative of normal barrier operating conditions.

As groundwater flows laterally within the Talbert aquifer to the southwest in the Talbert Gap area, groundwater also flows vertically from the Talbert aquifer down into the Alpha, Beta, and Lambda aquifers due to their respective mergence zones as discussed above. As shown on Figure 4-3 for June 2022, a relatively steep and uniform seaward gradient existed in the Talbert aquifer north of the barrier but largely flattened out south of the barrier due to vertical flow losses to the mergence zones. This June 2022 condition represents sufficient barrier injection to overcome these vertical losses to the mergence zones while still maintaining a somewhat flat but slight seaward gradient with groundwater levels above mean sea level south of Ellis Avenue. That is, the Talbert aquifer groundwater elevations were at an optimal level in which they were high enough to be protective of seawater intrusion but with only minimal losses to the ocean. A seaward gradient in this area has the added benefit of displacing existing brackish water past the crucial Talbert-Lambda mergence zone along Adams Avenue.

4.3.1.1 Key Monitoring Well M26

Monitoring well M26 is strategically located seaward of the barrier in the Talbert-Lambda mergence zone in the middle of the Talbert Gap (Figure 4-1) and is screened across both the Talbert and Lambda aquifers. Therefore, M26 is a key monitoring well for evaluating barrier injection requirements versus seawater intrusion potential. M26 is located approximately 1,000 feet north of Adams Avenue, which approximately represents the farthest seaward line at which the goal is to achieve protective groundwater elevations of approximately 3 feet above mean sea level (ft msl). This protective elevation is based on the Ghyben-Herzberg relation (Ghyben, 1888;

Herzberg, 1901; Freeze and Cherry, 1979, pp. 375-376), which accounts for the depth of the Talbert aquifer at that location along with the density difference between saline and fresh groundwater. If this protective elevation is achieved along Adams Avenue for at least the majority of each year, then there would be net annual seaward movement of groundwater; brackish water in the Talbert aquifer would be maintained slightly seaward of the mergence zone and thus prevented from migrating down into the Lambda aquifer that is tapped by inland production wells.

Figure 4-4 shows the historical inter-relationship between coastal groundwater production, Talbert Barrier injection, and groundwater elevations at M26 over the last 15 years since the commencement of GWRS in January 2008. Groundwater elevations at M26 were approximately 15 feet below mean sea level at the beginning of 2008. This represented the lowest conditions at this well over the last 15 years because barrier injection supply was limited during 2007 before GWRS AWPF startup. Also, Basin pumping reached a historical maximum during 2007.

With the startup of several new injection wells in January 2008 with commencement of GWRS, the injection volume was significantly increased from previous years, causing groundwater elevations at M26 to rise over a two-year period to reach protective elevations by the beginning of 2010 (Figure 4-4). Since then, groundwater elevations at M26 have consistently been maintained at or above protective elevations except for brief periods related to AWPF shutdowns, such as in June 2014.

4.3.2 Lambda Aquifer

Figure 4-5 shows interpreted groundwater elevation contours and inferred groundwater flow directions within the intermediate depth Lambda aquifer for June 30, 2022, during a typical on-line barrier condition. The June 2022 Lambda inferred flow directions shown on Figure 4-5 are very similar to those for June 2021 presented in the prior year's Annual Report.

The June 2022 Lambda groundwater elevations in Figure 4-5 near the Talbert Barrier and in the mergence zones seaward of the barrier were nearly the same as in June 2021, since Basin storage was approximately the same and the lesser coastal pumping was offset by the lower amount of barrier injection.

Inland of the Talbert Barrier, the June 2022 Lambda groundwater elevation contours (Figure 4-5) were very similar in shape to those from the prior June. However, the June 2022 Lambda groundwater elevations were approximately 5 ft higher than the prior year in the Huntington Beach area northwest of the barrier and approximately 10 ft higher than the prior year in the IRWD Dyer Road Well Field (DRWF) area of Santa Ana northeast of the barrier. These slightly higher groundwater elevations were likely caused by decreased groundwater pumping from the

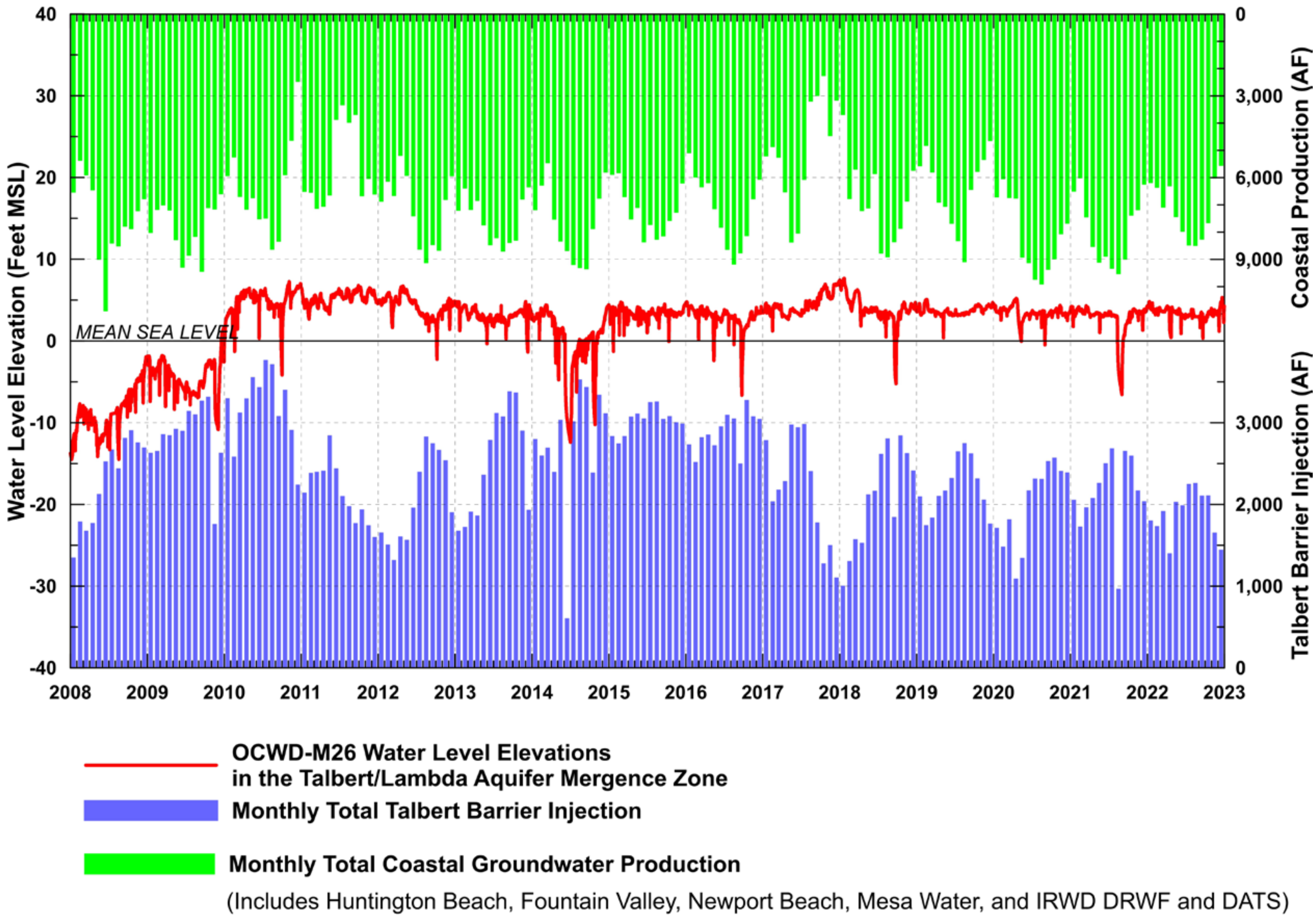
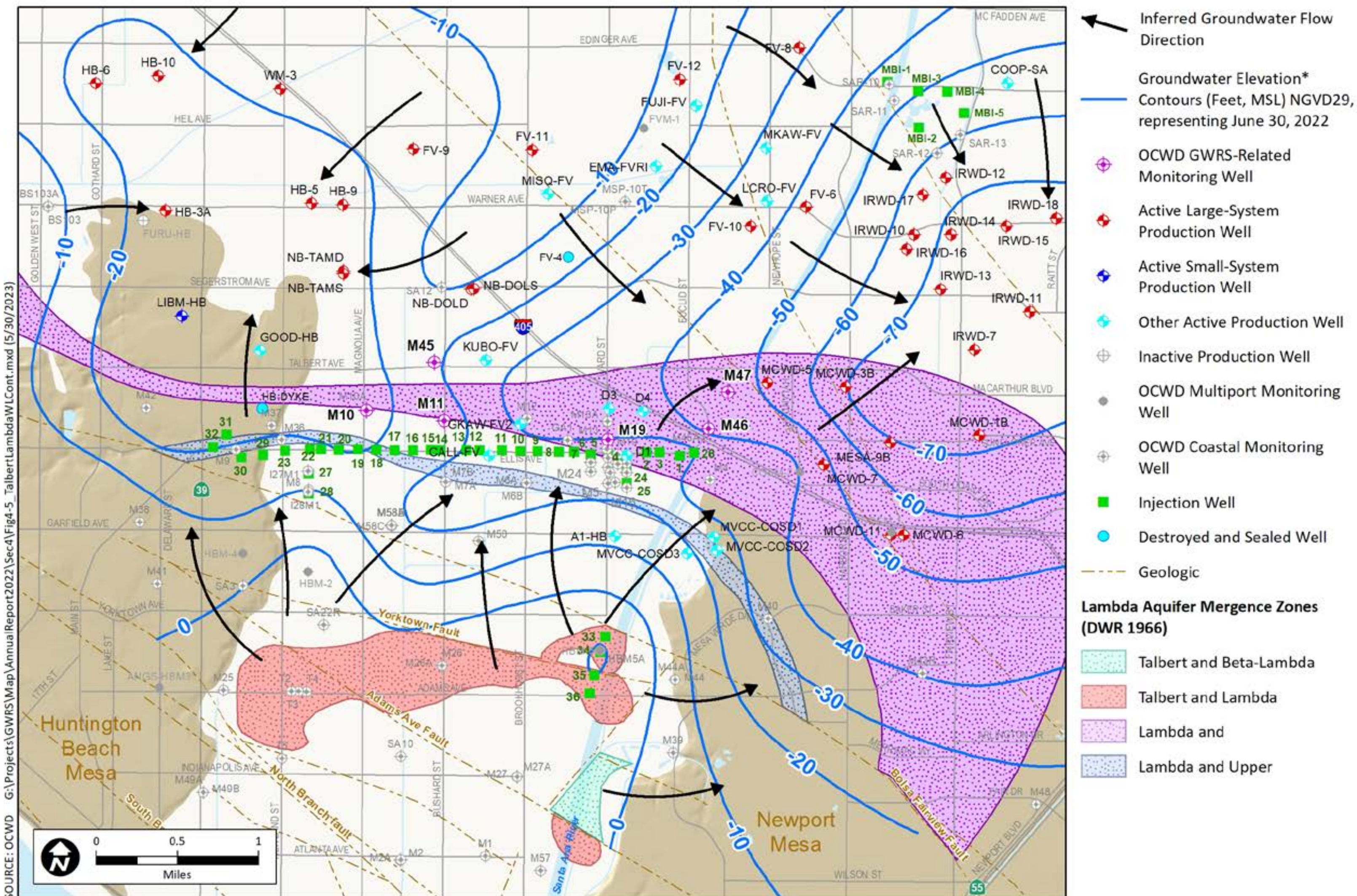


Figure 4-4. Talbert Barrier Injection, Coastal Production, and M26 Groundwater Levels



*For wells with chloride concentration greater than 250 mg/L, groundwater elevations adjusted to freshwater equivalent after Guo and Langevin (2002).

Figure 4-5. Lambda Aquifer Potentiometric Surface with Inferred Groundwater Flow Directions in the Talbert Gap Area During 2022

Principal aquifer in the spring and early summer in 2022 as compared to the same time period in 2021.

When the barrier is on-line as in June 2022, there is typically a localized area of higher groundwater elevations in the Lambda aquifer, albeit below sea level, in the central portion of the Ellis Avenue barrier alignment. The lack of a more pronounced injection mound along Ellis Avenue is likely due to: (1) the limited amount of injection into the legacy well Lambda zones (previously shown on Figure 3-9), and (2) the presence of mergence zones between the Lambda aquifer and the deeper Omicron and Upper Rho aquifers in the vicinity of the barrier, causing groundwater injected into the Lambda aquifer to quickly drain down into these deeper aquifers due to a downward vertical gradient induced by coastal production wells screened in these aquifers. In other words, the Lambda-Omicron and Lambda-Upper Rho mergence zones drain the Lambda aquifer, thus preventing Lambda groundwater levels from mounding higher. As such, the groundwater flow arrows shown on Figure 4-5 in this area only depict the inferred lateral flow directions within the Lambda aquifer, but do not show the downward vertical flow lost into the Omicron and Upper Rho aquifers.

As previously discussed, the Talbert-Lambda mergence zone located approximately 1.5 miles seaward of the barrier acts as a groundwater source for the Lambda aquifer, as groundwater flows from the Talbert aquifer down into the Lambda aquifer, from where it then flows inland within the Lambda aquifer due to groundwater gradients caused by production wells.

Landward of the Talbert Barrier near monitoring well sites M45 (and also M11) exists a seasonally variable east-west groundwater flow divide in the Lambda aquifer (and also within the other intermediate depth aquifers Beta-III, Omicron, and Upper Rho) due to being near the geometric center of the Ellis Avenue injection barrier alignment as well as being flanked to the northwest by the Huntington Beach and Newport Beach production wells and to the east-northeast by the Mesa Water wells and the IRWD DRWF. This groundwater flow divide was again evident in the Lambda aquifer based on the June 2022 groundwater elevation contours shown on Figure 4-5. Therefore, the direction of groundwater flow at monitoring well site M45 in the Lambda aquifer and the other intermediate depth aquifers may vary both seasonally and from year to year and depend largely on the timing and amount of municipal well production and to a lesser extent on the distribution and amount of barrier injection.

Figure 4-5 shows that Lambda aquifer groundwater elevations near the Talbert-Lambda mergence zone along Adams Avenue were at or slightly above mean sea level and have approximately the same levels as the shallower Talbert aquifer in this same area on Figure 4-3. However, Figure 4-5 has a coarser contour interval of 10 ft. Lambda groundwater elevations decrease with distance away from the Talbert-Lambda mergence zone moving north towards the barrier and towards production wells. As is typical, Lambda groundwater elevations were lowest to the northeast of the Talbert Barrier, at approximately -50 to -70 ft msl near the Mesa Water production wells and IRWD DRWF at the end of June 2022. Lambda groundwater elevations were approximately -15 to -25 ft msl to the north-northwest of the Talbert Barrier near Huntington Beach and Newport Beach production wells at the end of June 2022, as groundwater pumping was less concentrated in that area.

4.3.3 Main Aquifer

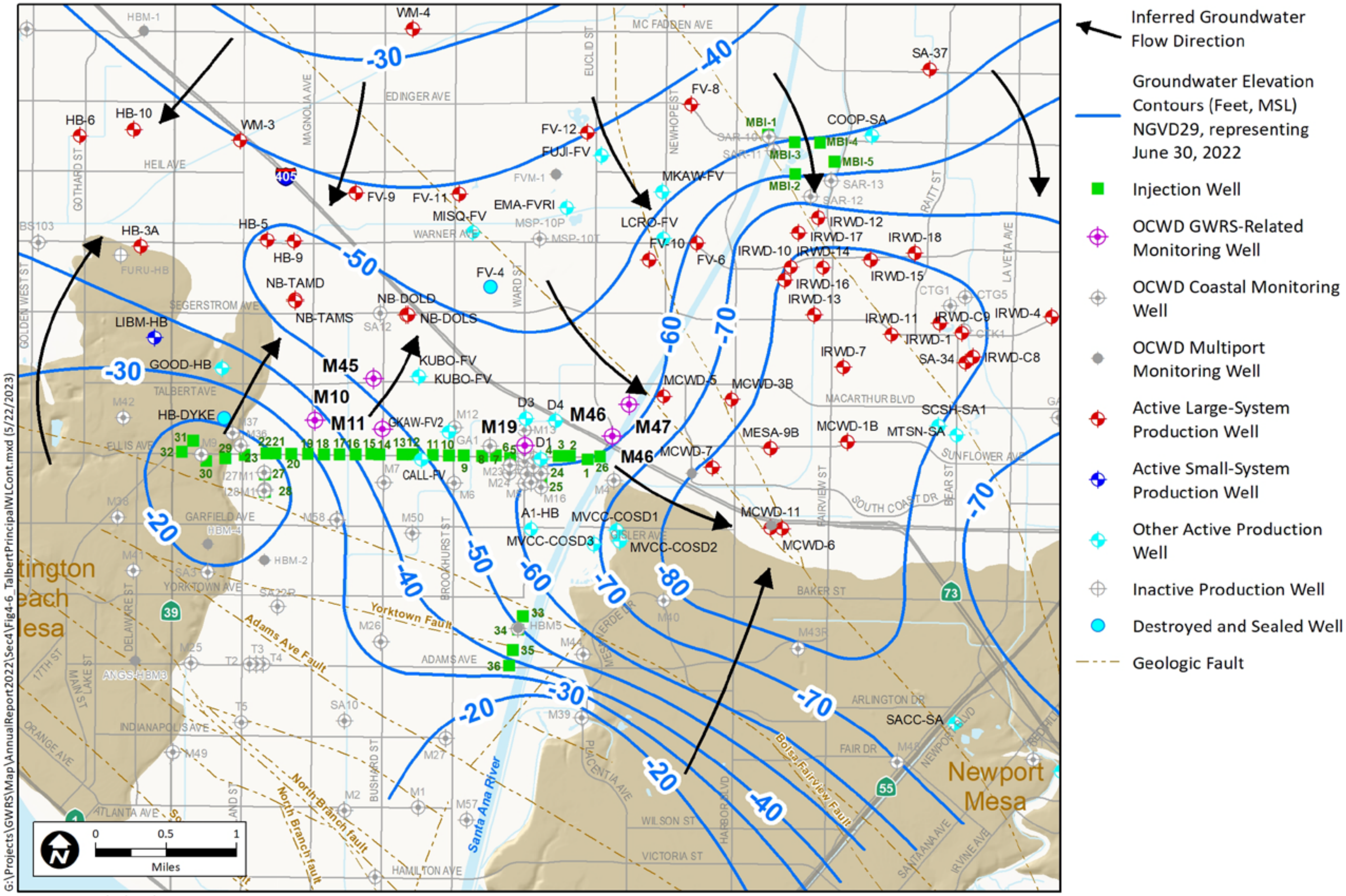
Figure 4-6 shows interpreted groundwater elevation contours and inferred groundwater flow directions within the lower portion of the Principal aquifer system for June 30, 2022. Over 90% of Basin pumping occurs from the Principal aquifer system, which vertically from top to bottom includes the Beta, Lambda, Omicron, Upper Rho, Lower Rho, and Main aquifers. The groundwater elevation contours shown on Figure 4-6 most closely represent the lower portion of the Principal aquifer system and thus for convenience will be referred to herein more specifically as Main aquifer groundwater elevations. The Main aquifer typically has the lowest groundwater elevations in the area.

The June 2022 Main aquifer groundwater elevations shown on Figure 4-6 indicate a large pumping depression to the north-northeast of the barrier as in previous years. The southern portion of the pumping depression encompasses the Mesa Water production wells, and the northern extent encompasses the majority of the IRWD DRWF. At approximately -80 ft msl, the June 2022 Main aquifer groundwater elevations were approximately 0-5 ft higher than the prior June in the Mesa Water and IRWD DRWF areas.

North-northwest of the barrier, production wells owned by the cities of Huntington Beach and Newport Beach are relatively fewer and more spread out, and therefore create a less pronounced pumping depression. June 2022 Main aquifer groundwater elevations in this area were approximately -50 ft msl (Figure 4-6), approximately 0-5 ft higher than the prior June.

Figure 4-6 shows a localized mound of raised Main aquifer groundwater elevations of approximately -20 ft msl at the west end of the Talbert Barrier. All six of the Talbert Barrier west-end deep injection wells were on-line throughout 2022 and nearby June 2022 Main aquifer groundwater elevations were approximately 0-2 ft higher than the prior June. As shown in Figure 4-6, the inferred groundwater flow direction from the west end of the barrier was predominantly inland to the north-northeast towards the Newport Beach well field and Huntington Beach wells HB-5 and HB-9, as in previous years.

On the east end of the barrier, there are only two Main aquifer injection wells: I24/2 and I26C. As illustrated on Figure 4-6, their combined injection is typically not substantial enough to create a noticeable mound in the Main aquifer, especially with the pumping influence of the nearby OCWD Deep wells (D1, D3, and D4) used periodically for GAP blending supply. These two deep injection wells are typically kept on-line throughout the year, but I24/2 was off-line throughout



SOURCE: OCWD (04/2023)

Figure 4-6. Main Aquifer Potentiometric Surface with Inferred Groundwater Flow Directions in the Talbert Gap Area During 2022

2022 (see Section 3). June 2022 Main aquifer groundwater elevations near the east end of the barrier were approximately -60 ft msl, approximately 5-7 feet higher than the prior June. Although Main aquifer groundwater elevations shown on Figure 4-6 were well below sea level, the Main aquifer is not considered to be directly susceptible to seawater intrusion in this area due to the Newport-Inglewood Fault Zone acting as an effective barrier to inland groundwater flow in the Main aquifer. All eight Main aquifer injection wells are primarily used for Basin replenishment.

4.3.4 Barrier Monitoring Well Trends

Groundwater level hydrographs for the 10-year period 2013-2022 for well sites M10, M11, M19, M45, M46, and M47 are shown on the upper graph of Figure 4-7 through Figure 4-12, respectively. These figures also show chloride and 1,4-dioxane concentrations, which are discussed in Section 4.4. The seasonal fluctuations in groundwater levels indicate that the potable aquifers in the Talbert Barrier area – especially the Principal aquifer system – are influenced heavily by groundwater production, which typically varies considerably from winter to summer based on seasonal water demands.

The discussion that follows describes the seasonal groundwater level trends during 2022 at the barrier compliance monitoring wells for the following three aquifer depth categories: (1) shallow Talbert and Alpha aquifers, (2) intermediate depth Beta, Lambda, Omicron, and Upper Rho aquifers, and (3) deeper Lower Rho and Main aquifers. Only the shallow and intermediate depth aquifers are susceptible to seawater intrusion and have thus historically received injection prior to GWRS.

Groundwater level trends in all barrier compliance monitoring wells in 2022 exhibited a typical seasonal pattern: (1) rising or remaining relatively high during the winter and early spring months, (2) declining in the late spring and summer months, and (3) recovering in the late fall months to the end of the year. In the coastal area, these seasonal groundwater level trends are largely controlled by seasonal coastal pumping and to a lesser degree by barrier injection. Overall, groundwater levels in all barrier compliance monitoring wells in 2022 were very similar to their 2021 seasonal counterparts, except for the period immediately following an extended barrier shutdown. During 2022, water levels flattened or only slightly decreased in response to the shutdown, whereas in 2021, water levels decreased sharply. The more muted groundwater level response in 2022 was due to the difference in timing and duration of the two shutdowns. The 2021 barrier shutdown lasted 21 days and occurred in August during the height of seasonal coastal pumping demands, while the 2022 barrier shutdown lasted only 7 days and occurred in April, a month with moderate seasonal coastal pumping demands. Groundwater levels at the barrier monitoring wells at the end of 2022 were approximately equal to the end of the prior year due to a minimal change in groundwater storage conditions throughout the Basin from June 2021 to June 2022 and the lower amount of barrier injection offsetting the lesser coastal pumping.

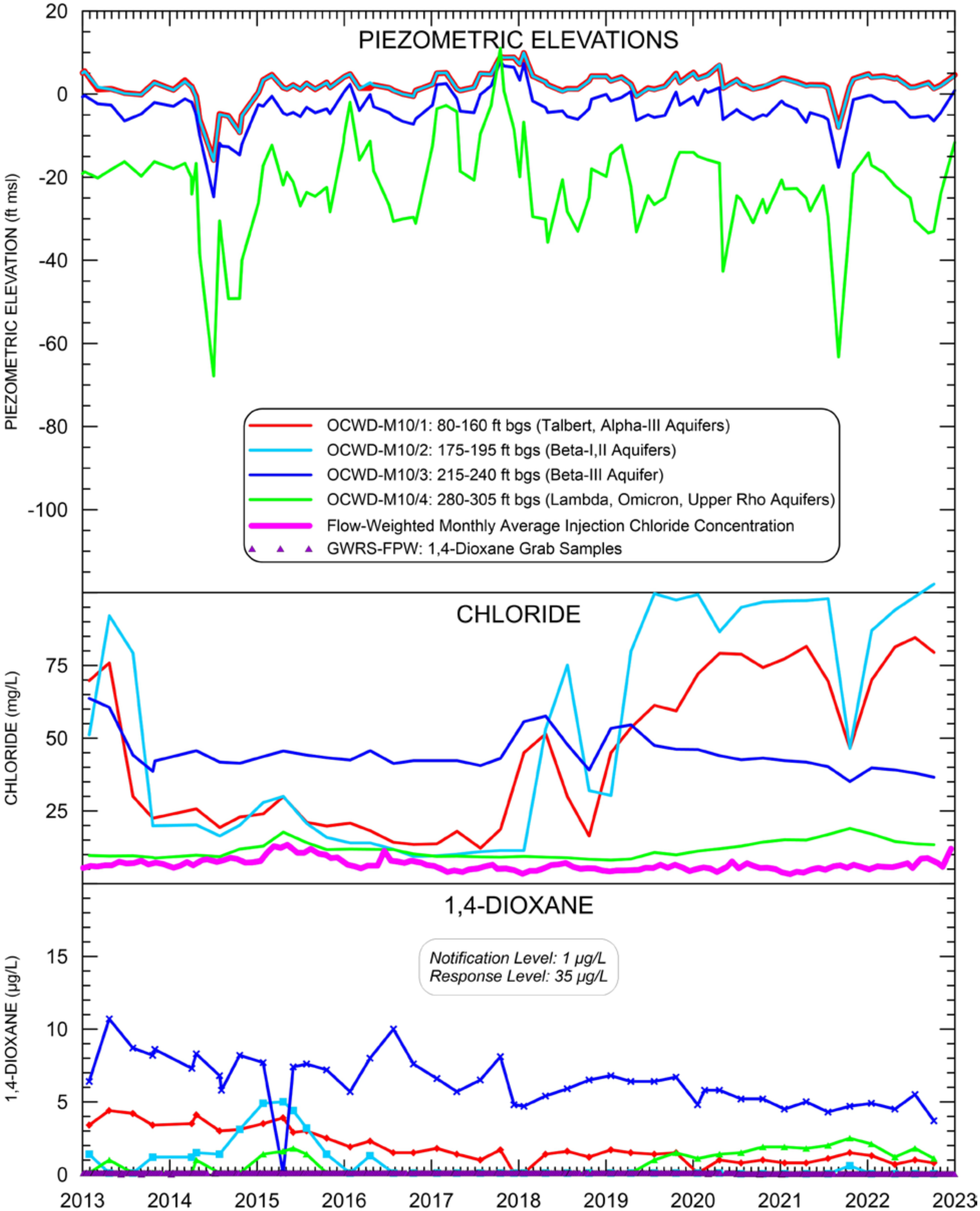


Figure 4-7. Monitoring Well OCWD-M10 Piezometric Elevations, Chloride Concentration, and 1,4-Dioxane Concentration

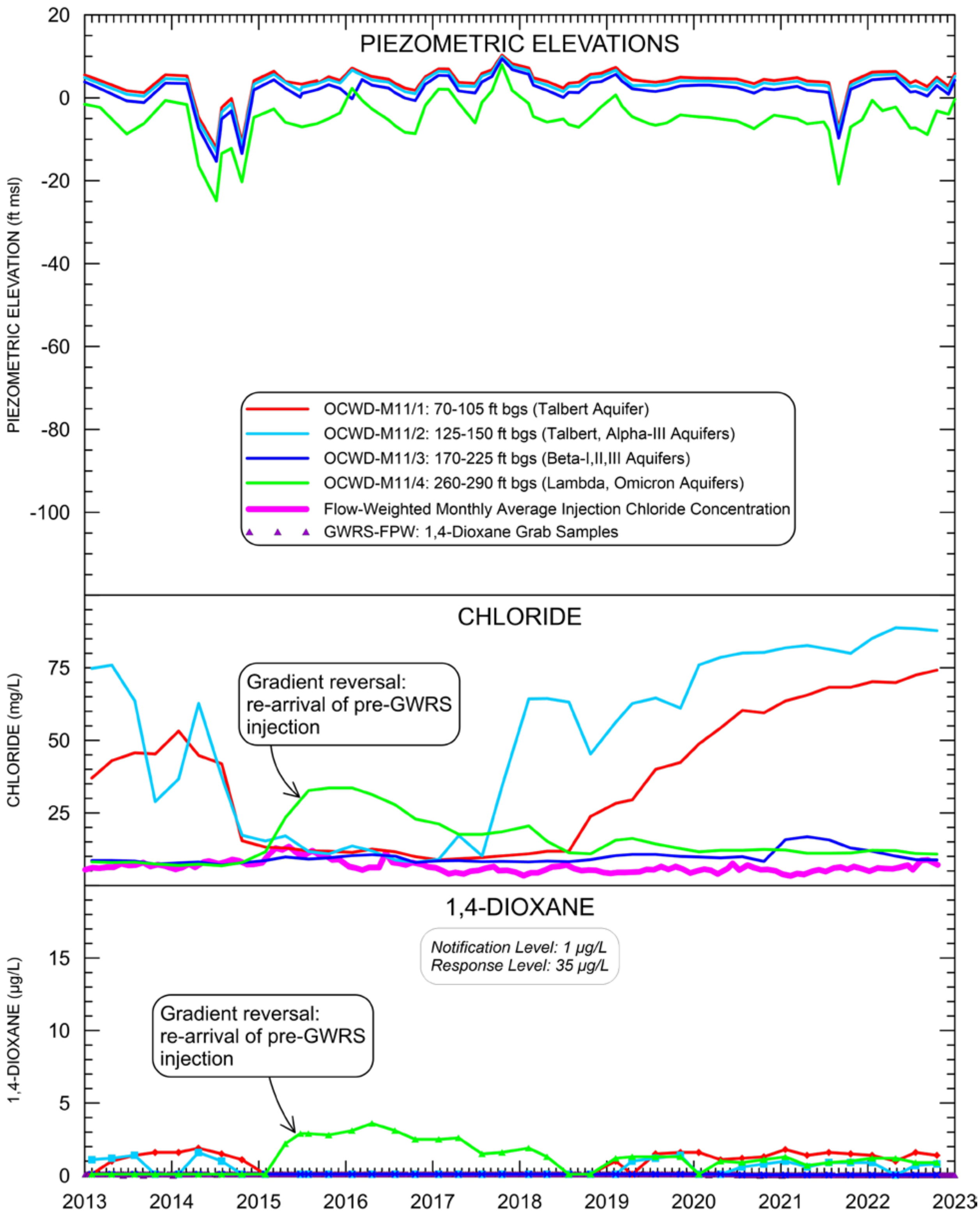


Figure 4-8. Monitoring Well OCWD-M11 Piezometric Elevations, Chloride Concentration, and 1,4-Dioxane Concentration

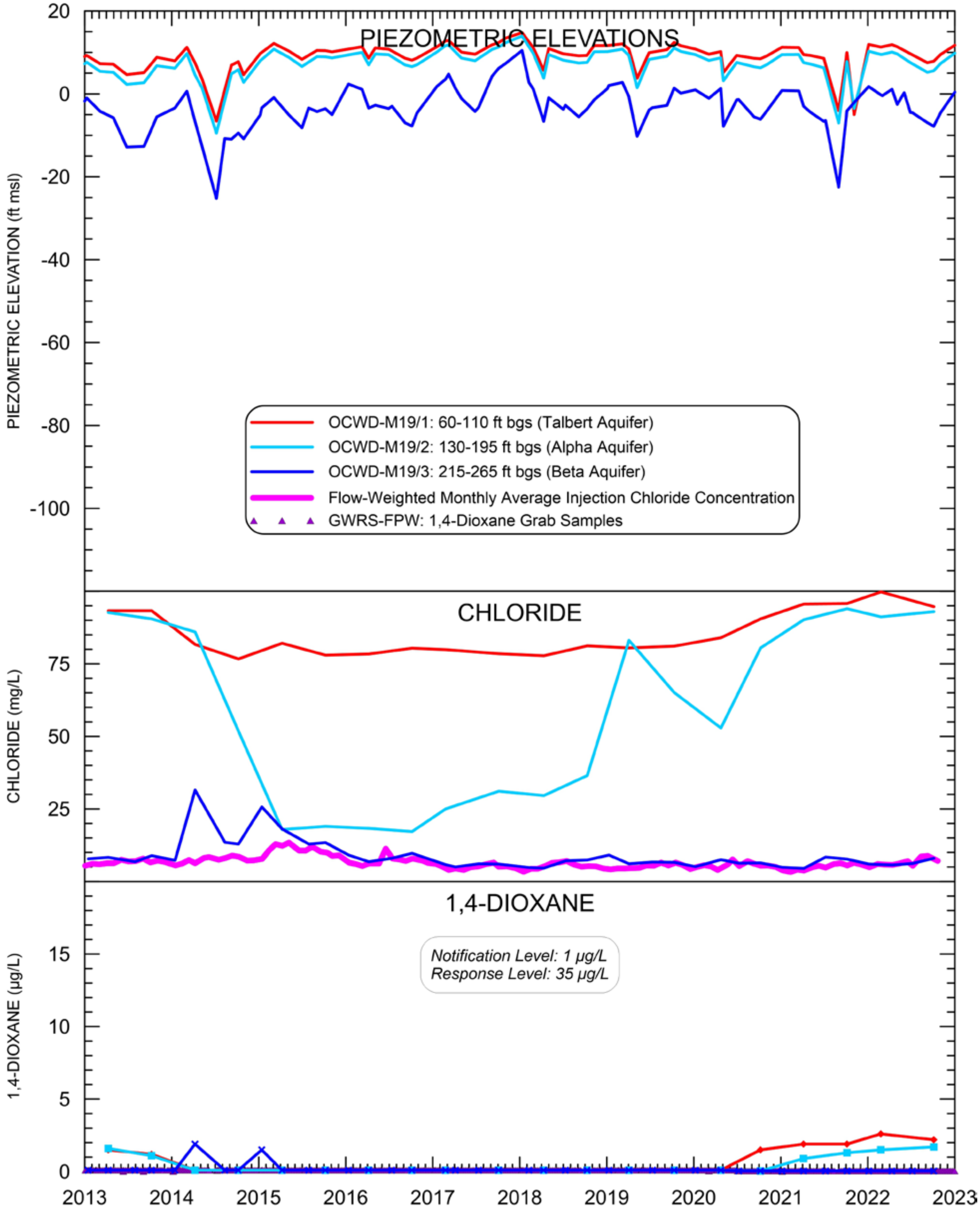


Figure 4-9. Monitoring Well OCWD-M19 Piezometric Elevations, Chloride Concentration, and 1,4-Dioxane Concentration

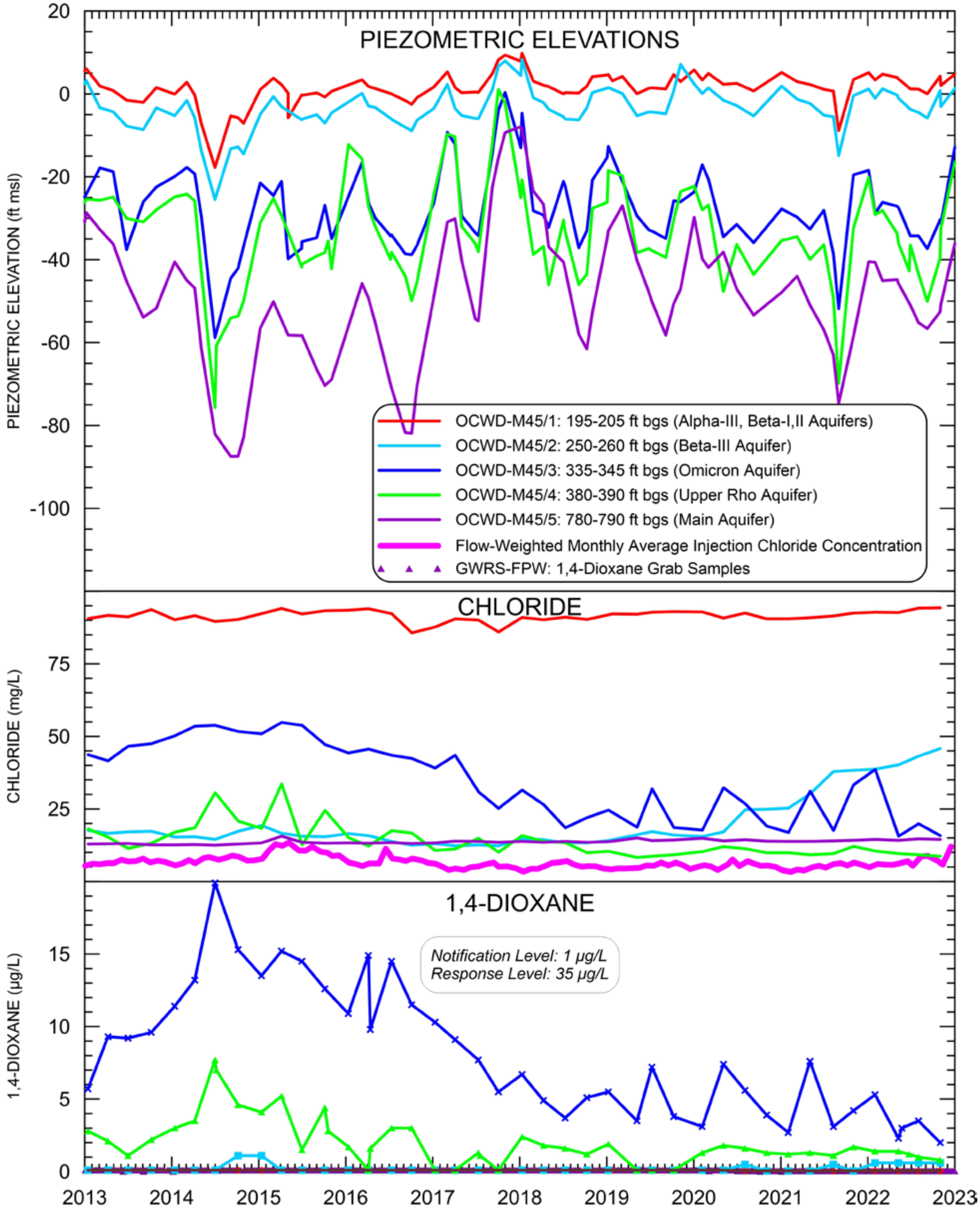


Figure 4-10. Monitoring Well OCWD-M45 Piezometric Elevations, Chloride Concentration, and 1,4-Dioxane Concentration

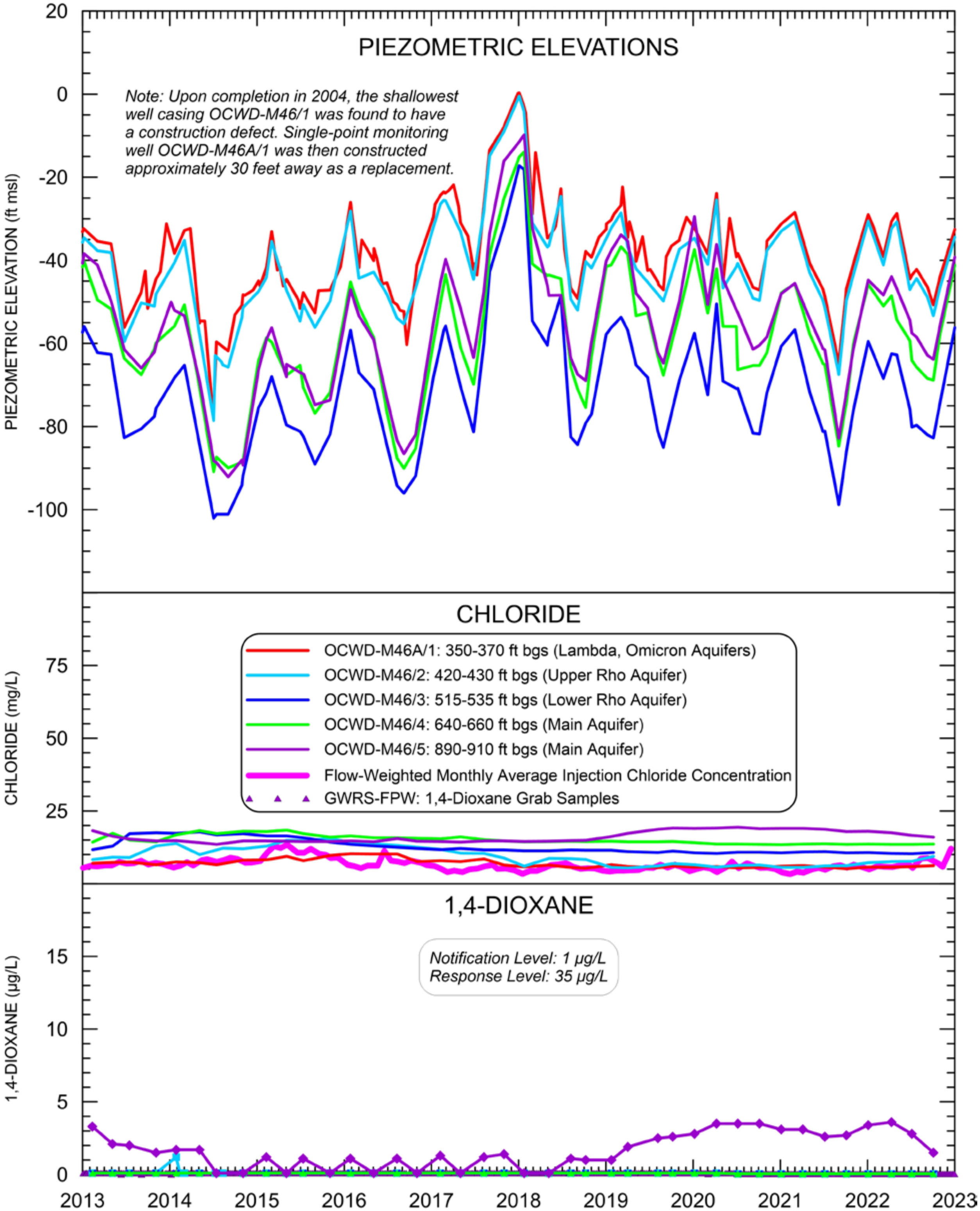


Figure 4-11. Monitoring Well OCWD-M46 and -M46A Piezometric Elevations, Chloride Concentration, and 1,4-Dioxane Concentration

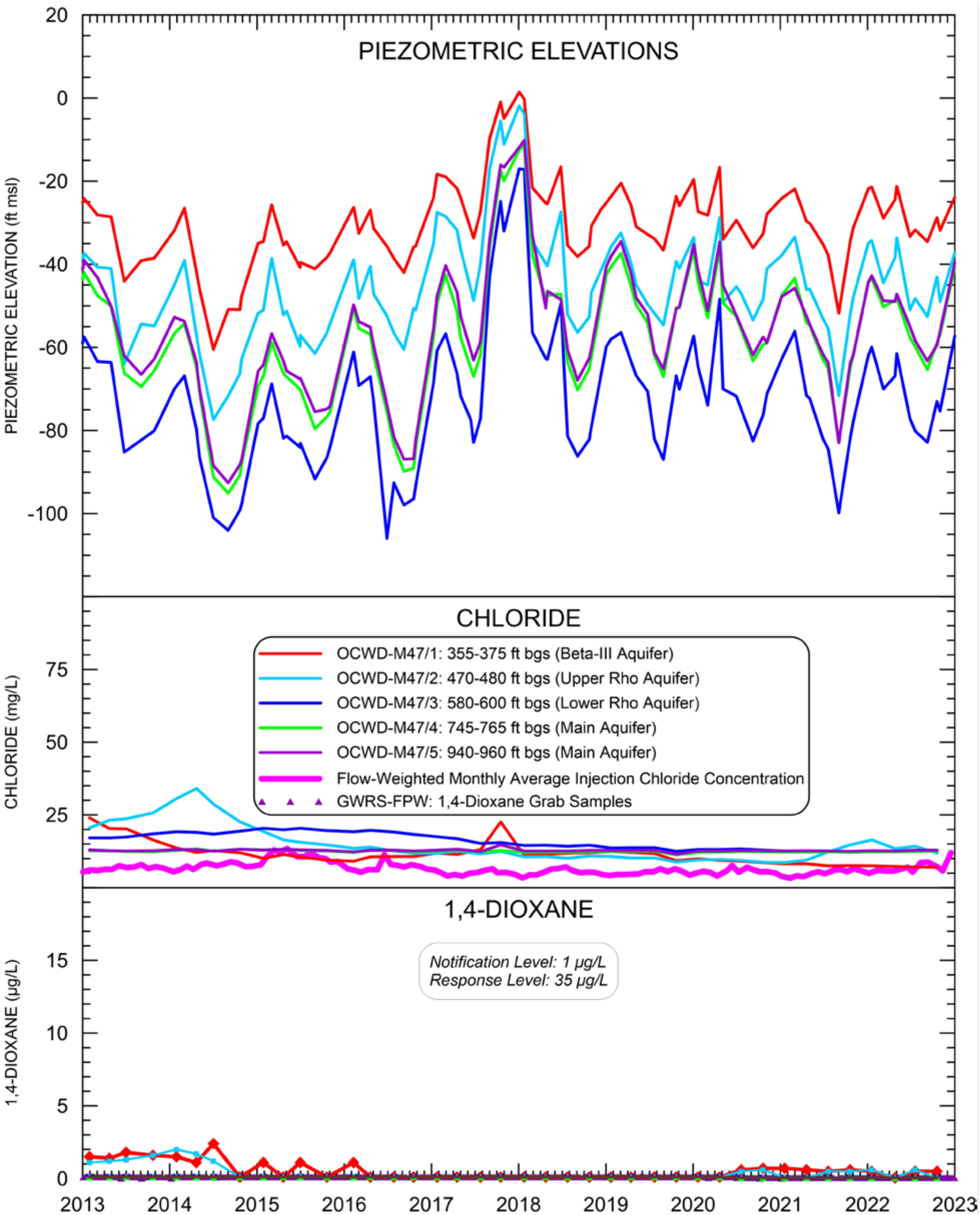


Figure 4-12. Monitoring Well OCWD-M47 Piezometric Elevations, Chloride Concentration, and 1,4-Dioxane Concentration

4.4 Groundwater Quality

This section describes monitoring well groundwater quality for general constituents, 1,4-dioxane, and NDMA in the vicinity of the Talbert Barrier. Groundwater quality for production wells in the vicinity of the Talbert Barrier is also summarized.

4.4.1 Monitoring Wells – General Water Quality

Quarterly compliance groundwater quality data for 2022 are presented in Appendix G for the Talbert Barrier monitoring wells. General groundwater quality data for the past five years (2018-22) are summarized in Appendix H for the barrier compliance monitoring wells. Barrier compliance monitoring wells were tested for: (1) an extensive list of inorganic, organic and radiological parameters, (2) the majority of the U.S. Environmental Protection Agency (EPA) Priority Pollutants, and (3) 1,4-dioxane and NDMA.

Some analyses revealed constituents above the EPA Secondary MCL in 2022 (color and odor), similar to past years and unrelated to purified recycled water injection. It is suspected that the elevated color and odor levels may be due to the presence of Deep aquifer groundwater containing naturally occurring organic matter.

Previous changes in the GWRS groundwater monitoring program reduced the required frequency for some analytes from quarterly to annually based on a history of no detections (RWQCB 2011 and CDPH, 2010; RWQCB 2018 and DDW, 2018a) and eliminated a former permit requirement for total coliform monitoring at the GWRS groundwater compliance monitoring wells (RWQCB, 2018; DDW, 2018a). The GWRS permit Monitoring and Reporting Program issued by the RWQCB in November 2020 formally incorporated both the removal of the total coliform monitoring requirement and the select monitoring frequency reductions (RWQCB, 2020a). Additional changes to the required constituents for Talbert Barrier compliance monitoring were made as part of the new GWRS permit (RWQCB, 2022). However, reporting under the new permit will not go into effect until January 1, 2023.

4.4.2 Monitoring Wells – Intrinsic Chloride Tracer, 1,4-Dioxane, and NDMA

Dissolved chloride concentrations can be used to trace the subsurface movement of injection water because chloride is relatively unaffected by sorption, chemical, or biological reactions in the aquifer. Thus, chloride is a relatively good conservative tracer. Groundwater flow paths determined from groundwater level monitoring are also verified by comparing groundwater quality changes at nearby monitoring wells with injection water quality, primarily using chloride concentrations, chloride/bromide ratios, and electrical conductivity. These methods have proven useful for estimating travel times of injection water to reach Talbert Barrier monitoring wells. These same methods were also used in tracking injected GWRS water from the DMBI Project and more recently for the 2020 MBI Project intrinsic tracer test as discussed in Section 8.

Fortunately for tracking purposes, GWRS-FPW has a very low chloride concentration with an annual average ranging from 4-11 mg/L since 2008 and more recently ranging from 5-6 mg/L during 2017-2021. During 2022, the annual average chloride concentration of GWRS-FPW was 7 mg/L, with the monthly average ranging from 4-9 mg/L from January through November and increasing slightly to 12 mg/L in December due to an overall slight increase in TDS when the AWPF began receiving water from OC San Plant 2 for initial GWRS Final Expansion operations. This slight increase in the December 2022 GWRS-FPW chloride concentration can be seen in Figure 4-7 through Figure 4-12. These GWRS-FPW chloride concentrations are considerably lower than older pre-GWRS (WF-21) injection water which predominantly ranged from approximately 50 to 100 mg/L (with a few sporadic years slightly lower in the 20 to 50 mg/L range as shown in Table 3-2).

Native groundwater inland of the barrier typically possesses chloride concentrations within the range of older pre-GWRS injection water in the shallow zones; lower than pre-GWRS injection water but still noticeably greater than GWRS water in the intermediate depth zones; and just slightly greater than GWRS water chloride concentrations in the deep zones (15-20 mg/L).

In 2000-2001, OCWD discovered elevated levels of 1,4-dioxane and NDMA present in injection water produced by WF-21. Subsequently, OCWD began frequent monitoring for 1,4-dioxane and NDMA at several locations: in the WF-21 source water, intermediate treatment steps, final product water, and monitoring and production wells located near the Talbert Barrier. By 2001, OC San and OCWD implemented additional source control measures and installed a UV/AOP treatment process as part of WF-21 to produce injection water in compliance with drinking water guidance levels for 1,4-dioxane and NDMA. Figure 4-13 shows the 1,4-dioxane and NDMA concentrations in injection water since 2000; GWRS-FPW has been tested for NDMA and 1,4-dioxane at least weekly since 2008. In March 2002, DDW reduced the Notification Level (known as the Action Level prior to January 1, 2005) for NDMA to the current level of 10 ng/L. The Notification Level (NL) for 1,4-dioxane was originally set at 3 μg/L but was subsequently reduced to 1 μg/L in November 2010. DDW recommends that a drinking water production well be taken out of service if the Response Levels (RL) of 300 ng/L for NDMA or 35 μg/L for 1,4-dioxane are exceeded. While these NLs are not formal permit limits for GWRS, OCWD consistently produces purified recycled water for injection and recharge with concentrations below detection and/or below these NLs (Figure 4-13). No drinking water production wells in the vicinity of the Talbert Barrier have NDMA or 1,4-dioxane concentrations remotely approaching their respective RLs.

Testing for NDMA and 1,4-dioxane at monitoring wells and production wells near the Talbert Barrier continued during 2022. In mid-2020, the Reportable Detection Limit (RDL) for 1,4-dioxane

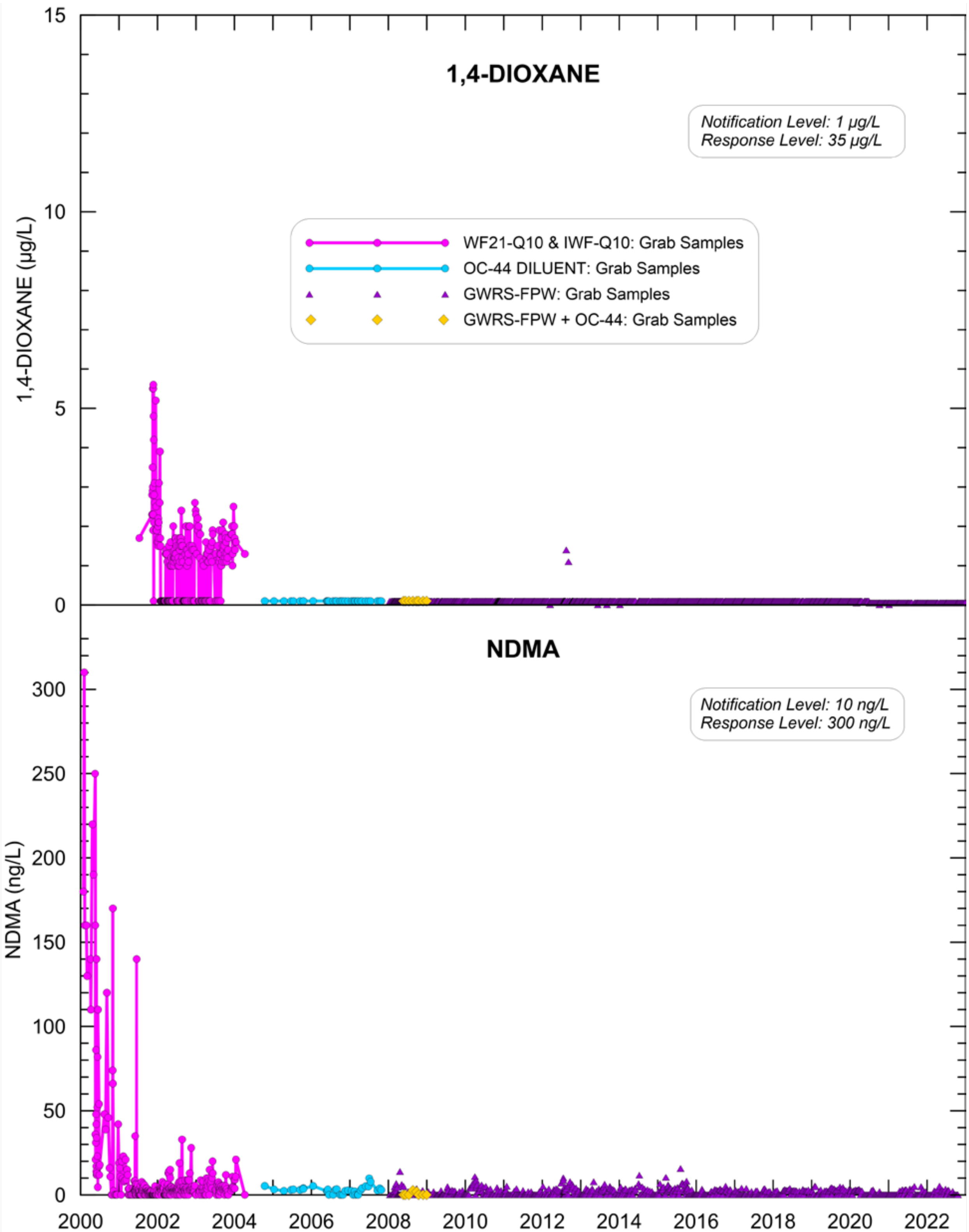


Figure 4-13. Talbert Barrier Injection Water 1,4-Dioxane and NDMA Concentrations

was lowered from 1.0 to 0.5 µg/L for both AWPF and groundwater samples analyzed by the OCWD Laboratory. NDMA and 1,4-dioxane concentrations from the monitoring wells are presented in Appendix H.

During 2022, all barrier compliance monitoring wells except M47 had one or more aquifer zones with 1,4-dioxane concentrations that were above the DDW NL of 1 µg/L during at least a portion of the year, but all samples at all six monitoring wells were significantly below the DDW RL for drinking water systems; these detections are a legacy of WF-21 injection. In contrast, NDMA was only detected in two monitoring wells during 2022 at M19/3 and M46A/1 and was well below the DDW NL of 10 ng/L. In general, OCWD has observed 1,4-dioxane to be more persistent than NDMA in groundwater in the vicinity of the Talbert Barrier. Therefore, time-series plots for NDMA were not included herein but can be found in prior year's annual reports for historical trends when NDMA was more prevalent.

NDMA concentrations at M19/3 and M46A/1 remained well below the NL of 10 ng/L during 2022, ranging from non-detect (<2 ng/L) to 3.6 ng/L. In comparison, NDMA concentrations in GWRS-FPW ranged from non-detect (<2 ng/L) to approximately 5 ng/L during 2022.

Figure 4-7 through Figure 4-12 show observed chloride concentrations in the middle graph and observed 1,4-dioxane concentrations on the lower graph over the 10-year period 2013-2022 for barrier monitoring wells M10, M11, M19, M45, M46, and M47, respectively.

For illustrative purposes, these graphs have been kept to a running 10-year history for each successive Annual Report. For comparison, the chloride graphs also show historical flow-weighted monthly average injection water chloride concentrations. Observed chloride concentrations at these compliance wells were influenced by a variety of historical factors, including: (1) injection water quality and volumes, (2) nearby individual injection well operational status, (3) coastal groundwater production, and (4) overall groundwater storage conditions in the Basin.

Since the 10-year period shown in Figure 4-7 through Figure 4-12 does not include the commencement of GWRS injection in 2008, the efficacy of tracking injection water by using chloride concentrations and first arrival of the low-chloride GWRS signal at many of these monitoring wells is more thoroughly described in Section 4.4.2 of prior years' Annual Reports. As part of the permitting process for the GWRS and GWRSFE, OCWD is currently evaluating historical tracer data for the Talbert Barrier to validate the existing underground travel time. This process is discussed in more detail in Section 4.4.3.

Figure 4-7 through Figure 4-12 show the relationship between chloride and 1,4-dioxane when comparing the middle graph to the lower graph of each figure. During GWRS arrival at a well, antecedent higher chloride concentrations characteristically decrease; this is typically accompanied by a contemporaneous decrease in the antecedent 1,4-dioxane concentrations that were often previously elevated due to the historical impact of WF-21 injection. The chloride concentration decline upon GWRS arrival does not always reach GWRS levels due to mixing along longer and/or more dispersive flow paths, depending on distance from the barrier and depth. During high Basin conditions, several of the wells often exhibit a shift or reversal in the typically inland hydraulic gradient, causing older pre-GWRS (WF-21) water to migrate back to these wells; therefore, these gradient reversals typically lead to an increase in both chloride and 1,4-dioxane concentrations back towards pre-GWRS levels. At some of the wells however, a gradient reversal indicated by increasing chloride concentrations may not lead to an increase in 1,4-dioxane concentrations if the pre-GWRS antecedent condition was native groundwater devoid of 1,4-dioxane. The chloride versus 1,4-dioxane relationship can be summarized as follows:

a) GWRS arrival – decrease in both chloride and 1,4-dioxane (if the latter is present in the pre-GWRS background condition);
b) Re-arrival of WF-21 water (gradient reversal) – increase in chloride and 1,4-dioxane (if the latter is present in the pre-GWRS background condition); and
c) Re-arrival of native groundwater (gradient reversal) – chloride increase without any increase in 1,4-dioxane.

Figure 4-8 for OCWD-M11/4 (Lambda and Omicron aquifers) presents an illustrative example of the correlation between chloride and 1,4-dioxane. From 2013-2014, chloride concentrations at M11/4 were low and stable at GWRS levels, indicating approximately 100% GWRS arrival during that time. During that same time, 1,4-dioxane concentrations were also low and stable and were largely non-detect, confirming the 100% GWRS water arrival. During 2015, both chloride and 1,4-dioxane concentrations increased notably, signaling some proportion of older WF-21 water migrating back to this well due to a reversal in the gradient from landward to seaward.

4.4.2.1 Monitoring Well M10

At M10/1 (Talbert and Alpha-III aquifers) and M10/2 (Beta-I and Beta-II aquifers), Figure 4-7 shows that chloride concentration trends have been very similar at these two wells over the last 10 years, with the chloride signal being lagged by approximately two months at M10/2 as compared to M10/1, likely related to a slightly deeper, slower flow path at M10/2. Chloride concentrations at M10/1 and M10/2 were high from mid-2019, then declined temporarily in the second half of 2021 following the 21-day barrier shutdown in August 2021. Chloride concentrations at M10/1 and M10/2 then rebounded and remained high through 2022, reaching an annual maximum of 85 mg/L at M10/1 and 103 mg/L at M10/2. For both M10/1 and M10/2, the sustained higher chloride concentrations during 2019-2022 (except for the brief decline in late 2021) resulted from higher groundwater conditions causing a localized shift in the gradient to a more west-southwesterly direction (more seaward), consistent with the inferred groundwater flow direction in the Talbert aquifer near M10 as shown in Figure 4-3. Concentrations of 1,4-dioxane at both wells were either low, stable, or non-detect during 2019-

2022, remaining below 1.3 µg/L at M10/1 and consistently non-detect at M10/2 during 2022, indicating that the water migrating back to these wells during the gradient shift was likely a blend of native groundwater (devoid of 1,4-dioxane) and pre-GWRS injection water at M10/1 and 100% native groundwater at M10/2.

At M10/3 (Beta-III aquifer), Figure 4-7 shows that chloride concentration trends were similar to but much more dampened than at M10/1 and M10/2 over the entire period shown. Since the second quarter of 2019, chloride concentrations at M10/3 have gradually declined from 55 mg/L down to 37 mg/L by the fourth quarter of 2022, likely indicating an inland gradient, albeit relatively flat, in the Beta aquifer at this location. However, only a relatively small portion of GWRS water has likely arrived at this well based on chloride concentrations remaining significantly higher than GWRS water while 1,4-dioxane concentrations during this same period also remained elevated with only a very gradual decrease down to 5.5 µg/L by the end of 2022. The relatively low proportion of GWRS water at this well is likely due to a less permeable and/or a more dispersive flow path.

At M10/4 (Lambda, Omicron, and Upper Rho aquifers), GWRS arrival first occurred in 2010, and chloride concentrations have since remained mostly stable and low near GWRS levels until 2019 (Figure 4-7), indicating a prolonged predominance of GWRS purified recycled water at this well due to a consistently landward gradient in these aquifers confirmed by low and mostly non-detect 1,4-dioxane concentrations during that time. Chloride concentrations at M10/4 gradually increased from 10 mg/L in the fourth quarter of 2019 to 19 mg/L by the fourth quarter of 2021, indicating a lesser percentage of GWRS water at this well due to a subtle shift in the gradient direction resulting from high Basin conditions. Consistent with the gradual chloride increase during 2019-2021, concentrations of 1,4-dioxane at M10/4 gradually increased from below the RDL in 2019 to 2.5 µg/L by the fourth quarter of 2021, confirming the return of a small portion of pre-GWRS injection water to this well. During 2022, chloride concentrations at M10/4 gradually decreased to 13 mg/L by the fourth quarter along with a contemporaneous decrease in 1,4-dioxane concentrations to 1.1 µg/L, both signaling the arrival of an increased percentage of GWRS water likely due a subtle shift in the gradient back to a more landward direction.

4.4.2.2 Monitoring Well M11

At M11/1 (Talbert aquifer) and M11/2 (Talbert and Alpha-III aquifers), Figure 4-8 shows that chloride concentrations increased in both wells during 2019-2022, reaching a high of 74 mg/L at M11/1 in the fourth quarter of 2022 and 89 mg/L at M11/2 in the second quarter of 2022. At both wells, the sustained chloride concentration increases likely indicated a seaward gradient reversal from late 2018 through 2022 in the Talbert and Alpha aquifers at this location, confirmed by the slight increase in 1,4-dioxane concentrations at both wells from below the RDL in 2018 to just above the RDL in the 1 to 2 µg/L range throughout 2019-2022. Similar to the aforementioned gradient reversal during this same time at M10/1 and M10/2 in these shallow Talbert and Alpha aquifers, the gradient reversal at M11/1 and M11/2 likely brought a blend of native groundwater (devoid of 1,4-dioxane) and pre-GWRS injection water back to these wells. Inspection of Figure 4-3 shows that the June 2022 inferred groundwater flow direction in the Talbert aquifer near the M11 location was to the west-southwest as at M10, thus confirming the seaward gradient during this time.

At M11/3 (Beta-I, Beta-II, and Beta-III aquifers), Figure 4-8 shows that chloride concentrations increased slightly from GWRS levels of 8 mg/L in the fourth quarter of 2020 to 17 mg/L in the second quarter of 2021 and then gradually down to GWRS levels of 9 mg/L in the second half of 2022, indicating a subtle seaward shift in the gradient during the first half of 2021 and then back to landward during the second half of 2021 and through 2022 in the Beta aquifer at this location. This short-term subtle seaward shift in the gradient during early 2021 was likely not significant enough to bring older WF-21 water back to this well, as concentrations of 1,4-dioxane at M11/3 have remained below the RDL since 2008, indicating a predominance of GWRS purified recycled water at this well for several years and through 2022.

At M11/4 (Lambda and Omicron aquifers), Figure 4-8 shows that chloride concentrations remained low and stable at approximately 11 to 12 mg/L during 2022, indicating a continued landward gradient and a predominance of GWRS water at this well but slightly less than 100%. This is confirmed by the low 1,4-dioxane concentrations just above the RDL during 2022, ranging from 0.9 to 1.2 μg/L at M11/4 which indicate a small percentage of pre-GWRS injection water still arriving at this well due to mixing via dispersive transport or persistent shifts in the gradient direction in this central portion of the barrier flanked to the northeast and northwest by municipal production wells.

4.4.2.3 Voluntary Monitoring Well M19

At M19/1 (Talbert aquifer), Figure 4-9 shows that chloride concentrations have remained stable at historical background levels of approximately 80 to 100 mg/L. These chloride levels are significantly higher than GWRS water, thus indicating that no GWRS water has ever reached this well within the shallow Talbert aquifer, consistent with the inferred groundwater flow direction in the Talbert aquifer indicating a seaward gradient at this location on Figure 4-3. Concentrations of 1,4-dioxane at M19/1 increased slightly above the RDL in the fourth quarter of 2020 and remained low and stable through 2022. The small 1,4-dioxane increase in late 2020-2022 occurred during high Basin conditions like the prior 1,4-dioxane detections during 2013 and is likely due to the high Basin conditions causing a slight shift in the typically seaward gradient. High chloride concentrations of over 90 mg/L during both the 2013 and 2020-2022 periods likely indicate a blend of older pre-GWRS injection water and native groundwater (devoid of 1,4-dioxane) arriving at M19/1 during those high Basin conditions.

At M19/2 (Alpha aquifer), chloride concentrations shown in Figure 4-9 suggest gradient reversals based on the increasing and decreasing trends. Chloride concentrations at M19/2 increased from early 2020 reaching ambient background concentrations during 2021 and remaining at those levels through 2022, staying above 90 mg/L throughout the year. This trend since early 2020 likely indicates a return to the dominant seaward gradient and no GWRS water at this well in the Alpha aquifer by the end of 2021 and throughout 2022. Concentrations of 1,4-dioxane increased slightly above the RDL in the first quarter of 2021 and remained low during 2021-2022. Like at M19/1, the small 1,4-dioxane increases at M19/2 in 2013 and 2021-2022 occurred when high Basin conditions likely caused a slight shift in the seaward gradient to move a blend of older pre-GWRS injection water and native groundwater (devoid of 1,4-dioxane) to M19/2.

At M19/3 (Beta aquifer), Figure 4-9 shows that chloride concentrations have remained low at or near GWRS levels since 2017, while 1,4-dioxane concentrations have contemporaneously remained below the RDL since 2017, indicating a persistent landward gradient from the barrier to this well since then. During 2022 chloride concentrations at M19/3 remained below 10 mg/L, indicating 100% GWRS water.

4.4.2.4 Monitoring Well M45

At M45/1 (Alpha-III, Beta-I, and Beta-II aquifers), Figure 4-10 shows that chloride concentrations have remained stable at historical background levels of approximately 80 to 100 mg/L. These stable and high chloride levels are significantly higher than GWRS water and thus indicate that no GWRS water has reached M45/1, consistent with the lack of 1,4-dioxane detections (Figure 4-10) which indicate native groundwater (devoid of 1,4-dioxane) at this well.

At M45/2 (Beta-III aquifer), Figure 4-10 shows that chloride concentrations were relatively low from 2013-2019, indicating the sustained arrival of some percentage of GWRS water at this well. Chloride concentrations at M45/2 increased slightly in the first half of 2020 and continued to increase through 2022, reaching 46 mg/L in October, likely indicating a seaward gradient reversal at M45/2 in the Beta aquifer during 2020-2022 due to high Basin conditions. Concentrations of 1,4-dioxane remained below the previous RDL of 1 µg/L during 2015-2019, then were detected sporadically at the new RDL of 0.5 µg/L during 2020-2021 and then consistently at 0.6 µg/L during 2022. Due to the RDL change in 2020, it is unclear if these detections during 2020-2022 represent a 1,4-dioxane increase from the prior years, but the detections do confirm the presence of a small portion of older WF-21 water at this well during 2020-2022.

At M45/3 (Omicron aquifer), Figure 4-10 shows that chloride concentrations remained relatively high within a range of approximately 40 to 50 mg/L until finally beginning to decline for the first time during 2017. During 2018-2022 chloride concentrations at M45/3 displayed temporary increases each year, typically in the spring, then decreased. Despite the temporary seasonal increases every year, chloride concentrations have been trending down over this time period and reached a historical low of 16 mg/L in 2022. These overall lower chloride concentrations with brief seasonal rises over the last five years likely indicate some proportion of GWRS water arriving at this well in the Omicron aquifer but with seasonal interruptions due to shifts in the gradient direction likely caused by M45/3 being flanked locally by the City of Newport Beach production wells to the northwest and northeast. Concentrations of 1,4-dioxane at M45/3 have been the highest of all zones at M45 since 2013 and exhibited a gradually decreasing trend since 2017 with seasonal upticks consistent with the chloride trends at this well. During 2022, 1,4-dioxane seasonal trends were very similar to those for chloride, with concentrations of 1,4-dioxane increasing to just over 5 µg/L in the first quarter and then decreasing thereafter remaining between 2-3.5 µg/L for the remainder of the year.

At M45/4 (Upper Rho aquifer), Figure 4-10 shows that chloride concentrations were relatively low from 2013-2019, indicating the sustained arrival of some percentage of GWRS water in this zone. Since the nearest legacy injection wells are not screened in the Upper Rho aquifer, GWRS arrival at M45/4 requires vertical migration from the Lambda aquifer down into the Upper Rho aquifer, likely from their zone of mergence in the vicinity of the central portion of the barrier (Figure 4-5). During 2020-2022 chloride concentrations at M45/4 remained low and stable at 9-12 mg/L, indicating a predominance of GWRS water. Concentrations of 1,4-dioxane were low and stable during 2020-2022, remaining consistently above the RDL but below 2 µg/L. These low 1,4-dioxane detections during 2020-2022 confirm a small proportion of older pre-GWRS injection water present at this well in the Upper Rho aquifer, likely resulting from the variable gradient direction in this central area inland of the barrier.

At M45/5 (Main aquifer), GWRS arrival is inconclusive based on the low and stable chloride concentrations (Figure 4-10) since prior to the commencement of GWRS injection. This well is located over a mile downgradient to the northeast from the nearest Main aquifer deep injection wells on the west end of the barrier. As shown on Figure 4-10, 1,4-dioxane has never been detected above the RDL at M45/5, consistent with the stable chloride concentrations indicating native groundwater (devoid of 1,4-dioxane) at this well.

4.4.2.5 Monitoring Well M46

At M46A/1 (Lambda and Omicron aquifers), chloride concentrations began declining during the fourth quarter of 2008, reaching GWRS levels in 2011, where they have remained through 2022. Figure 4-11 shows chloride concentrations at M46A/1 have remained low and stable at GWRS levels for the last ten years while 1,4-dioxane concentrations have remained below the RDL, both indicating the continued presence of 100% GWRS purified recycled water in the Lambda aquifer at this location.

In the four other deeper zones at the M46 monitoring well site, the arrival of GWRS water was indicated by the chloride concentration decline in each well occurring at various times prior to

2012 and were illustrated in Figure 4-11 of prior year's annual reports. The chloride decline becomes more delayed and dampened with depth due to dispersive transport and a weaker GWRS injection signal from only two injection wells (I24/2 and I26C) screened in the Lower Rho and Main aquifers on the east end of the barrier.

At M46/2 (Upper Rho aquifer), Figure 4-11 shows that chloride concentrations slightly declined to GWRS levels in 2019 and remained at those low levels through 2022, indicating 100% GWRS water at this well and confirmed by 1,4-dioxane concentrations remaining below the RDL.

At the two deeper zones M46/3 (Lower Rho aquifer) and M46/4 (Main aquifer), Figure 4-11 shows that chloride concentrations during 2018-2022 remained low and stable ranging from 10-14 mg/L, just slightly higher than GWRS water, while concentrations of 1,4-dioxane remained below the RDL in these two wells.

At M46/5 (Main aquifer), Figure 4-11 shows that the decreasing trends in 2013 and 2014 for both chloride and 1,4-dioxane indicated that some percentage of GWRS water has likely reached this well, but the declines were too gradual to reliably infer a mean arrival time. Chloride concentrations experienced a subtle increase to 19 mg/L in the second half of 2019, remained at 19 mg/L during 2020-2021, and then decreased slightly to 16 mg/L by the fourth quarter of 2022, possibly indicating a subtle shift to a more seaward gradient direction during 2019-2021 due to high Basin conditions and then back to more landward during 2022. Consistent with the subtle chloride increase during 2019-2021 and subsequent subtle chloride increase in 2022, concentrations of 1,4-dioxane rose gradually from the old RDL of 1 µg/L in the first quarter of 2019 to 3.5 µg/L in 2020 and remained slightly elevated at 2.7-3.6 µg/L through the second quarter of 2022, before slightly decreasing again for the remainder of the year to 1.5 µg/L. These dampened chloride and 1,4-dioxane trends indicate a slightly larger proportion of older WF-21 injection back to this well in the Main aquifer during 2019-2021 and then a lesser proportion once again in the last half of 2022.

4.4.2.6 Monitoring Well M47

At M47/1 (Beta-III aquifer), Figure 4-10 shows that chloride concentrations declined to near GWRS levels in 2015 and finally reached levels indicative of nearly 100% GWRS water during 2021. During 2022 chloride concentrations were low and stable at 7-8 mg/L, indicating sustained near-100% GWRS water at this well. Concentrations of 1,4-dioxane at M47/1 gradually decreased to below the RDL for the first time in late 2014, consistent with the contemporaneously gradual chloride decline to nearly GWRS levels, indicating a landward gradient from the barrier and a majority proportion of GWRS water at this well since 2015. During the second half of 2020 and throughout 2021, low 1,4-dioxane concentrations just above the new RDL of 0.5 µg/L were detected but remained at or below 0.7 µg/L at M47/1. During 2022, concentrations of 1,4-dioxane ranged from non-detect to 0.5 µg/L. Based on the contemporaneously low and stable chloride concentrations at M47/1 below 10 mg/L, these 1,4-dioxane detections during 2020-2022 were likely a result of the lower RDL and continued mixing via dispersive transport rather than a shift in the gradient direction and confirmed a predominance of GWRS water with a very small portion of older pre-GWRS water at this well.

At M47/2 (Upper Rho aquifer), chloride concentrations first began to gradually decline in late 2008 much sooner than at the shallower M47/1, likely indicating that the GWRS arrival time to M47/2 was faster than M47/1. Figure 4-12 shows that chloride concentrations at M47/2 were low and stable at 9-10 mg/L during 2020, indicating nearly 100% GWRS water at this well, but then increased slightly to 15 mg/L by the fourth quarter of 2021 and remained slightly elevated at 12 to 16 mg/L during 2022, possibly indicating a slight shift in the gradient or a reduced GWRS signal due to I24/2 being off-line during 2019-2022. Like at M47/1, low 1,4-dioxane concentrations at or just above the new RDL of 0.5 µg/L were detected at M47/2 during the second half of 2020 and sporadically throughout 2022, likely due to the lower RDL of 0.5 µg/L but possibly due to very subtle shifts in the gradient or a reduced GWRS signal based on the contemporaneously small chloride increase.

At the three deeper zones M47/3 (Lower Rho aquifer), M47/4 (Main aquifer), and M47/5 (Main aquifer), GWRS arrival is inconclusive based on the low and stable chloride concentrations since prior to GWRS injection. As shown on Figure 4-12, chloride concentrations at M47/3, M47/4, and M47/5 remained low and stable throughout 2022, while concentrations of 1,4-dioxane have never been detected, likely due to a lack of WF-21 injection into these aquifers in the central and east end of the barrier. Also, the inferred groundwater flow direction at M47 in the Lower Rho and Main aquifers appears to consistently be to the east-southeast as was shown on the Main aquifer groundwater elevation contour map in Figure 4-6. Therefore, groundwater arriving at M47 in these deeper aquifers may either be native groundwater originating from north of the barrier or GWRS injection water originating from the west end of the barrier, both devoid of 1,4-dioxane. Going forward, confirmation of GWRS arrival at M47 in the Lower Rho and Main aquifers may never be conclusive since native groundwater chloride concentrations at M47/3, M47/4, and M47/5 are relatively low ranging from approximately 12 to 20 mg/L (Figure 4-12) and thus are only marginally higher than GWRS water.

4.4.3 Production Wells

Groundwater quality data for water samples collected during 2022 from several potable and non-potable production wells in the vicinity of the Talbert Barrier are summarized in Table 4-2.

OCWD has established a primary boundary of 12 months underground travel time from the injection operation at the Talbert Barrier. Any new drinking water wells are to be constructed outside this primary boundary. The secondary boundary is defined as the area less than

Table 4-2. 2022 Water Quality for Potable and Non-Potable Wells Within the Influence of the Talbert Barrier

OCWD Well Name	Well Depth (ft bgs)[1]	Perforation Interval (ft bgs)[1]	Distance from Injection Site (ft)[2]	Concentration [3,4]								
				Arsenic (As) ug/L	Chloride (Cl) mg/L	Bromide (Br) mg/L	Total Dissolved Solids (TDS) mg/L	Nitrate Nitrogen (NO3-N) mg/L	Nitrite Nitrogen (NO2-N) mg/L	Total Organic Carbon (Unfiltered) (TOC) mg/L	n-Nitrosodi-methylamine (NDMA) ng/L	1,4-Dioxane (14DIOX) ug/L
Large System Municipal Wells												
MCWD-5	960	400 - 940	3,300	2.5 (2.2 - 2.8)	13.1 (13 - 13.2)	ND	172 (154 - 190)	1.14 (1.1 - 1.18)	ND	0.14 (0.08 - 0.2)	ND	1 (0.9 - 1)
MCWD-7	793	363 - 753	4,200	1.5 (1.4 - 1.5)	34.4 (31.4 - 37.3)	0.11 (0.1 - 0.11)	231 (224 - 238)	0.62 (0.58 - 0.64)	ND	0.16 (0.12 - 0.2)	ND	1.9 (1.8 - 2.1)
NB-DOLD	739	399 - 729	5,300	2.6 (2.4 - 2.8)	18.8 (18.6 - 19)	ND	201 (200 - 202)	0.22 (0.21 - 0.24)	ND	0.11	ND	2.2 (1.9 - 2.5)
NB-DOLS	366	201 - 356	5,300	1.2 (1.1 - 1.2)	58.4 (56.9 - 59.2)	0.22	444 (416 - 472)	2.32 (2.26 - 2.37)	ND	0.18 (0.18 - 0.19)	ND	0.8 (0.6 - 0.9)
MCWD-3B	592	242 - 572	5,400	2.5	25.0 (24.8 - 25.2)	ND	293 (244 - 342)	1.07 (1.05 - 1.08)	0.001 (ND - 0.002)	0.1 (0.09 - 0.1)	ND	3.7 (3.2 - 4.1)
NB-TAMD	700	395 - 690	5,700	3.8 (3.5 - 4.2)	9.3 (8.7 - 9.7)	ND	140 (124 - 164)	0.59 (0.55 - 0.61)	ND	0.11 (0.08 - 0.15)	ND	0.5 (ND - 0.7)
NB-TAMS	370	170 - 360	5,800	1.8 (1.6 - 2.1)	71.0 (66.3 - 78.5)	0.28 (0.26 - 0.31)	573 (530 - 634)	3.20 (2.87 - 3.38)	ND	0.27 (0.25 - 0.3)	ND	1.2 (0.8 - 1.6)
FV-10	990	460 - 980	7,600	ND	27.1	Well not operational in 2022						
HB-3A	660	370 - 640	7,600	2.7	52.3 (52 - 52.6)	0.28 (0.27 - 0.28)	234	ND	ND	0.18	ND	0.6 (ND - 0.9)
HB-5	820	223 - 800	8,000	2.7	23.4 (20.5 - 26.2)	0.06 (ND - 0.1)	268	1.33 (1.32 - 1.34)	ND	0.14	ND	ND
HB-9	996	556 - 996	8,000	1	13.3 (13.2 - 13.3)	ND	196	ND	ND	0.54	ND	ND
Small System and Private Wells												
GKAW-FV2	125	120 - 125	700	1.4	106 (105 - 107)	0.33 (0.32 - 0.33)	705 (630 - 780)	3.34	ND	0.24 (0.23 - 0.25)	ND	3.1 (2.8 - 3.4)
KUBO-FV	133	122 - 132	2,900	1.7 (1.6 - 1.8)	86.1 (85.2 - 87)	0.28 (0.27 - 0.29)	621 (596 - 646)	4.29	ND	0.23 (0.22 - 0.24)	ND[5]	ND
LIBM-HB		NA	4,100	1.5 (1.4 - 1.5)	74.2 (52.3 - 115)	0.22 (0.16 - 0.33)	337 (250 - 496)	3.34 (2.54 - 4.71)	ND	0.15 (0.09 - 0.24)	ND	ND
Private Irrigation Wells												
CALL-FV		NA	400	2.1 (2 - 2.2)	6.7 (5.9 - 7.5)	ND	79 (76 - 82)	1.51 (1.32 - 1.7)	ND	0.03 (ND - 0.05)	ND	ND
A1-HB	305	188 - 300	1,800	1.8	30.5 (30.1 - 30.9)	0.11 (0.1 - 0.11)	272 (266 - 278)	1.26	ND	0.13 (0.12 - 0.14)	ND	1 (0.7 - 1.2)

[1] ft bgs: Feet below ground surface

[2] Distance from Injection: Straight line shortest distance to the nearest Talbert Barrier injection well, estimated to the nearest 100 feet

[3] Concentrations are annual averages with annual ranges in parenthesis for the given year

[4] ND: Not detected or less than the detection limit (For average calculations, ND results are applied as 10% of the reporting limit)

[5] Data from 2021

12 months underground travel time from the Talbert Barrier injection operations. Generally, any new drinking water wells proposed to be constructed near the secondary boundary must be evaluated to assess any potential impact that the proposed well may have on the primary boundary, potentially changing the boundaries. In the case of the Talbert Barrier, the secondary boundary coincides with the primary boundary; therefore, drinking water wells are to be constructed outside the secondary boundary.

The Talbert Barrier injection operation complies with the GWRS permit requirements for underground retention time. The primary boundary is supported by Resolution No. 05-4-40 adopted by the OCWD Board of Directors on April 20, 2005 (OCWD, 2005). OCWD has notified the OCHCA and the City of Fountain Valley, which are the well permitting agencies in this area, of this boundary area requirement. The Orange County Well Standards Advisory Board has also been notified. No new drinking water wells have been installed in the 12-month underground retention area.

The existing GWRS permit predates boundary zone requirements in the 2018 Title 22 Water Recycling Criteria. As part of the new permit anticipated for the GWRS and GWRSFE, OCWD plans to evaluate historical tracer data for the Talbert Barrier to validate the existing underground travel time used to establish the primary zone of controlled drinking water well construction and the secondary boundary in accordance with Title 22 Section 60320.208(d) tracer evaluation methodology (CCR, 2018). If necessary, OCWD will revise the primary and secondary boundaries establishing control zones at the Talbert Barrier and notify the local well permitting agencies. The Talbert Barrier boundary zone reevaluation will be completed by June 2023 and will be summarized in next year's Annual Report.

The active municipal well closest to the Talbert Barrier is MCWD-5, which is owned and operated by Mesa Water and located approximately 3,300 feet northeast of the eastern end of the barrier. OCWD staff previously estimated the travel time for injection water to reach MCWD-5 to be between three and eight years (depending on the specific aquifer screened by the multi-aquifer production well) based on groundwater level conditions and injection operations over the last several years. NDMA concentrations at MCWD-5 decreased below the RDL in early 2010 and remained below the RDL of 2 ng/L through 2022. To reduce final drinking water concentrations of NDMA, a UV treatment system was previously operated at the MCWD-5 well site from 2001-2010. The steady decline in NDMA levels below the RDL led to a DDW-approved shutdown of the UV system in 2010 via an accepted amendment to Mesa Water's Domestic Water Supply Permit.

Concentrations of 1,4-dioxane and chloride for MCWD-5 and injection water for the 10-year period 2013-2022 are shown on Figure 4-14. Concentrations of 1,4-dioxane at MCWD-5 have gradually decreased over time since 2010 except for minor intermittent increases in some years

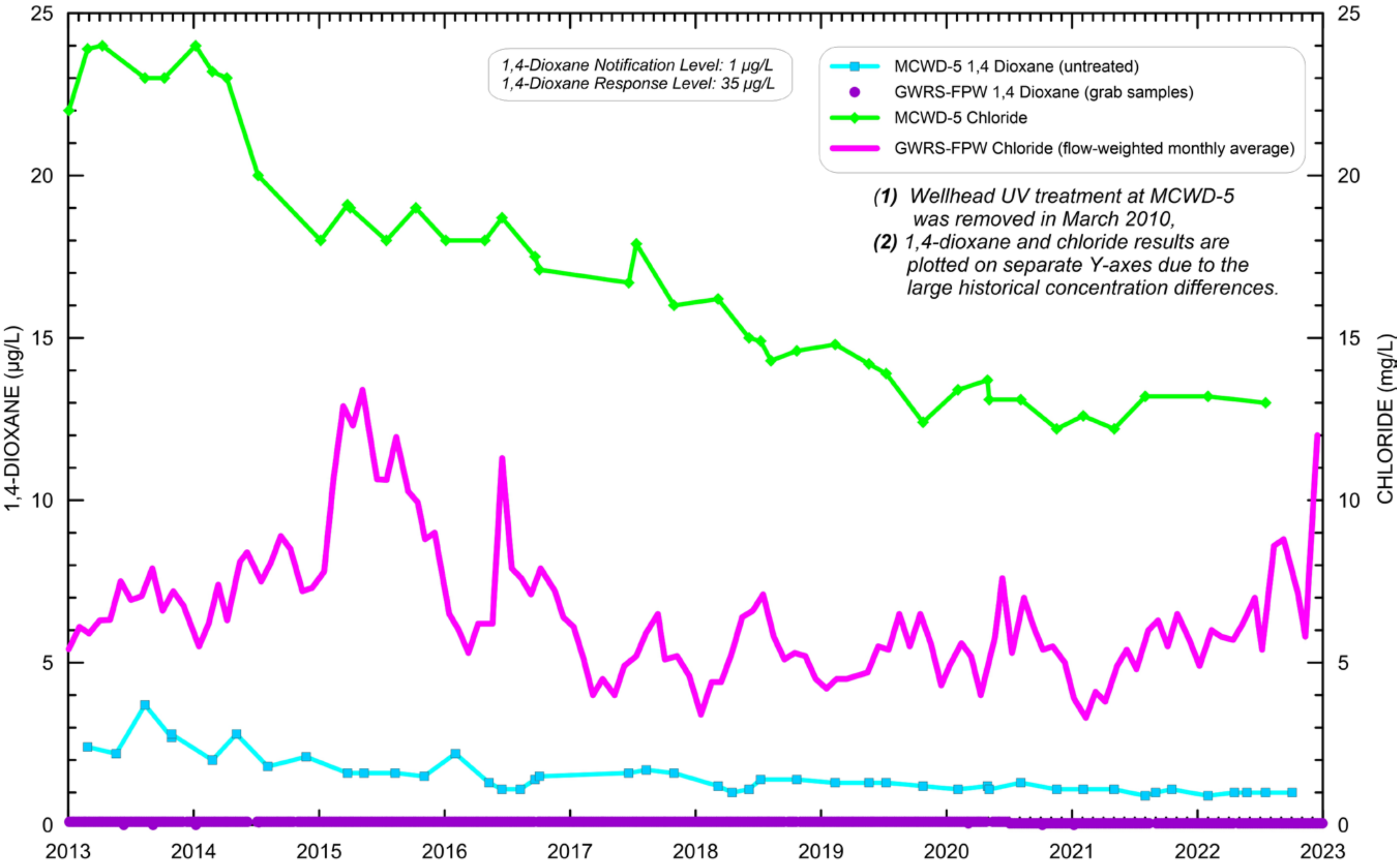


Figure 4-14. MCWD-5 Pre-Treatment and Injection Water 1,4-Dioxane and Chloride Concentrations

likely related to shifts in the gradient direction based on groundwater level variations as was explained in Section 4.4.2 for the GWRS compliance monitoring wells based on comparing 1,4-dioxane and chloride concentration trends. Figure 4-14 shows that one such temporary increase in both 1,4-dioxane and chloride occurred during 2013, likely resulting from high Basin conditions during that time causing a shift in the gradient direction and likely bringing older pre-GWRS water back to this well. Concentrations of 1,4-dioxane have remained well below the DDW RL of 35 μg/L at MCWD-5 since sampling began in 2002 and over the last several years have gradually declined, falling below the DDW NL of 1 μg/L for the first time in 2021. During 2022, 1,4-dioxane concentrations at MCWD-5 remained low and stable at 0.9-1.0 μg/L, just above the new RDL of 0.5 μg/L.

Since 1,4-dioxane concentrations at MCWD-5 did not quite drop below the new RDL during 2022, GWRS arrival at this well is likely still blended with at least some small percentage of older pre-GWRS injection water. Due to the vertical blending in the well from the various screened intervals at MCWD-5, travel times for the individual aquifer zones screened at MCWD-5 are not discernable based on the vertically blended 1,4-dioxane concentrations from the pumped samples. The low 1,4-dioxane concentrations at MCWD-5 over the last several years (Figure 4-14) could possibly represent a blend of nearly 100% GWRS injection water from one or more of the screened aquifer zones along with older pre-GWRS injection water from one or more of the other screened aquifer zones. Except for the temporary increase in 2012-2013, chloride concentrations at MCWD-5 have decreased steadily since 2011 and reached approximately 13 mg/L during 2022, still slightly higher than GWRS injection water chloride concentrations (Figure 4-14). These declining chloride concentrations confirm the progressive arrival of greater proportions of GWRS water but still less than 100% and are consistent with the decline in 1,4-dioxane concentrations just slightly above the RDL.

Municipal wells HB-5 and HB-9 owned and operated by the City of Huntington Beach are both located approximately 8,000 feet north of the Talbert Barrier near each other (Figure 4-1) but display distinctly different water quality characteristics due to their different screened interval depths (Table 4-2). HB-9 is screened exclusively in the Main aquifer, while HB-5 is screened across both the Main aquifer and the shallower intermediate depth aquifers that have historically received injection water directly from the Talbert Barrier legacy wells. HB-5 had chloride concentrations ranging from approximately 20-60 mg/L over the last several years and had detectable concentrations of 1,4-dioxane from 2002-2008 (above the DDW NL but well below the RL), while HB-9 had lower chloride concentrations ranging from approximately 10-30 mg/L and 1,4-dioxane has never been detected there. However, with the commencement of injection directly into the Main aquifer at the I27 and I28 sites in 2004, and at the newer I29 through I32 sites in 2008, HB-9 will likely receive GWRS injection water in the future.

Since these two production wells are approximately 8,000 feet north of the barrier, a travel time in the range of 10-20 years would be expected (assuming an average groundwater velocity of 1-2 feet per day). From inspection of older historical chloride concentrations at HB-5 from 1970-1990, it appears that historical barrier injection from WF-21 arrived at HB-5 during 1986-1988. During this two-year period, chloride concentrations increased from a background native groundwater chloride concentration of approximately 20 mg/L to approximately 50 mg/L by late 1988, indicating arrival of some percentage of WF-21 water. Since barrier injection first began in 1976, this would imply an average groundwater travel time of 10-12 years under the gradient conditions of that time, corresponding to the upper end of the estimated 1-2 feet per day groundwater velocity.

At HB-5, the chloride concentration range of approximately 21-26 mg/L in 2022 (Table 4-2) was slightly below the range measured in 2021 but still within the lower end of the historical range for that well. Further decline of chloride concentrations at HB-5 closer to GWRS levels would signal arrival of GWRS injection water. At HB-9, the chloride concentration during 2022 remained stable at approximately 13 mg/L throughout the year (Table 4-2), which is still within the lower end of the historical range for this well; continued decline of chloride concentrations below 10 mg/L at HB-9 could signal arrival of GWRS water. At HB-5 and HB-9, neither NDMA nor 1,4-dioxane were detected during 2022 (Table 4-2).

In 2012, OCWD became aware that existing private well GKAW-FV2/1 near the Talbert Barrier was being used to supply water to an occupied residence in Fountain Valley. Historically, this well had been used only for irrigation purposes. More recent inquiries with the owner have revealed that, beginning in approximately 2011, the well water is also being used for potable purposes with a reverse osmosis treatment system. Well GKAW-FV2/1 is located approximately 700 feet north of injection well site I10 and is perforated from 120 to 125 ft bgs in the Talbert aquifer. The underground retention time prior to extracting GWRS purified recycled water at this private drinking water well is estimated to be greater than 15 years; this is based on groundwater samples taken from this well since GWRS began operation in January 2008 which indicate that GWRS purified recycled water has not yet reached Well GKAW-FV2/1 despite its proximity to the barrier. During 2022, the chloride concentration at GKAW-FV2/1 ranged from 105 to 107 mg/L while 1,4-dioxane concentrations ranged from 2.8 to 3.4 μg/L (Table 4-2), both indicative of pre-GWRS injection water and likely some proportion of ambient groundwater. Since the inception of GWRS however, the groundwater flow direction in the Talbert aquifer at GKAW-FV2/1 has predominantly been seaward to the southwest towards the barrier, similar to what was shown in Figure 4-3 for the Talbert aquifer during June 2022 in the vicinity of this well. All water quality sample results reported by the OCWD Laboratory are reviewed by OCWD Water Quality Department staff and then sent to the well owner. This is consistent with typical practice by OCWD Water Quality staff for both public and private wells but is of particular importance for well GKAW-FV2/1 since this well is in close proximity to the Talbert Barrier.

5. KRAEMER-MILLER-MIRALOMA-LA PALMA BASINS OPERATIONS

During 2022, OCWD spread GWRS purified recycled water at Kraemer-Miller-Miraloma-La Palma (K-M-M-L) Basins to recharge the Orange County Groundwater Basin (Figure 1-1). Operation of the recharge facilities is presented in this section:

- Spreading facilities;
- Spreading water sources;
- Spreading water volumes; and
- K-M-M-L Basins operations.

5.1 Spreading Facilities

Table 5-1 summarizes the area, storage capacity and potential recharge water source(s) for each surface recharge facility owned or operated by OCWD. K-M-M-L Basins are the only spreading basins that receive GWRS purified recycled water. The locations of the surface spreading facilities are shown in Figure 5-1.

Table 5-1. Area and Storage Capacities of Recharge Facilities

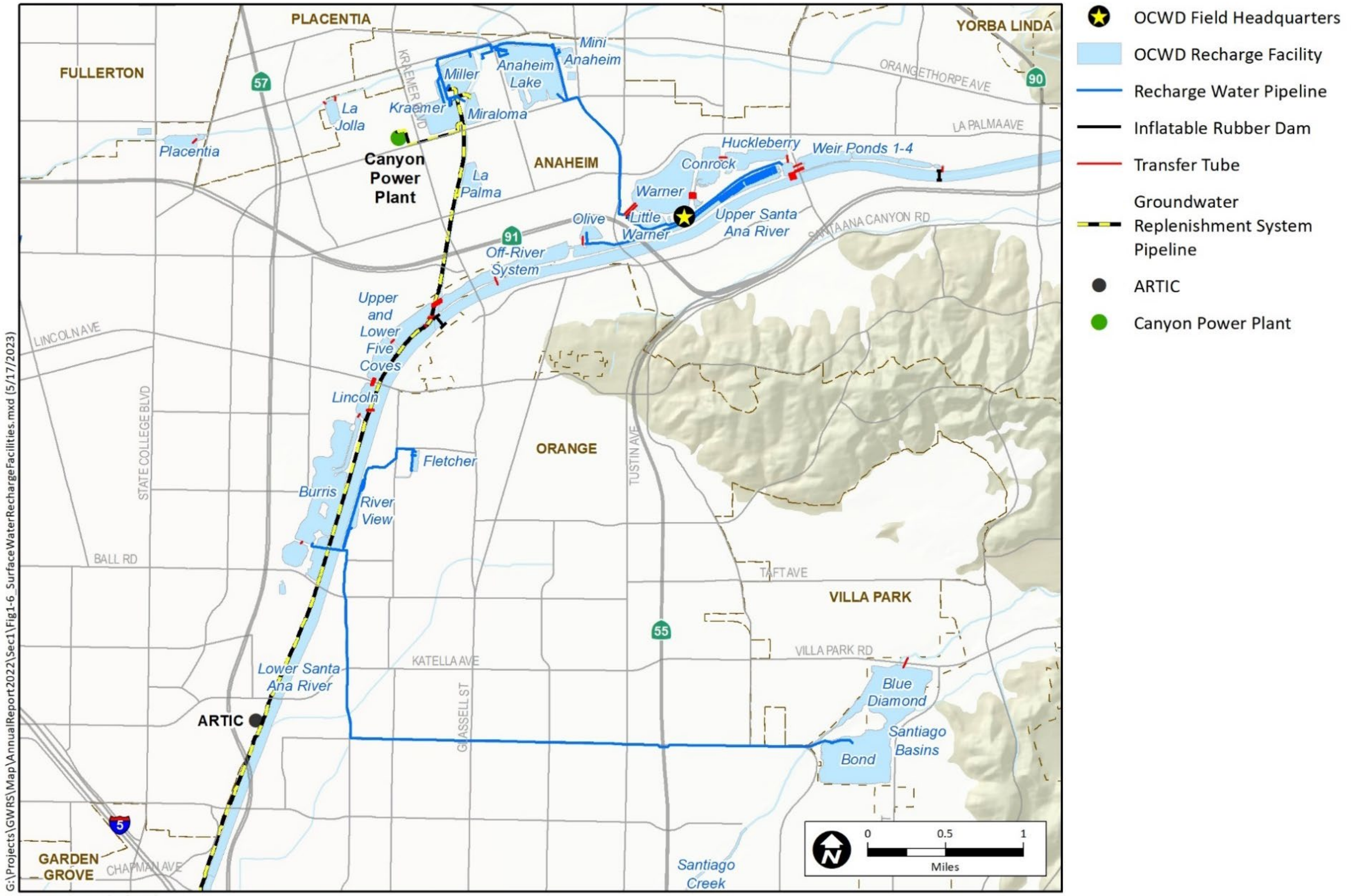
Facility	Wetted Area (acres)	Maximum Storage Capacity (AF)	Possible Recharge Sources			
			GWRS Purified Recycled Water	Captured Storm Water	Imported Water	SAR Base Flow
Anaheim Lake	72	2,260		✓	✓	✓
Kraemer Basin	31	1,170	✓	✓	✓	✓
La Jolla Basin	6.5	26		✓	✓	✓
Miller Basin	25	300	✓	✓	✓	✓
Mini-Anaheim Lake	5	13		✓	✓	✓
Miraloma Basin[1]	11	110	✓	✓	✓	✓
La Palma Basin[2]	14	140	✓	✓	✓	✓
Other Basins[3,4]	935	22,446		✓	✓	✓

1 Miraloma Basin has been essentially dedicated for GWRS purified recycled water recharge since coming on-line in 2012 to minimize basin clogging and maintain high percolation rates (small volume of non-GWRS water recharged there in 2017).

2 La Palma Basin continues to be dedicated for only GWRS purified recycled water recharge since coming on-line in 2016 to minimize basin clogging and maintain high percolation rates.

3 OCWD owns and/or operates a total of 24 surface water recharge basins near the SAR and Santiago Creek. These other basins are outside the influence of the current GWRS recharge system operation.

4 Quagga mussel control requirements restrict the recharge of imported Colorado River water in some of the other basins.



SOURCE: OCWD (04/2023)

Figure 5-1. Surface Water Recharge Facilities

Kraemer Basin is one of eleven deep basins used for percolation. Figure 5-2 shows a photo of Kraemer Basin, which first recharged GWRS purified recycled water on February 19, 2008. Kraemer Basin covers an area of approximately 31 acres and has a maximum storage capacity of about 1,170 AF. Based on percolation tests with low turbidity water, its maximum percolation rate is estimated at 65 MGD (100 cubic feet per second [CFS]).

Figure 5-2. Kraemer Basin

Miller Basin is a flood control basin owned by the County of Orange and conjunctively used by OCWD as a recharge basin through a cooperative agreement. Miller Basin covers an area of approximately 25 acres and has a maximum storage capacity of about 300 AF. In winter, its usable storage capacity (and thus recharge potential) is reduced for flood control purposes. More storage capacity is available at Miller Basin in the summer. Its estimated maximum percolation rate is 29 MGD (45 CFS), assuming percolation of low turbidity GWRS and/or imported water. Shown on Figure 5-3, GWRS purified recycled water recharge first began at Miller Basin on January 17, 2008.

Figure 5-3. Miller Basin with GWRS Purified Recycled Water in 2008

Miraloma Basin is located immediately southeast of Kraemer-Miller Basins and along Carbon Creek Diversion Channel. Pictured on Figure 5-4, Miraloma Basin covers an area of approximately 11 acres and has a maximum storage capacity of about 110 AF. Based on the observed percolation of GWRS purified recycled water, its maximum percolation rate is estimated at 30 MGD (46 CFS). GWRS purified recycled water recharge first began at Miraloma Basin on July 26, 2012. Since then, OCWD has predominately recharged purified recycled water at Miraloma Basin, though the recharge was briefly supplemented with a small volume of non-GWRS water in 2017. The Anaheim Adventure Park is located at Miraloma Basin and began operation in July 2021.

La Palma Basin is the newest spreading basin located south of Kraemer and Miraloma Basins along Carbon Creek Diversion Channel as shown on Figure 5-5. La Palma Basin covers an area of approximately 14 acres and has demonstrated exceptional percolation capabilities, achieving an estimated maximum percolation rate of 65 MGD (100 CFS). GWRS purified recycled water spreading first began at La Palma Basin on November 9, 2016. Since then, La Palma Basin has been dedicated to recharging purified recycled water and recharged more than half of all GWRS production during 2022.

Figure 5-4. Miraloma Basin with GWRS Purified Recycled Water in 2012

Figure 5-5. La Palma Basin with GWRS Purified Recycled Water in 2016

5.2 Spreading Water Sources

Water from three sources was percolated at K-M-M-L Basins in 2022: (1) GWRS purified recycled water; (2) SAR water including captured storm water and baseflow; and (3) imported water.

Anaheim Lake, Mini-Anaheim Lake, and La Jolla Basin are located in the vicinity of K-M-M-L Basins and all can be grouped together as part of the same hydrogeologic system (Figure 5-1). Anaheim Lake and Mini-Anaheim Lake are adjacent to and upgradient of K-M-M-L Basins; La Jolla Basin is located downgradient of Kraemer-Miller-Miraloma Basins and downgradient/crossgradient of La Palma Basin, which is located further south. SAR water and imported water recharged at Anaheim Lake, Mini-Anaheim Lake, and La Jolla Basin supplement and effectively blend with the purified recycled water recharged at K-M-M-L Basins. While purified recycled water may only be recharged at K-M-M-L Basins, they may also receive other water sources (SAR water and imported water). Except for a minor volume of other water recharged at Miraloma Basin in 2017, both Miraloma Basin and La Palma Basin have been dedicated to recharging GWRS purified recycled water since their inception to prevent long-term clogging and maintain their exceptionally high percolation rates.

Prior to 2014, the volume of diluent water (recharge water of non-wastewater origin) was formally recorded for determining compliance with the maximum allowable Recycled Water Contribution (RWC), which was 75% at Kraemer-Miller-Miraloma Basins (La Palma Basin was not in operation at that time). Diluent consisted of SAR captured storm flow and imported water; SAR base flow was not classified as a diluent because the year-round base flow is principally comprised of tertiary treated wastewater effluent from upstream dischargers.

In 2014 DDW approved a maximum RWC at K-M-M-L Basins of 100%, eliminating the blending requirement (CDPH, 2014). The volumes of spreading water from the aforementioned sources are still reported herein, but determination of the RWC and compliance with the RWC limit are no longer required.

In summary, GWRS purified recycled water, SAR water, and imported water were the spreading water sources utilized at the Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins recharge system during 2022. Since determination of the RWC is no longer required, the two non-GWRS sources are grouped together herein as "other water."

5.3 Spreading Water Volumes and Flow Rates

Spreading water volumes recharged in the Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins recharge system in 2022 are presented below and compared with historical spreading amounts in this area.

5.3.1 2022 Spreading Water Quantities

Table 5-2 presents the monthly recharge volumes at each of the individual recharge basins in this area. A total volume of approximately 34,410 MG (105,600 AF) of GWRS purified recycled water and other water, comprised of SAR water and imported water, was recharged at Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins during 2022.

Table 5-3 summarizes the monthly volumes of water that were recharged at Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins during calendar year 2022 based on OCWD Forebay Operations' percolation records. The percolation records typically differ slightly from the AWPF purified recycled water production records due to storage effects in the spreading basins, GWRS Pipeline, flow measurement/metering inaccuracies, and unmeasured rainfall and local runoff to the basins. Based on AWPF flow records during 2022, the following volumes and average daily flow rates of GWRS purified recycled water were delivered to the Anaheim Forebay:

- Kraemer Basin received approximately 30 MG (93 AF), or 0.08 MGD on average;
- Miller Basin received approximately 950 MG (2,913 AF), or 2.60 MGD on average;
- Miraloma Basin received approximately 4,497 MG (13,801 AF), or 12.32 MGD on average; and
- La Palma Basin received approximately 16,307 MG (50,045 AF), or 44.68 MGD on average.

The total volume of GWRS purified recycled water recharged at the K-M-M-L Basins during 2022 was 21,784 MG (66,853 AF). The annual average daily flow rate of GWRS purified recycled water spread in 2022 was 59.68 MGD. No GWRS purified recycled water was recharged at Anaheim Lake, Mini-Anaheim Lake, or La Jolla Basin; spreading GWRS purified recycled water at these three sites is not allowed under the GWRS permit. Furthermore, the hydraulics of the water conveyance system at the Anaheim Forebay are such that delivery of GWRS purified recycled water to Anaheim Lake, Mini-Anaheim Lake, or La Jolla Basin is not physically possible.

Captured flow was diverted from the SAR and recharged at Kraemer and Miller Basins as well as Anaheim Lake, Mini-Anaheim Lake and La Jolla Basin. Imported water was purchased and recharged at these same basins. In 2022, a total of approximately 12,863 MG (39,475 AF) of the two other (non-GWRS) sources was recharged in this area of the Anaheim Forebay. Kraemer and Miller Basins received primarily non-GWRS water during 2022. Miraloma and La Palma Basins received only GWRS purified recycled water during 2022 (excluding any unmeasured rainfall or site runoff). Miraloma and La Palma Basins have been dedicated almost exclusively to GWRS water as noted in Section 5.2.

Table 5-2. 2022 Summary of Spreading Water Locations and Volumes [1]

Month	Kraemer Basin				Miller Basin				Miraloma Basin				La Palma Basin				Anaheim Lake	Mini-Anaheim Lake	La Jolla Basin	TOTAL PERCOLATION	
	GWRS Water (AF)	Other Water[3] (AF)	Change in Storage (AF)	Total Percolation (AF)	GWRS Water (AF)	Other Water (AF)	Change in Storage (AF)	Total Percolation (AF)	GWRS Water (AF)	Other Water (AF)	Change in Storage (AF)	Total Percolation (AF)	GWRS Water (AF)	Other Water (AF)	Change in Storage (AF)	Total Percolation (AF)	Total Percolation (AF)[2]	Total Percolation (AF)[2]	Total Percolation (AF)[2]	(AF)	(MG)
Jan	0	3,595	190	3,405	0	1,110	181	929	1,202	0	2	1,200	4,829	0	9	4,820	3,197	390	566	14,507	4,727
Feb	0	506	-414	920	0	89	-175	264	1,074	0	4	1,070	4,330	0	9	4,321	212	0	273	7,060	2,301
Mar	0	-103[3]	-178	75	0	368	36	332	1,338	0	16	1,322	4,601	0	5	4,596	22	0	177	6,524	2,126
Apr	0	0	0	0	0	383	-42	425	1,212	0	-7	1,219	3,207	0	-21	3,228	0	0	223	5,095	1,660
May	0	0	0	0	0	0	0	0	2,374	0	5	2,369	3,362	0	24	3,338	0	0	0	5,707	1,860
Jun	0	0	0	0	0	0	0	0	1,182	0	0	1,182	4,140	0	18	4,122	1,963	0	0	7,267	2,368
Jul	0	0	0	0	74	0	0	74	1,081	0	-1	1,082	4,102	0	29	4,073	1,022	0	0	6,251	2,037
Aug	0	0	0	0	25	1	5	21	1,063	0	1	1,062	4,304	0	-10	4,314	0	0	0	5,397	1,759
Sep	0	0	0	0	1,003	0	-1	1,004	1,016	0	0	1,016	2,659	0	-18	2,677	19	0	0	4,716	1,537
Oct	0	3,633	272	3,361	0	2,274	87	2,187	963	0	0	963	4,885	0	15	4,870	2,901	275	1,025	15,582	5,077
Nov	0	2,847	128	2,719	439	1,559	-9	2,007	703	0	1	702	5,064	0	39	5,025	3,253	147	975	14,828	4,832
Dec	93	3,572	479	3,186	1,373	417	22	1,768	593	0	3	590	4,562	0	23	4,539	2,043	0	540	12,666	4,127
TOTAL	**93**	**14,050**	**477**	**13,666**	**2,914**	**6,201**	**104**	**9,011**	**13,801**	**0**	**24**	**13,777**	**50,045**	**0**	**122**	**49,923**	**14,632**	**812**	**3,779**	**105,600**	**34,410**

[1] Volumes include:

GWRS purified recycled water (GWRS water) data are based on AWPF flow meter records and Forebay Operations' records for flows discharged to individual spreading basins.

Other water volumes are estimated based on Forebay Operations' total percolation records and include:

- Santa Ana River (SAR) water
- Imported water

Total percolation volumes are based on Forebay Operations' percolation records.

Change in storage volume represents water retained in the basin that has not yet percolated based on Forebay Operations records. Changes in storage volumes are estimated values that may be positive (increase) or negative (decrease).

[2] Total percolation volumes shown for Anaheim Lake, Mini-Anaheim Lake, and La Jolla Basin are other water (non-GWRS water).

[3] Negative value is a result of Kraemer Basin being prepared for maintenance work when water was transferred from Kraemer Basin to Miller Basin.

Table 5-3. 2022 Summary of Spreading Water Sources and Quantities [1]

Month	GWRS Purified Recycled Water[2]		Other Water[3]		Total Spreading Water		Total Change in Storage[4]	TOTAL PERCOLATION	
	(Avg. MGD)	(AF)	(Avg. MGD)	(AF)	(Avg. MGD)	(AF)	(AF)	(AF)	(MG)
January	63.4	6,031	93.1	8,858	156.5	14,889	382	14,507	4,727
February	62.9	5,404	12.6	1,080	75.5	6,484	(576)	7,060	2,301
March	62.4	5,939	4.9	464	67.3	6,403	(121)	6,524	2,126
April	48.0	4,418	6.6	606	54.6	5,024	(70)	5,095	1,660
May	60.3	5,737	0.0	0	60.3	5,737	29	5,707	1,860
June	57.8	5,321	21.3	1,963	79.1	7,284	18	7,267	2,368
July	55.3	5,258	10.7	1,022	66.0	6,280	28	6,251	2,037
August	56.7	5,392	0.0	1	56.7	5,393	(4)	5,397	1,759
September	50.8	4,678	0.2	19	51.0	4,697	(19)	4,716	1,537
October	61.5	5,848	106.2	10,108	167.7	15,956	374	15,582	5,077
November	67.4	6,206	95.4	8,781	162.8	14,987	159	14,828	4,832
December	69.6	6,621	69.1	6,572	138.7	13,193	527	12,666	4,127
TOTAL	**59.7**	**66,853**	**35.2**	**39,475**	**94.9**	**106,327**	**727**	**105,600**	**34,410**

[1] Spreading at Anaheim Lake, Mini-Anaheim Lake, Kraemer Basin, Miller Basin, Miraloma Basin, La Palma Basin, and La Jolla Basin.

[2] GWRS purified recycled water inflows are based on AWPF and Forebay Operations' flow records.

[3] Other water is Santa Ana River (SAR) water and/or imported water based on percolation records from Forebay Operations.

[4] Change in storage represents water retained in the basin that has not yet percolated at K-M-M-L Basins based on Forebay Operations records. Change in storage volume are estimated values that may be positive (increase) or negative (decrease).

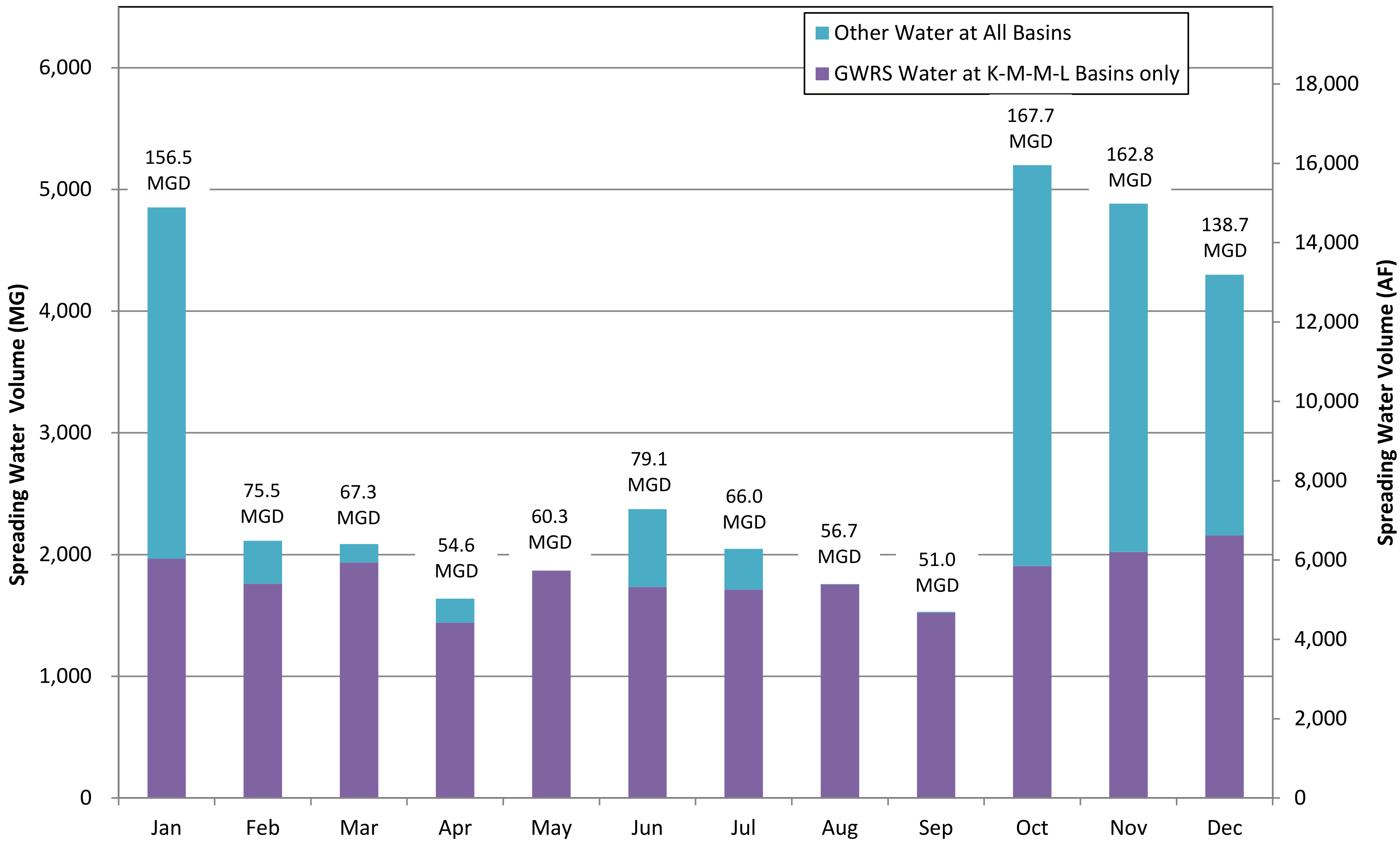
Figure 5-6 illustrates the total 2022 water supply volumes recharged in the Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins area. As noted above, a total of approximately 21,784 MG (66,853 AF) of GWRS purified recycled water was recharged at K-M-M-L Basins. Approximately 75% of the GWRS purified recycled water pumped to the Anaheim Forebay was recharged at La Palma Basin during 2022.

Figure 5-6 also shows how the recharge of GWRS purified recycled water at the basins varied on a month-to-month basis. The monthly volume of purified recycled water delivered to the Anaheim Forebay varied throughout 2022, ranging from 4,418 AF in April to 6,621 AF in December, with the low volume in April being due to a planned AWPF shutdown for GWRSFE construction (See Table 5-3 presented earlier). The amounts of other water (SAR water and imported water) varied seasonally depending on availability. Other water monthly volumes ranged from approximately zero to 10,108 AF. The monthly volume of GWRS purified recycled water exceeded the monthly volume of other water in eight months during 2022: February through September.

The average daily flow rate of GWRS purified recycled water recharged at K-M-M-L Basins was 59.7 MGD during 2022. Excluding the planned extended GWRS shutdown period in 2022 (April 17 at 0815 hours– April 23 at 0900 hours; total 144.75 hours), the average daily flow rate of purified recycled water recharged at K-M-M-L Basins was 60.7 MGD. The combined average daily flow rate of other water (SAR water and imported water) recharged at Anaheim Lake/Mini-Anaheim Lake/Kraemer-Miller/La Jolla Basins was approximately 43.6 MGD.

5.3.2 Historical Spreading Water Quantity

Prior to 2008, only SAR water and imported water were recharged at Kraemer-Miller Basins. GWRS purified recycled water spreading began at Kraemer Basin in February 2008 and continued through 2022; albeit, in 2022 Kraemer Basin received no purified recycled water between January and November and only a minimal volume of purified recycled water in December. Purified recycled water spreading began at Miller Basin in January 2008; this occurred in 2022 only during the month of December, with the basin being used to recharge other sources or not all during the rest of the year. Purified recycled water spreading began at Miraloma Basin in July 2012 and has essentially been constant since, with the exception of the April 2020 – January 2021 construction period for the Anaheim Adventure Park. Purified recycled water spreading began at La Palma Basin when this basin first became operational in November 2016 and continued through 2022.



Note: Other water consists of SAR water and imported water.
Spreading water average flow rate shown in MGD

Figure 5-6. 2022 Monthly Spreading Water Sources and Volumes in Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins

Table 5-4 and Figure 5-7 compare the volume of purified recycled water and other water recharged at K-M-M-L Basins in 2022 with historical recharge data since the GWRS began operation in January 2008. Since 2008, the highest purified recycled water volume that was delivered to K-M-M-L Basins occurred in 2019 (24,240 MG or 74,391 AF). The purified recycled water volumes delivered to K-M-M-L Basins from 2020 through 2022 were approximately 10% to 20% less than the 2019 peak volume due to the four Centennial Park MBI wells coming on-line in 2020, as well as AWPF shutdowns for GWRSFE construction, GWRS Pipeline inspection, and demand response program power curtailments that limited deliveries to the Forebay.

Table 5-4. Summary of Annual Spreading Water Sources and Volumes Since 2008 in the Anaheim Forebay [1]

Year	Other Water[2,3] (AF)	GWRS Purified Recycled Water[4] (AF)	TOTAL PERCOLATION[5]	
			(AF)	(MG)
2008	46,871	21,307	68,178	22,216
2009	53,304	27,023	80,327	26,175
2010	65,457	29,473	94,930	30,933
2011	62,396	42,283	104,678	34,109
2012	49,204	46,865	96,070	31,304
2013	38,213	42,478	80,691	26,293
2014	67,740	33,091	100,831	32,856
2015	44,993	55,472	100,465	32,737
2016	50,685	63,048	113,407	36,955
2017	78,984	72,458	151,448	49,349
2018	67,017	70,307	136,659	44,530
2019	43,940	74,391	118,454	38,598
2020	38,357	63,097	101,706	33,141
2021	48,887	59,884	108,400	35,322
2022	39,475	66,853	105,600	34,410
TOTAL	**795,523**	**768,030**	**1,561,844**	**508,929**

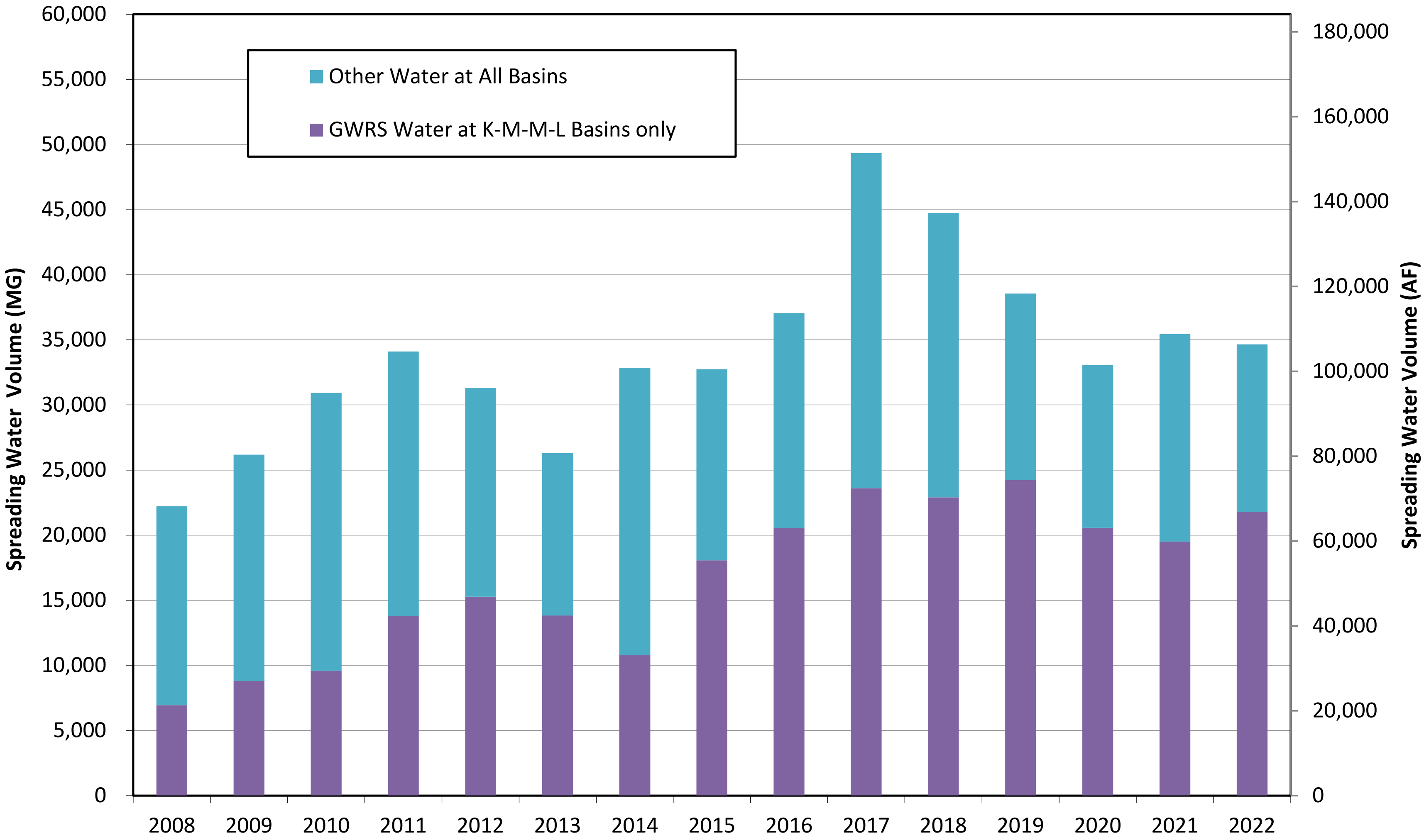
[1] Spreading at Anaheim Lake, Mini-Anaheim Lake, Kraemer Basin, Miller Basin, Miraloma Basin, La Palma Basin, and La Jolla Basin.

[2] Other water is captured/recharged Santa Ana River (SAR) water and/or imported water. Total water flows are based on percolation records measured by OCWD Forebay Operations staff. Other water is calculated by subtraction: (Other water = Total - GWRS water) with adjustments for estimated storage in basin (water not yet percolated).

[3] Other water shown for 2015 represents a corrected volume based on OCWD flow records.

[4] GWRS purified recycled water flows are based on AWPF flow records.

[5] Totals based on percolation records from Forebay Operations.



Note: Other water consists of SAR water and imported water

Figure 5-7. Annual Spreading Water Sources and Volumes Since 2008 in Anaheim Lake/Mini-Anaheim Lake/ K-M-M-L/La Jolla Basins

The combined total of 105,600 AF (GWRS and other water) recharged at Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins during 2022 was approximately 3% lower than the 2021 volume even though GWRS purified recycled water recharge at K-M-M-L Basins was approximately 12% higher in 2022 than in 2021 (Table 5-4 and Figure 5-7). Recharge of other water (SAR and imported) was approximately 19% lower in 2022 than in 2021 primarily due to less SAR storm flows recharged in 2022 than in 2021, as rainfall at the OCWD Field Headquarters in Anaheim was less in 2022 (6.71 in) than in 2021 (9.16 in). Approximately the same amount of imported replenishment water was purchased and recharged during 2022 (19,842 AF) as in 2021 (20,000 AF).

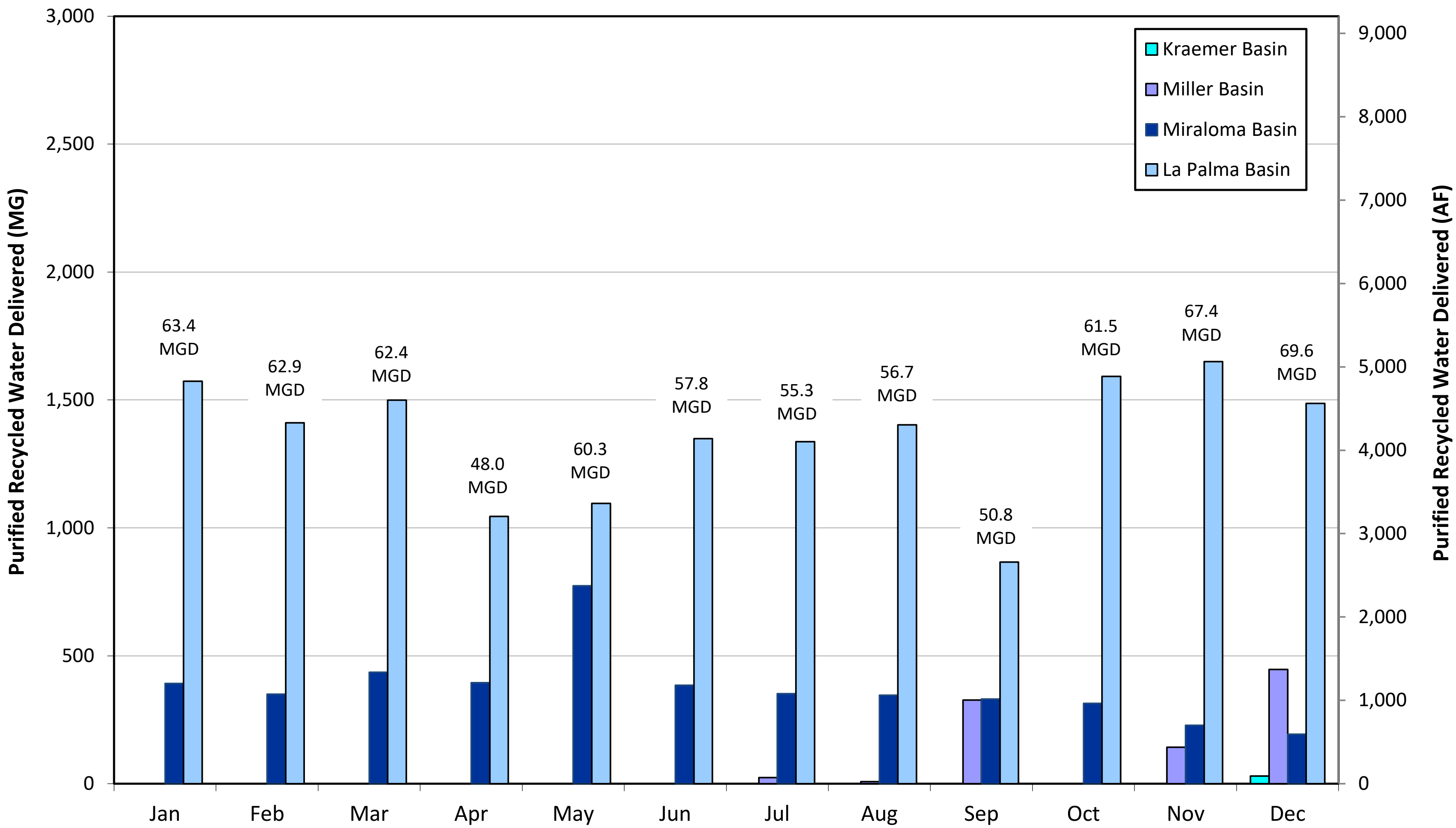
5.4 K-M-M-L Basins Operations

Purified recycled water produced by the AWPF was pumped to the Anaheim Forebay and spread at K-M-M-L Basins in 2022. La Palma Basin was the primary site used for recharging purified recycled water throughout 2022, as detailed in Table 5-5 and illustrated on Figure 5-8. Miraloma Basin required a relatively steady flowrate to ensure a proper water level for Anaheim Adventure Park operations. Miraloma Basin recharged purified recycled water throughout 2022, accounting for approximately 21% of the K-M-M-L Basins volume. In total, La Palma Basin received approximately 75% of the purified recycled water spread at K-M-M-L Basins. A minimal volume (less than 1%) of purified recycled water was recharged at Kraemer Basin. Miller Basin recharged purified recycled water during the last half of 2022 (approximately 4% of the total spread at K-M-M-L Basins). Kraemer and Miller Basins were primarily utilized to recharge other water during 2022.

OCWD does not have a regularly scheduled cleaning cycle for K-M-M-L Basins. The need for a basin to be taken out of service and cleaned depends on the percolation performance.

Table 5-5. 2022 Monthly Purified Recycled Water Spreading Volumes and Flow Rates at K-M-M-L Basins

Month	Kraemer Basin			Miller Basin			Miraloma Basin			La Palma Basin			TOTAL		
	(AF)	(MG)	(Avg. MGD)	(AF)	(MG)	(Avg. MGD)	(AF)	(MG)	(Avg. MGD)	(AF)	(MG)	(Avg. MGD)	(AF)	(MG)	(Avg. MGD)
January	0	0	0.0	0	0	0.0	1,202	392	12.6	4,829	1,573	50.8	6,031	1,965	63.4
February	0	0	0.0	0	0	0.0	1,074	350	12.5	4,330	1,411	50.4	5,404	1,761	62.9
March	0	0	0.0	0	0	0.0	1,338	436	14.1	4,601	1,499	48.4	5,939	1,935	62.4
April	0	0	0.0	0	0	0.0	1,212	395	13.2	3,207	1,045	34.8	4,418	1,440	48.0
May	0	0	0.0	0	0	0.0	2,374	774	25.0	3,362	1,096	35.3	5,737	1,869	60.3
June	0	0	0.0	0	0	0.0	1,182	385	12.8	4,140	1,349	45.0	5,321	1,734	57.8
July	0	0	0.0	74	24	0.8	1,081	352	11.4	4,102	1,337	43.1	5,258	1,713	55.3
August	0	0	0.0	25	8	0.3	1,063	346	11.2	4,304	1,403	45.2	5,392	1,757	56.7
September	0	0	0.0	1,003	327	10.9	1,016	331	11.0	2,659	866	28.9	4,678	1,524	50.8
October	0	0	0.0	0	0	0.0	963	314	10.1	4,885	1,592	51.3	5,848	1,906	61.5
November	0	0	0.0	439	143	4.8	703	229	7.6	5,064	1,650	55.0	6,206	2,022	67.4
December	93	30	1.0	1,373	447	14.4	593	193	6.2	4,562	1,487	48.0	6,621	2,157	69.6
TOTAL	**93**	**30**	**0.1**	**2,914**	**949**	**2.6**	**13,801**	**4,497**	**12.3**	**50,045**	**16,307**	**44.7**	**66,853**	**21,784**	**59.7**



Note: Average Flow Rate in MGD to All Basins.

Figure 5-8. 2022 Purified Recycled Water Spreading Operations at K-M-M-L Basins

6. GROUNDWATER MONITORING AT THE ANAHEIM FOREBAY

OCWD has maintained a comprehensive groundwater monitoring program in the Anaheim and Orange Forebay areas for decades as part of its recharge operations and to monitor groundwater quality. Much of OCWD's current Forebay groundwater monitoring program was initially developed as part of the Santa Ana River Water Quality and Health (SARWQH) Study, which was conducted from 1994-2004 in the Anaheim Forebay (OCWD, 2004a; NWRI, 2004). The SARWQH Study assessed the use of SAR surface water as a recharge source for the Basin, given the potential for groundwater quality impacts due to the significant treated wastewater fraction in SAR base flow, as well as the agricultural and urban runoff components of storm flow.

For the purposes of GWRS permit compliance, OCWD began groundwater monitoring activities in the Anaheim Forebay downgradient of the GWRS spreading basins in 2005, well in advance of the initial delivery and spreading of GWRS purified recycled water in 2008. This annual report for 2022 marks 15 years of Forebay compliance monitoring at the well sites specified in the GWRS permit (RWQCB, 2004) and Monitoring and Reporting Program (RWQCB, 2020a). This section describes the following for calendar year 2022:

- Anaheim Forebay aquifer system;
- Groundwater monitoring program;
- Groundwater elevations and directions of flow; and
- Groundwater quality.

On December 2, 2022, a new GWRS permit was issued by the RWQCB (RWQCB, 2022a). Forebay compliance monitoring is slightly different under the new permit than described here. However, reporting requirements under the new permit will not go into effect until January 1, 2023, and therefore these changes will be captured in the 2023 GWRS Annual Report.

6.1 Anaheim Forebay Aquifer System

Earlier studies (DWR, 1934; DWR, 1967) divided the alluvial Orange County Groundwater Basin (the Basin) into the Pressure and Forebay areas. The Forebay refers to the inland area of intake or recharge generally characterized by higher permeability sediments (e.g., sands and gravels) and unconfined aquifer conditions. In contrast, the Pressure area refers to the coastal and central regions of the Basin where the presence of low-permeability clay and silt deposits limits surface percolation and creates confined or pressurized aquifer conditions at depth.

During the SARWQH Study, OCWD gained valuable insight into the local hydrogeology in the vicinity of K-M-M-L Basins through: (1) the installation of several multi-depth nested monitoring wells; (2) extensive groundwater quality testing; and (3) the performance of large-scale artificial tracer tests from various recharge basins (OCWD, 2004a; LLNL, 2004). These studies generally confirmed that most sediments down to approximately 1,000 ft bgs are coarse-grained, high-permeability sands and gravels, with only a minimal presence of intervening low-permeability sediments that do not appear to be laterally extensive.

For the purposes of the OCWD Basin-wide Groundwater Flow Model (Phraner, 2001; OCWD, 2004b) and the Annual Groundwater Storage Change calculation (OCWD, 2007), the Basin has been vertically characterized into three distinct aquifer systems: (1) Shallow, (2) Principal, and (3) Deep. Over 90% of groundwater production in the Basin occurs from the Principal aquifer. The approximate vertical intervals of the three aquifer systems in the immediate vicinity of K-M-M-L Basins are presented in Table 6-1. It should be noted that the Principal and Deep aquifers rapidly thicken and deepen to the west/southwest of this area, conforming to the Basin's overall synclinal structure (Herndon and Bonsangue, 2006).

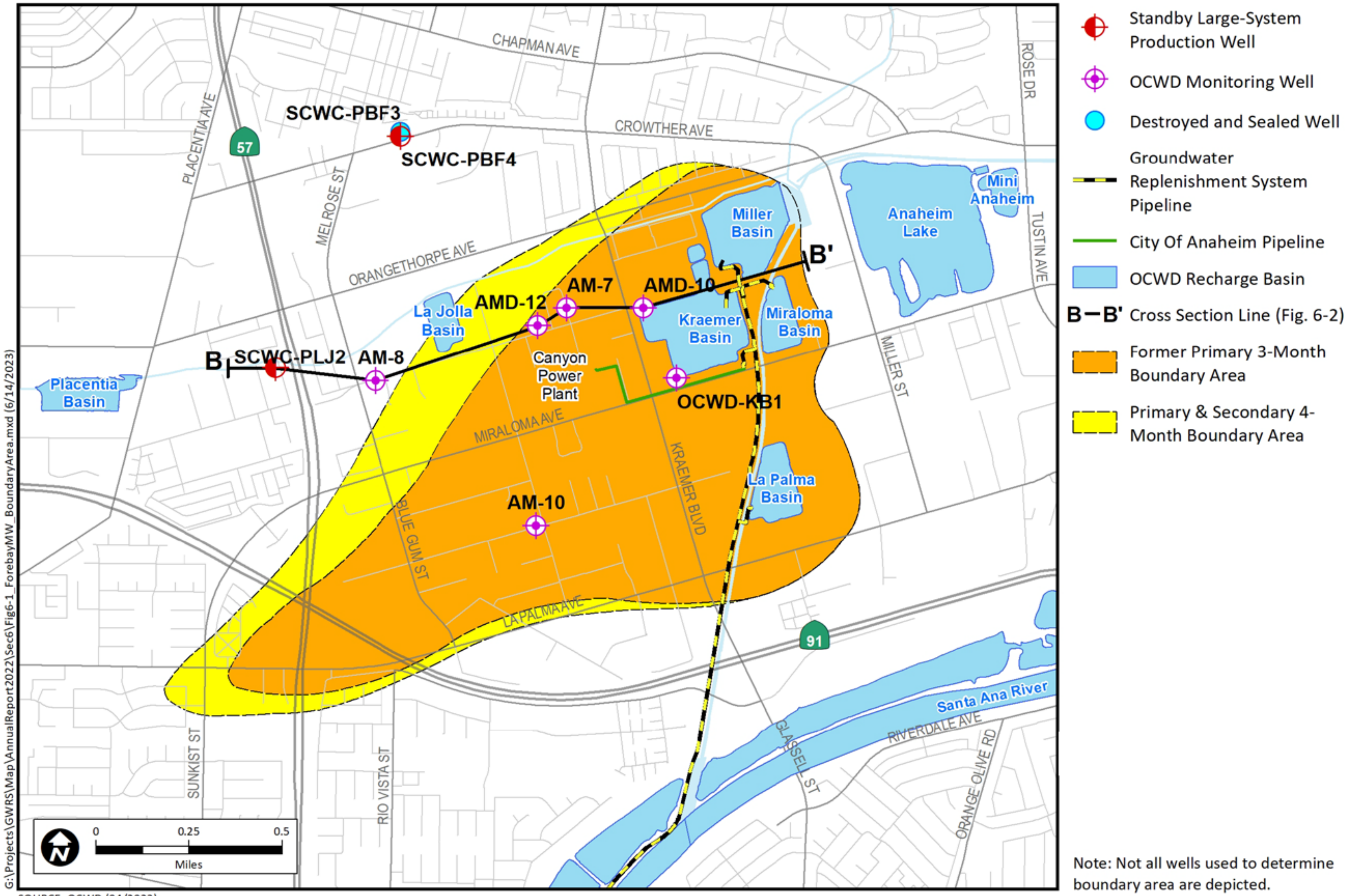
Table 6-1. Approximate Aquifer System Depths in the Vicinity of K-M-M-L Basins

Shallow Aquifer (ft bgs)	Principal Aquifer (ft bgs)	Deep Aquifer (ft bgs)
0 – 250	250 – 1,250	1,250 – 1,750

As required by state regulations (CCR, 2018), OCWD has established retention time boundary areas for the control of pathogenic microorganisms and response retention time in the area downgradient of K-M-M-L Basins that are illustrated on Figure 6-1; potable drinking water wells are prohibited in these areas. The boundary areas are based on an artificial tracer test conducted in Kraemer Basin (Clark, 2009), with sequential modifications via numerical modeling and GIS to incorporate Miraloma Basin (OCWD, 2011; OCWD, 2012, CDPH, 2012; RWQCB, 2012; RWQCB, 2014a) and La Palma Basin (OCWD and DDB Engineering, Inc., 2014, RWQCB 2016, OCWD, 2016). No existing public water supply wells are located inside the existing boundary areas. Due to changes to the GWRS Pathogen Log Reduction Requirements (Section 2.2.3, Table 2-4) following the state's adoption of the Final Groundwater Recharge Reuse Project (GRRP) regulations (CCR, 2018), the four-month boundary area now serves as both the primary and secondary project boundary. The boundary areas are enforced by the City of Anaheim and Orange County Health Care Agency well permitting authorities, as well as DDW.

6.2 Groundwater Monitoring Program

As part of the comprehensive groundwater monitoring program required by the 2004 permit and its Monitoring and Reporting Program for the GWRS (RWQCB, 2004, 2008, 2014a, 2016, 2019, and 2020a), the following OCWD monitoring well sites in the vicinity of K-M-M-L Basins were sampled in 2022: nested monitoring wells AMD-10 and AMD-12, plus single-point monitoring wells AM-7, AM-8, and AM-10. Although not required under the permit, another single-point



SOURCE: OCWD (04/2023)

Figure 6-1. Selected Forebay Monitoring Well Locations and Boundary Areas

monitoring well, OCWD-KB1, was also sampled in 2022 because of its proximity to the Kraemer Basin recharge site. Under the December 2022 GWRS permit and Monitoring and Reporting Program (RWQCB, 2022a), compliance monitoring at well AMD-10 is no longer required. Compliance monitoring completed at this well through the fourth quarter of 2022 is described herein; this well will continue to be monitored voluntarily.

The locations of these wells and nearby municipal production wells are shown on Figure 6-1. A generalized geologic cross-section showing these wells in relation to the nearby recharge basins is presented on Figure 6-2. Note compliance well AM-10 is not shown on the cross-section since it is located farther south along the flow path emanating from La Palma Basin. Table 6-2 summarizes the screened interval depths and aquifer zones for the five compliance monitoring wells and OCWD-KB1.

Groundwater levels are measured at least quarterly for the monitoring wells shown on Figure 6-1, as well as at several other monitoring wells in the general vicinity to determine groundwater flow directions in this area and to track changes in groundwater storage, as this unconfined area represents the majority of the Basin's available groundwater storage capacity.

6.3 Groundwater Elevations and Directions of Flow

Figure 6-3 illustrates the inferred groundwater flow paths within the Shallow aquifer near K-M-M-L Basins, based on the groundwater elevation contours representing June 30, 2022. As shown by the inferred flow arrows on Figure 6-3, the dominant groundwater flow direction was west-southwest away from the recharge basins as in previous years.

Although groundwater levels at individual wells rise and fall over time, they generally behave similarly in this area. Thus, the shape of the groundwater elevation contours, and the resulting groundwater gradient and flow directions do not change significantly from year to year in the Anaheim Forebay. The June 2022 contour patterns in Figure 6-3 are similar to those shown for June 2021 presented in last year's Annual Report. However, the June 2022 contours in Figure 6-3 show a more prominent mound downgradient (west) of La Palma Basin than in June 2021 because La Palma Basin recharge in June 2022 was 4,140 AF (Table 5-2) as compared to only 1,067 AF in June 2021. The Shallow aquifer groundwater flow direction was still westerly from La Palma Basin towards compliance monitoring well AM-10 in June 2022 for the sixth straight year since the start of operations there. Prior to recharge at La Palma Basin, the groundwater flow direction towards AM-10 typically originated from Kraemer Basin, as in June 2016 just prior to new La Palma Basin being placed on-line as presented on Figure 6-3 of the 2016 GWRS Annual Report.

The June 2022 Shallow aquifer groundwater elevations shown in Figure 6-3 were slightly lower than in June 2021, by approximately 3 feet near La Palma Basin and downgradient at AM-10, by approximately 10 feet at Kraemer Basin, by 5 feet downgradient of Kraemer Basin at AM-8, and

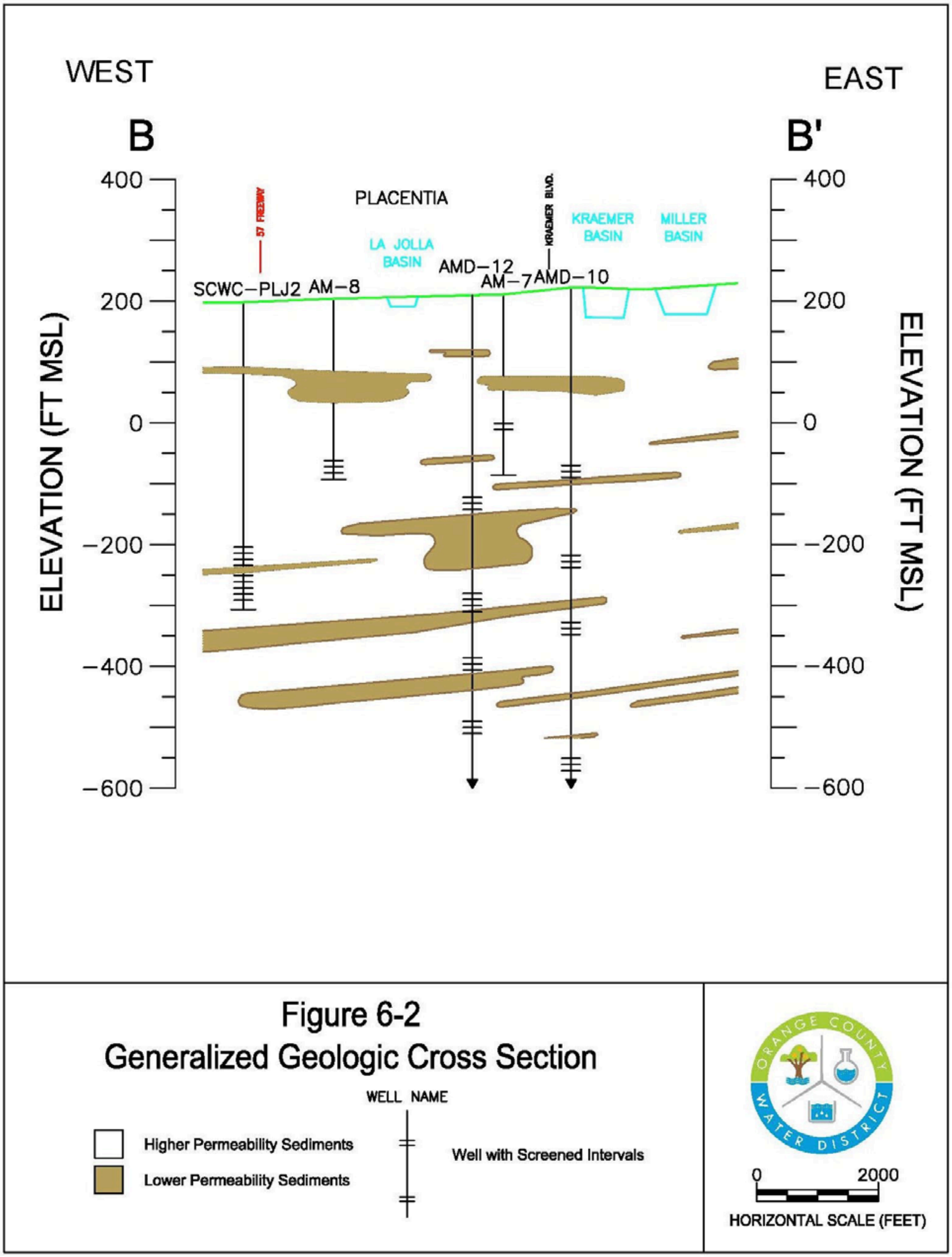


Figure 6-2. Generalized Geologic Cross Section in the Anaheim Forebay

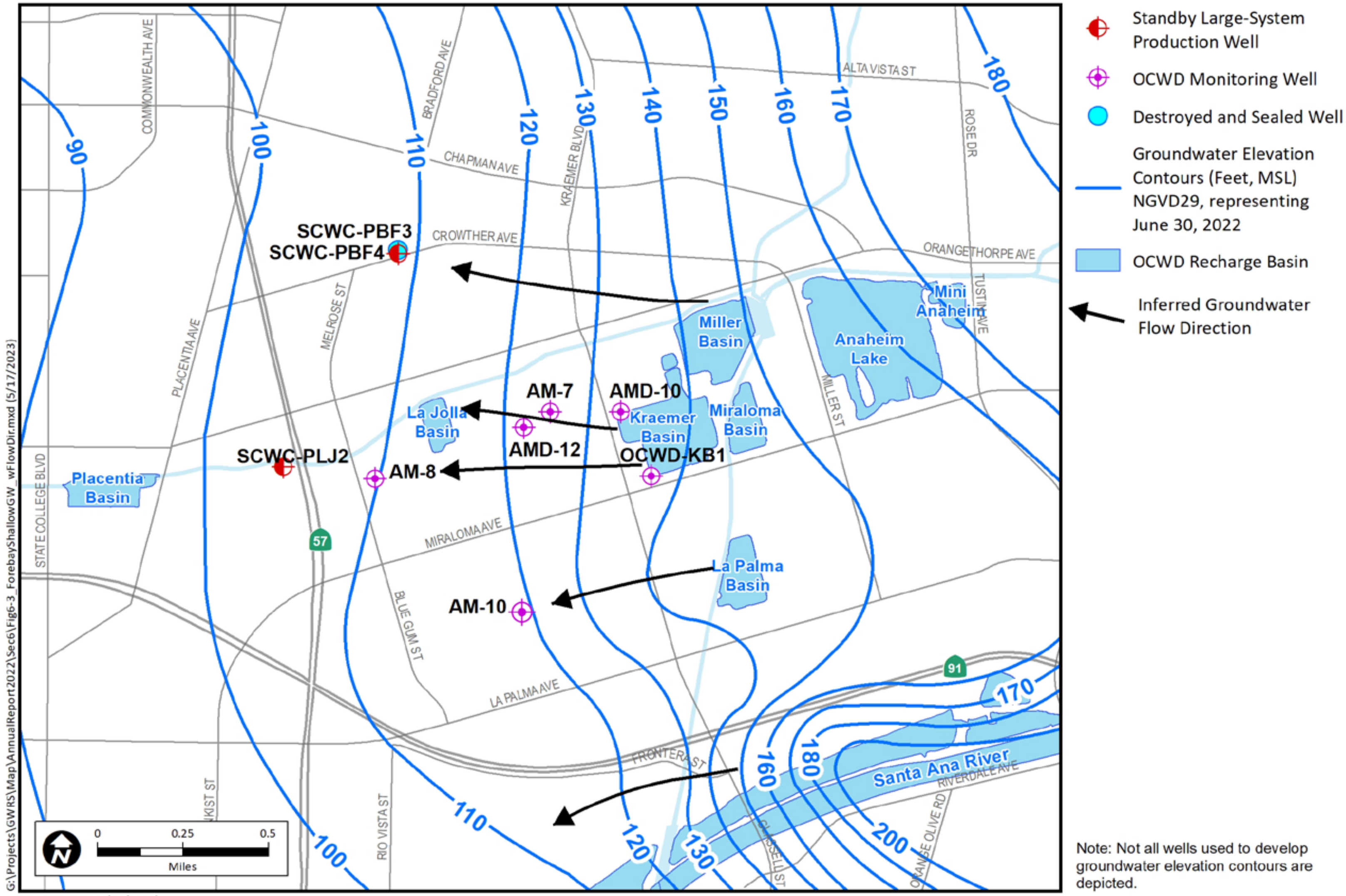
Table 6-2. Monitoring Wells Near K-M-M-L Basins

OCWD Well Name	Date Completed	Nearest GWRS Recharge Basin [1]	Approximate Distance and Direction from Basin	Well Depth (ft bgs)	Aquifer Name	Nearest Drinking Water Well
AM-7/1	09/19/1990	Kraemer	1,135 ft W	210-225	Shallow	SCWC-PLJ2
AM-8/1	09/22/1990	Kraemer	3,900 ft SW	268-285	Shallow	SCWC-PLJ2
AMD-10/1[2]	10/13/1997	Kraemer	55 ft NW	292-312	Principal	SCWC-PLJ2
AMD-10/2[2]	10/13/1997	Kraemer	55 ft NW	440-460	Principal	SCWC-PLJ2
AMD-10/3[2]	10/13/1997	Kraemer	55 ft NW	550-570	Principal	SCWC-PLJ2
AMD-10/4[2]	10/13/1997	Kraemer	55 ft NW	774-794	Principal	SCWC-PLJ2
AMD-10/5[2]	10/13/1997	Kraemer	55 ft NW	934-954	Principal	SCWC-PLJ2
AMD-12/1	11/30/2004	Kraemer	1,510 ft W	300-350	Principal	SCWC-PLJ2
AMD-12/2	11/30/2004	Kraemer	1,510 ft W	490-520	Principal	SCWC-PLJ2
AMD-12/3	11/30/2004	Kraemer	1,510 ft W	595-615	Principal	SCWC-PLJ2
AMD-12/4	11/30/2004	Kraemer	1,510 ft W	725-745	Principal	SCWC-PLJ2
AMD-12/5	11/30/2004	Kraemer	1,510 ft W	940-960	Principal	SCWC-PLJ2
AM-10/1	09/12/1990	La Palma	3,000 ft SW	217-235	Shallow	SCWC-PLJ2
OCWD-KB1/1[3]	10/13/1987	Kraemer	100 ft SW	180-200	Shallow	SCWC-PLJ2

[1] The closest GWRS recharge basin is not necessarily the source of GWRS water arrival at each well based on the inferred groundwater flow paths.
[2] As of December 2, 2022, monitoring wells AMD-10/1 through AMD-10/5 are not compliance wells per the new GWRS permit. The results of 2022 compliance monitoring are reported here. These wells will continue to be monitored on a voluntary basis.
[3] Monitoring well site OCWD-KB1/1 is not a compliance well per the existing GWRS permit but is monitored voluntarily due to its proximity to Kraemer Basin.

by 10 feet upgradient of K-M-M-L Basins near Anaheim Lake. The June 2022 Shallow aquifer groundwater levels were lower than in June 2021 in the vicinity of the OCWD spreading grounds in Anaheim for the following reasons: (1) decreased Basin storage from June 2021 to June 2022, (2) less rainfall in CY2022 (6.71 inches) than in CY2021 (9.16 inches), (3) lower recharge from April through June of 2022 compared to those three months in 2021 (Table 5-4 and Figure 5-6), and (4) more pumping in 2022 than in 2021 upgradient (east) of Anaheim Lake from Yorba Linda Water District (YLWD) wells that were off-line during most of 2021 and were placed back on-line in early 2022 with PFAS treatment.

From June 2021 to June 2022, Shallow aquifer groundwater elevations dropped by approximately 10 feet near AMD-10 adjacent to Kraemer Basin and by only 5 feet downgradient at AM-8. The Shallow aquifer groundwater elevation difference from the western edge of Kraemer Basin near



SOURCE: OCWD (04/2023)

Figure 6-3. Shallow Aquifer Groundwater Elevation Contours and Inferred Groundwater Flow Directions in the Anaheim Forebay Area During 2022

AMD-10 to downgradient monitoring well AM-8 was approximately 25 feet in June 2022 (Figure 6-3), which was 5 feet less than in June 2021, indicating that the gradient in this area was slightly flatter in June 2022. Farther south, the groundwater elevation difference from the northwest corner of La Palma Basin to downgradient compliance well AM-10 was approximately 25 feet in June 2022 (Figure 6-3) which was the same as in June 2021, indicating that the gradient remained unchanged along this southerly flow path despite increased recharge at La Palma Basin in June 2022 as compared to June 2021.

Groundwater level (piezometric elevation) hydrographs for monitoring well sites OCWD-KB1, AMD-10, AM-7, AMD-12, AM-8, and AM-10 are shown on the upper graphs of Figure 6-4 through Figure 6-9, respectively. These figures also show chloride concentrations on the middle graphs and arsenic concentrations on the lower graphs of each figure. Arsenic and chloride trends are discussed in Section 6.4. All five graphs show the 10-year period from 2013-2022. The groundwater level fluctuations over this period evident in the hydrographs reflect the effects of OCWD's managed recharge activities, local precipitation, groundwater production, and the Basin's overall groundwater storage condition.

Groundwater level trends at all six monitoring wells typically follow a seasonal pattern: (1) rising during the winter and early spring months, (2) declining in the late spring and summer months, and (3) recovering somewhat in the late fall months near the end of the year. These seasonal trends are typically caused by a combination of increased recharge (both natural and managed) from local rainfall and captured SAR storm flows during the winter months and increased groundwater pumping during the warmer and drier summer months.

During 2022, groundwater level trends at all six monitoring wells followed the typical seasonal pattern described above and had a relatively large seasonal amplitude of 25-40 feet from the winter high to the summer low.

Groundwater levels began 2022 relatively high due to December 2021 rainfall of over four inches and then rose slightly by 5-10 feet in January and peaked at the beginning of February at all six wells from increased recharge in January at the Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins complex (Figure 6-1) due to SAR storm flows and lower pumping. The 2022 winter peak was approximately 0-5 feet higher than the prior year's peak.

Groundwater levels at all six wells declined sharply from February through September 2022 by approximately 25-40 feet to an annual low at the beginning of October that was approximately 0-5 feet lower than the prior year's low. The sharp decline was primarily due to low recharge during these months at the Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins complex (Figure 5-6) due to limited SAR flows, little to no imported MWD replenishment water, and a planned GWRS AWPF shutdown April 18-22, coupled with the typical increase in pumping during

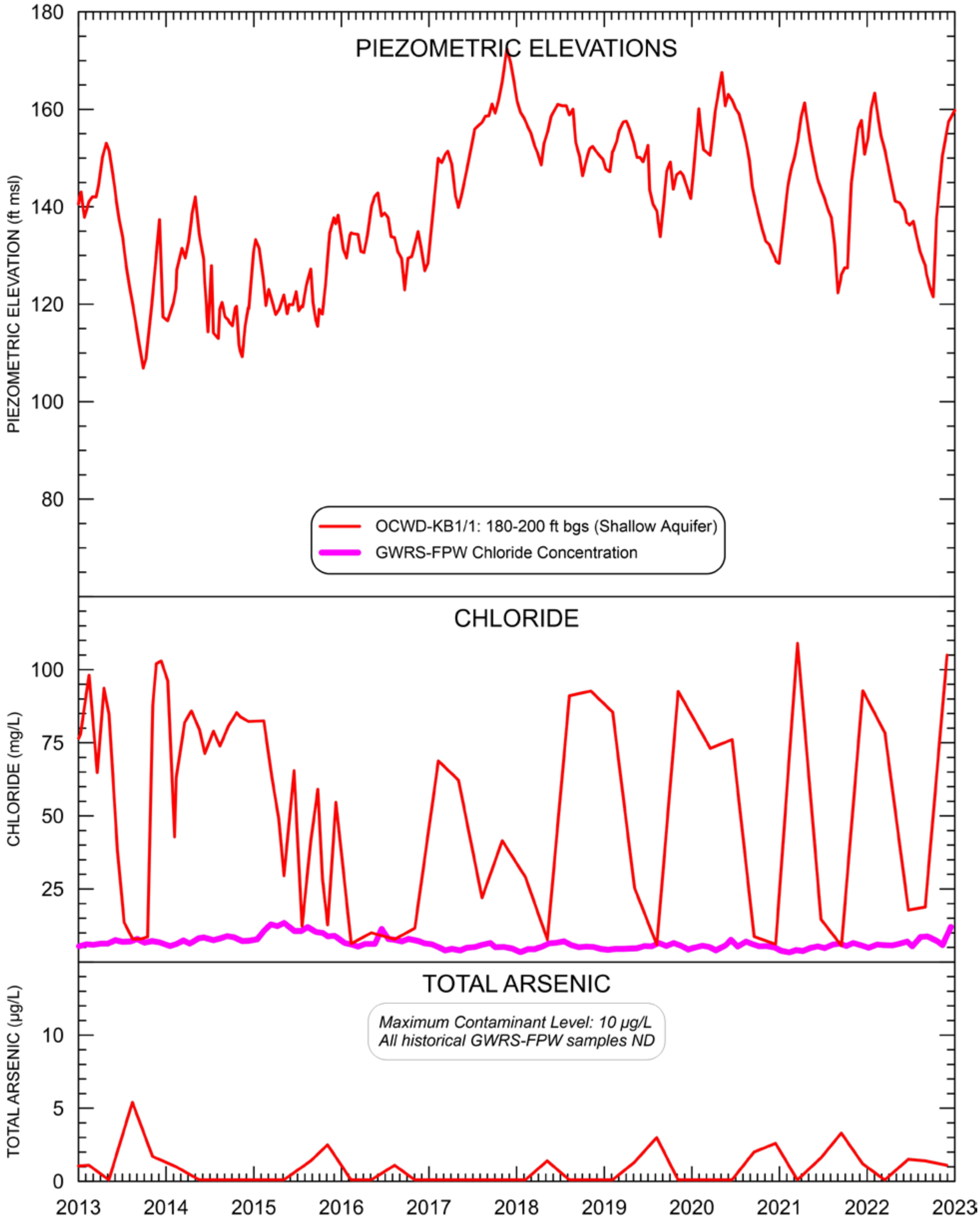


Figure 6-4. Monitoring Well OCWD-KB1 Piezometric Elevations, Chloride Concentration, and Total Arsenic Concentration

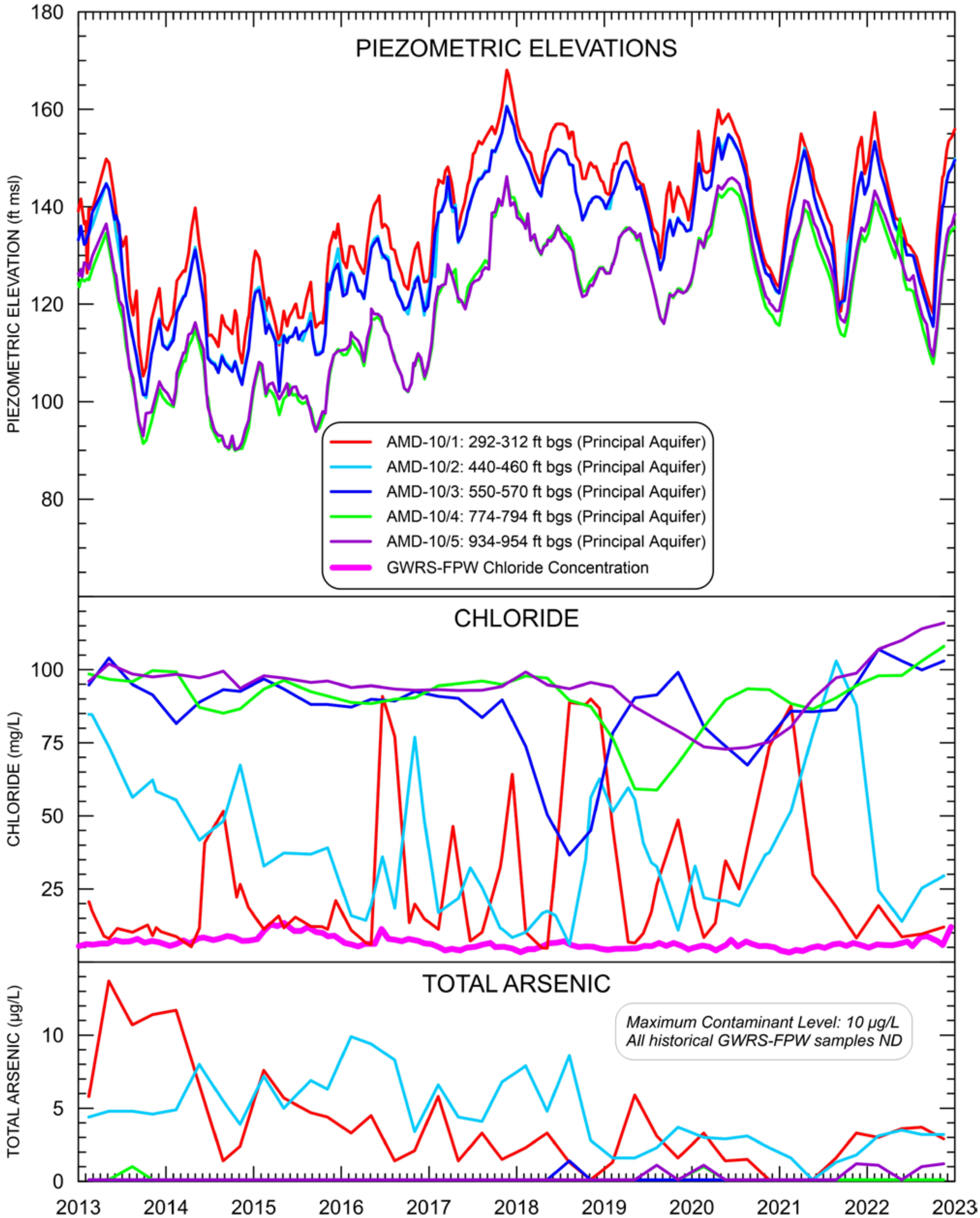


Figure 6-5. Monitoring Well AMD-10 Piezometric Elevations, Chloride Concentration, and Total Arsenic Concentration

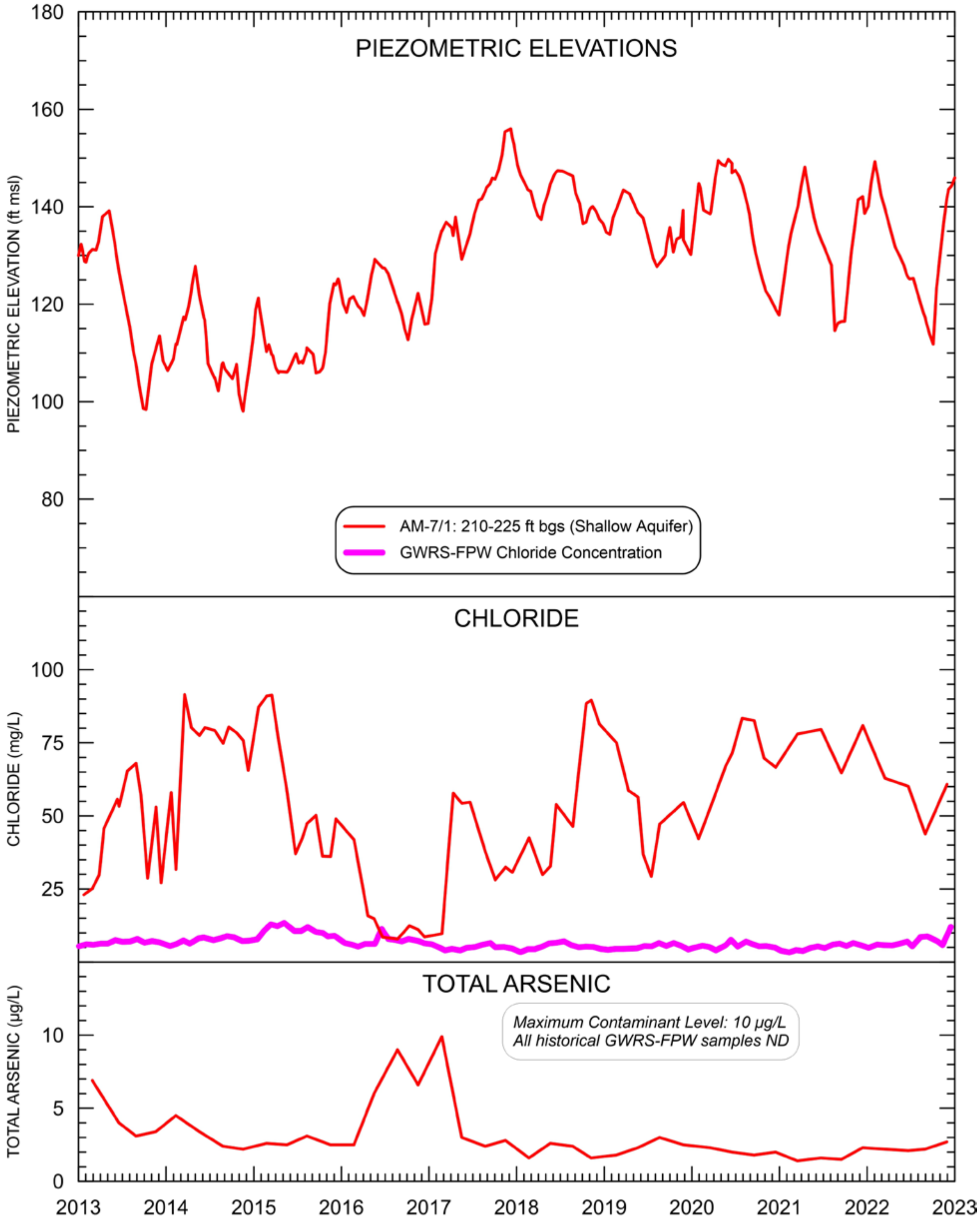


Figure 6-6. Monitoring Well AM-7 Piezometric Elevations, Chloride Concentration, and Total Arsenic Concentration

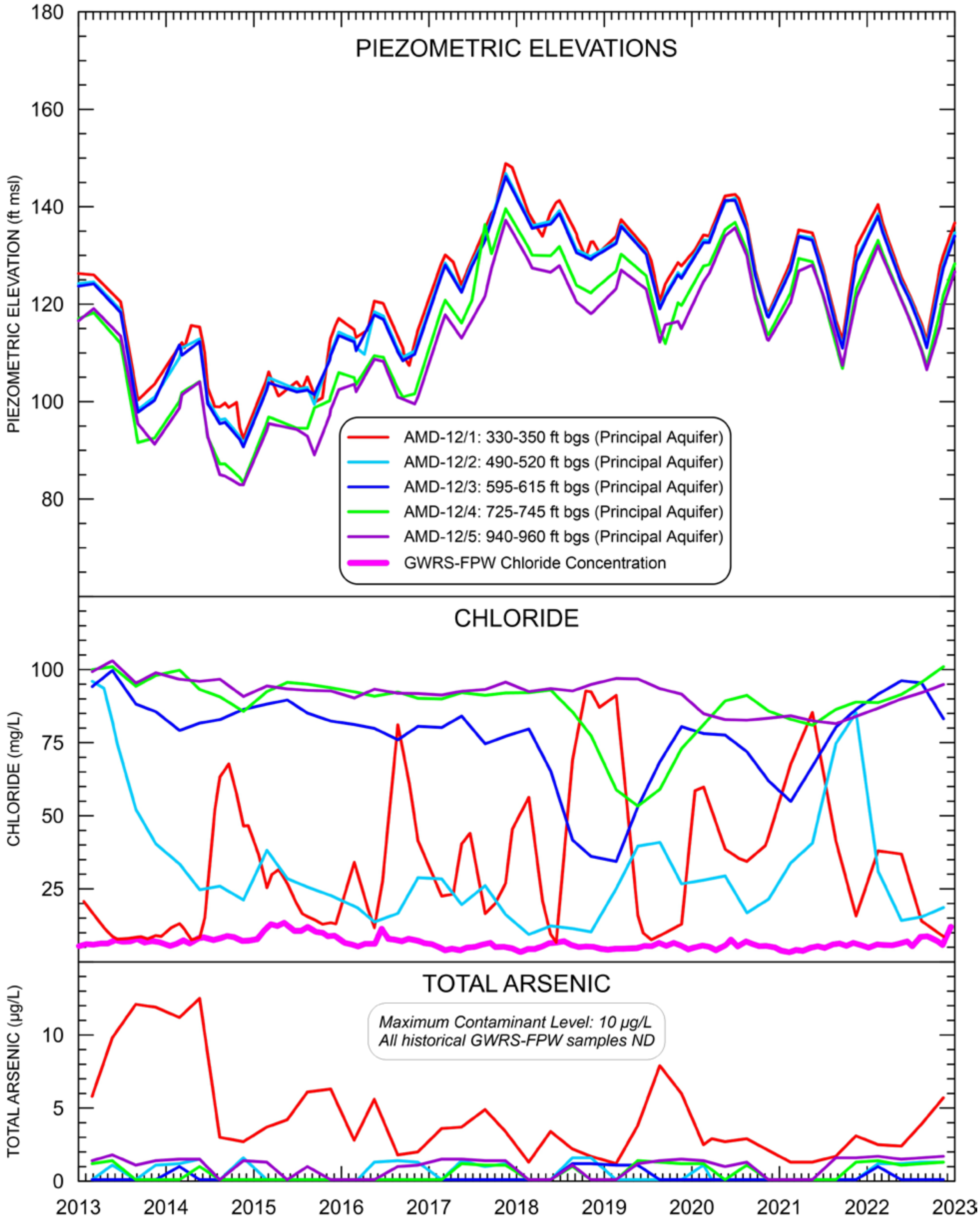


Figure 6-7. Monitoring Well AMD-12 Piezometric Elevations, Chloride Concentration, and Total Arsenic Concentration

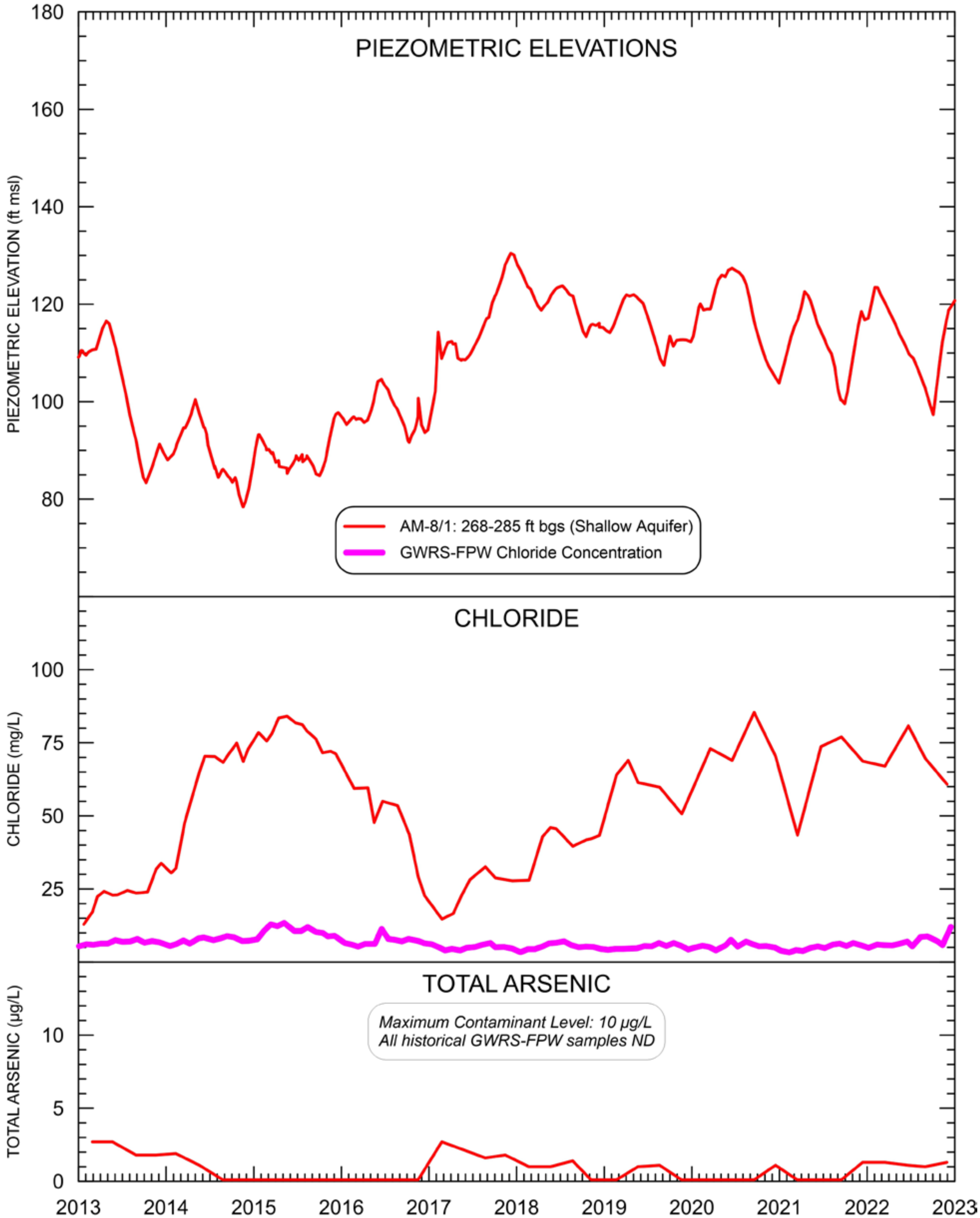


Figure 6-8. Monitoring Well AM-8 Piezometric Elevations, Chloride Concentration, and Total Arsenic Concentration

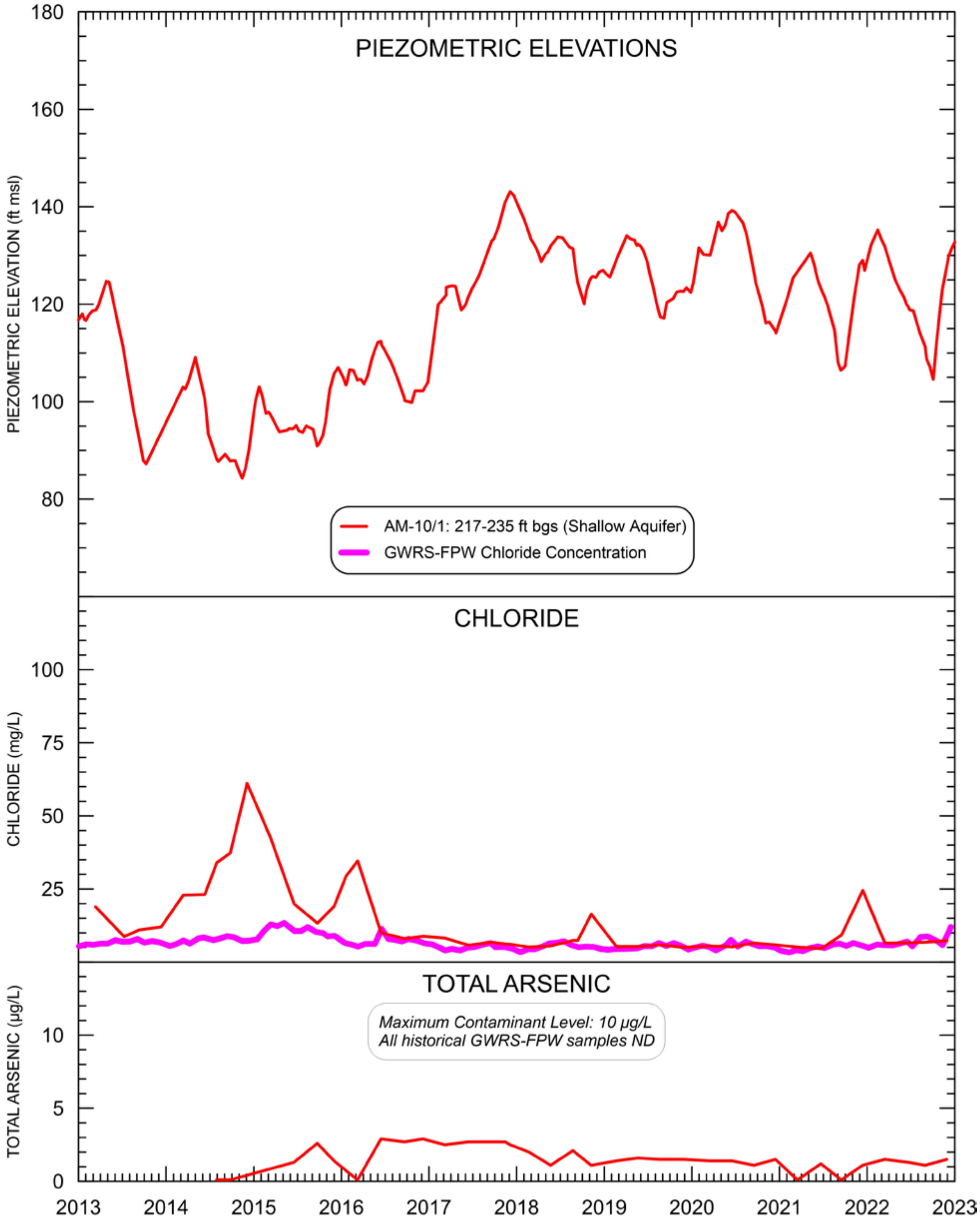


Figure 6-9. Monitoring Well AM-10 Piezometric Elevations, Chloride Concentration, and Total Arsenic Concentration

the warmer late spring and summer months that was amplified by YLWD wells coming back on-line in early 2022 with PFAS treatment.

Groundwater levels rose sharply from October through December 2022 by 25-40 feet at all six monitoring wells to within 5 feet of the February high. This significant rise was due to the typical seasonal decline in groundwater pumping but was enhanced by a large amount of recharge during these months at the Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins complex (Figure 5-6) resulting from nearly 17,000 AF of imported MWD replenishment water recharged in October and November, as well as a combined total of nearly 5 inches of local rainfall in November and December. At all six monitoring wells, groundwater levels at the end of 2022 were approximately 0-5 feet higher than at the beginning of the year.

Of the six monitoring wells shown on Figure 6-4 through Figure 6-9, the four single-point wells (OCWD-KB1, AM-7, AM-8, and AM-10) are screened in the Shallow aquifer, whereas all casings for the two nested wells (AMD-10 and AMD-12) are individually screened entirely in the Principal aquifer. However, all six monitoring wells have very similar groundwater elevation trends; only small differences are seen with depth within the Principal aquifer at nested monitoring wells AMD-10 and AMD-12. As mentioned earlier, the Anaheim Forebay area in the vicinity of K-M-M-L Basins is largely devoid of any laterally extensive low-permeability aquitards. Therefore, the Shallow and Principal aquifers behave quite similarly, and relatively rapid vertical transport of recharge water occurs as evidenced by water quality trends in the next section.

6.4 Groundwater Quality

This section describes monitoring well groundwater quality for general constituents and arsenic in the Anaheim Forebay area in the vicinity of K-M-M-L Basins.

6.4.1 Monitoring Wells – General Water Quality

Quarterly compliance groundwater quality data for 2022 are presented in Appendix J. General groundwater quality data for the past five years (2018-2022) are also summarized in Appendix J for the compliance monitoring wells and well OCWD-KB1. Compliance monitoring wells were tested for: (1) an extensive list of inorganic, organic, and radiological parameters, (2) the majority of U.S. Environmental Protection Agency (EPA) Priority Pollutants, and (3) 1,4-dioxane and NDMA.

During 2022, groundwater quality at the compliance monitoring wells complied with all Federal and State Primary Drinking Water Standards for the specific analytes tested using DDW-approved methods. All 1,4-dioxane and NDMA results were non-detect in 2022. During 2022, some of the analyses at monitoring well sites AM-7, AM-8, and AMD-10 revealed constituents above the EPA Secondary MCL for apparent color, odor, and iron, as well as turbidity at AMD-10/4 and manganese at AMD-10/5. At these monitoring wells, iron was detected above the Secondary MCL, however dissolved iron concentrations were relatively low and well below the Secondary

MCL, except for occasional increases both prior to and after commencement of GWRS recharge, confirming that particulate iron from corrosion of the mild steel monitoring well casing is likely the primary contributing factor causing any Secondary MCL exceedances for total iron. The particulate iron from the corroding well casings may also cause increased levels of apparent color and odor at these well sites.

At AMD-10/5, manganese has consistently been detected above the Secondary MCL of 50 μg/L since September 2007, prior to commencement of GWRS recharge at Kraemer-Miller Basins in January 2008. Manganese concentrations finally decreased below the Secondary MCL in late 2019 along with a contemporaneous decrease in chloride concentrations for the first time that signaled the first arrival of GWRS water at this deep well. Unlike iron, dissolved manganese concentrations were approximately the same as total manganese. During 2022, dissolved manganese increased slightly above the Secondary MCL for the first time since late 2019 to 60 μg/L in the second quarter and then dropped just below the Secondary MCL at 47 μg/L in the fourth quarter. The minor increase in dissolved manganese during 2022 was contemporaneous with an increase in chloride concentrations at this well, likely implying a non-GWRS manganese source or release trigger, such as arrival of SAR recharge following a GWRS arrival event.

All other Secondary MCL exceedances at AM-7, AM-8, AM-10, and AMD-10 during 2022 were consistent with the prior monitoring data collected from 2008-2022 and were not associated with the presence of GWRS purified recycled water.

The RWQCB and DDW approved a revised groundwater monitoring frequency beginning in 2011 and 2010, respectively. The revised monitoring frequency allows for selected analytes with no detections to be monitored on an annual basis in lieu of quarterly (RWQCB, 2011 and CDPH, 2010a). In 2018, the groundwater monitoring program was revised to monitor annually in lieu of quarterly for total nitrogen, thiobencarb, and foaming agents and eliminate total coliform monitoring (RWQCB, 2018 and DDW, 2018a). These changes were formalized as part of the revised GWRS permit Monitoring and Reporting Program (M&RP) issued by the RWQCB in November 2020 (RWQCB, 2020a).

In 2022, DDW approved additional changes to the groundwater monitoring program. Priority pollutants with no detection in the most recent two years of quarterly monitoring were eliminated from the required monitoring and monitoring well AMD-10, which is largely duplicative of well AMD-12 showing similar concentration and water level trends across 15 years of monitoring, was eliminated as a compliance monitoring well. The revised monitoring program was included in the new GWRS permit M&RP issued by the RWQCB in December 2022. However, the monitoring data discussed in this report for 2022 is reflective of the older, 2020 M&RP since monitoring requirements under the new permit did not go into effect until January 2023.

6.4.2 Monitoring Wells – Intrinsic Chloride Tracer and Arsenic

As shown earlier in Section 4 for the Talbert Barrier area, dissolved chloride concentrations can be used to trace the subsurface movement of groundwater because chloride is relatively unaffected by sorption, chemical, or biological reactions in the aquifer. Thus, chloride is a good conservative tracer. Groundwater flow paths determined from groundwater level monitoring are also verified by comparing groundwater quality changes and trends in the recharge source water with nearby monitoring wells, primarily using chloride concentrations and EC. However, since applied recharge in the Anaheim Forebay comes from multiple sources (see Section 5), water quality responses at the monitoring wells discussed in this section do not always follow a single source water trend.

Chloride concentration time series for the 10-year period 2013-2022 for the six monitoring wells near K-M-M-L Basins are shown on the middle graph on Figure 6-4 through Figure 6-9. Since the running 10-year period shown in these figures begins in 2013, the first arrival of the low-chloride GWRS signal at many of these monitoring wells is not shown in these figures and is discussed more thoroughly in Section 6.4.2 of prior years' Annual Reports.

Prior to GWRS start-up in January 2008, chloride concentrations in all six wells had similar overall trends, fluctuating somewhat from year to year but remaining within a range of approximately 80-120 mg/L, reflective of SAR water and MWD imported supplies from the Colorado River, which historically have been OCWD's primary source of recharge water in the Anaheim Forebay. Occasional decreases below this range prior to GWRS start-up were indicative of periods of greater SAR storm water recharge and/or greater recharge of MWD imported supplies from the State Water Project (SWP), both of which feature relatively lower EC, TDS, and chloride concentrations, but still significantly higher than for GWRS purified recycled water. Since the initial deliveries of GWRS water in January 2008 to Kraemer-Miller Basins, in July 2012 to Miraloma Basin, and in November 2016 to La Palma Basin, the migration of this purified recycled water in the subsurface was evidenced by chloride concentrations decreasing below 60 mg/L at all six monitoring well sites: OCWD-KB1, AMD-10, AMD-12, AM-7, AM-8, and AM-10. These chloride concentrations below 60 mg/L were lower than the bulk of historical recharge source waters (e.g., SAR water). Furthermore, the timing of these chloride concentration decreases corresponded well with previously established groundwater travel times away from Kraemer-Miller Basins (LLNL, 2004; Clark, 2009). The annual average chloride concentration of GWRS water has ranged from 4-7 mg/L since 2008 except for 2015 when it was slightly higher at 11 mg/L. The chloride concentration of GWRS water is largely dependent on the performance and age of the AWPF RO membranes, as well as OC San feed water quality.

Previous studies have indicated the potential for surface spreading of reverse osmosis purified wastewater to mobilize metals from alluvial aquifer sediments (Li, et al., 2006). In addition to the metals testing for the quarterly compliance monitoring, OCWD implemented a supplemental monthly sampling program of selected monitoring wells downgradient of K-M-M-L Basins to coincide with the first GWRS purified recycled water deliveries to the basins in January 2008.

Of all the metals analyzed, arsenic represents the greatest public health concern and has a Primary MCL of 10 µg/L. The bottom plots of Figure 6-4 through Figure 6-9 feature grouped time series plots of total arsenic concentrations measured quarterly at the compliance monitoring well sites near K-M-M-L Basins for the 10-year period 2013-2022. Arsenic trends associated with the earlier arrival of GWRS water at these monitoring wells are discussed more thoroughly in Section 6.4.3 of prior years' Annual Reports. Dissolved arsenic is also voluntarily monitored at some sites, but dissolved arsenic has consistently shown very similar concentrations and trends as total arsenic. Therefore, only total arsenic is discussed here and referred to simply as arsenic. During 2022, either non-detect, low stable concentrations, or decreases in arsenic were generally observed in all these monitoring wells, with the following exceptions:

- AMD-10/1 – remained somewhat elevated after increasing in late 2021 and peaked at 3.7 µg/L in the third quarter of 2022, before decreasing to 2.9 µg/L in the fourth quarter;
- AMD-10/2 – increased to 3.1 µg/L in the first quarter, peaked at 3.5 µg/L in the second quarter, and remained stable at 3.2 µg/L during the third and fourth quarters; and
- AMD-12/1 – increased from 2.4 µg/L in the second quarter to 5.7 µg/L in the fourth quarter.

Over the course of the GWRS groundwater monitoring program, an inverse relationship between the chloride concentration (representing percentage of GWRS water present) and the observed arsenic concentration at monitoring wells has been observed, i.e., arsenic concentrations have been shown to increase non-linearly as chloride concentrations decrease with the sustained arrival of large percentages of GWRS water. A review of the chloride and dissolved arsenic concentration trends for the monitoring wells in the vicinity of K-M-M-L Basins indicates a generally non-linear and spatially variable relationship between the percentage of GWRS water and arsenic concentration in groundwater, after a minimum threshold percentage of GWRS water reached the monitoring well. The threshold percentage of GWRS water required to cause an initial arsenic concentration rise above background appears to increase with travel distance downgradient from K-M-M-L Basins, implying a greater degree of geochemical stabilization within the aquifer with increased travel distance and/or less available arsenic for mobilization at locations farther downgradient from the recharge basins.

The historical dataset suggests that repeated cycles of sustained 100% GWRS recharge arrival events have resulted in diminishing arsenic peaks with each subsequent sufficiently sustained event due primarily to arsenic mass removal from the aquifer matrix. Similarly, following each sustained 100% GWRS event, low arsenic concentrations due to the subsequent arrival of other recharge sources (SAR flows and imported water) have generally been below the pre-GWRS baseline arsenic concentrations due to arsenic mass removal during the prior sustained 100% GWRS events.

Although the GWRS purified recycled water was the likely cause of the increased arsenic concentrations, it is not an arsenic source. The mechanism leading to the arsenic increases are the result of complex geochemical interactions between the GWRS water and arsenic bound to and/or comprising the aquifer matrix. A historical review of SAR water quality analyses showed arsenic concentrations during the late 1980s as high as 8 to 16 µg/L, which is similar in magnitude to the maximum arsenic peaks observed at the compliance monitoring wells in prior years corresponding to the first arrival of sustained 100% GWRS recharge events. More recent SAR arsenic concentrations generally range between 2 and 5 µg/L. Arsenic is known to adsorb onto naturally occurring alumina, iron, or manganese oxyhydroxides found on mineral surfaces within an alluvial aquifer matrix (Bowell, 1994).

The higher initial pH or lower ionic strength of GWRS water relative to surrounding groundwater has the potential to release this adsorbed arsenic by altering the surface charge of these mineral surfaces relative to their isoelectric point (Welch and Stollenwerk, 2003). To limit arsenic mobilization, the operation of the AWPF post-treatment decarbonation and lime stabilization processes were modified during 2010-2015. Completion of the GWRSIE post-treatment system upgrades in 2015 improved the ability to more closely control the FPW pH, targeting 8.5. During 2016-2021, there were no notable changes to post-treatment operations or GWRS-FPW quality.

In mid-December 2022, the AWPF began receiving water from OC San Plant 2 for GWRSFE, increasing the overall TDS and chloride concentrations of the combined influent. A slight adjustment to the decarbonation bypass volume was made at the AWPF, but no significant other changes were made to the post-treatment operations. The monthly average TDS of GWRS-FPW increased slightly as well as the monthly chloride concentration from 4-9 mg/L during January through November to 12 mg/L in December, reflective of the greater salinity of the combined influent after the introduction of OC San Plant 2 flows.

OCWD's supplemental metals monitoring will continue to evaluate the effects of any operational changes and the DDW, RWQCB, and NWRI GWRS Independent Advisory Panel will continue to be informed of any pertinent findings.

OCWD performed a laboratory study in 2012 with Stanford University aiming to identify the geochemical controls governing metals mobilization with GWRS purified recycled water as well as optimizing post-treatment operating parameters such as pH. Findings revealed the important role of divalent cations in controlling the mobilization of arsenic and that the magnitude of observed arsenic desorption is inversely correlated to the concentrations of calcium and magnesium in GWRS water (Fakhreddine et al., 2015). Cation bridging within finer-grained portions of the aquifer is thought to be the mechanism controlling arsenic mobilization, along with pH-mediated sorption also playing a role.

Comparing Table 5-2, Table 5-3, and Figure 5-6 presented in Section 5 provides a temporal sense of the volume and proportion of GWRS purified recycled water in the vicinity of K-M-M-L Basins relative to other recharge sources in 2022. These factors influence the strength of the GWRS low chloride signal, as well as where and when it is tracked in surrounding groundwater. The chloride and arsenic trends observed at each monitoring well in 2022 are discussed below.

6.4.2.1 Monitoring Well OCWD-KB1

OCWD-KB1/1 is screened in the Shallow aquifer (screened from 180 to 200 ft bgs) adjacent to the southwest corner of Kraemer Basin (Figure 6-3). Chloride concentration trends at OCWD-KB1/1 (Figure 6-4) indicate that this location is dominated by Kraemer Basin recharge with a travel time estimate of approximately one month whenever Kraemer Basin recharge volumes are sufficiently large. Conversely, when Kraemer Basin is empty or operated at a monthly recharge volume less than approximately 1,000 AF, the GWRS water recharged at upgradient Miraloma Basin migrates laterally within the Shallow aquifer to OCWD-KB1/1 within approximately four months. Example historic and recent monitoring well chloride trends at OCWD-KB1/1 demonstrating these flow paths include (Figure 6-4):

- Sustained low chloride concentrations of approximately 10 mg/L in 2016 indicated sustained arrival of GWRS water from the large volumes of GWRS water recharged in Kraemer Basin beginning in January 2016 and lasting nearly the entire year. This was followed by chloride concentrations increasing sharply to nearly 70 mg/L in February 2017 due to the large volume of non-GWRS recharge in Kraemer Basin beginning one month prior, confirming the approximately one-month travel time from Kraemer Basin.

- Chloride concentrations decreased sharply during the first half of 2019 to 6 mg/L by early August, indicating the arrival of GWRS water from the large volumes recharged in Miraloma Basin four months prior in January through April while Kraemer Basin contemporaneously recharged low volumes of non-GWRS water averaging less than 1,000 AF per month.

During 2022, Figure 6-4 shows that chloride concentrations at OCWD-KB1/1 decreased slightly during the first quarter from 93 mg/L at the end of 2021 to 78 mg/L in March, indicating some arrival of GWRS water from Miraloma Basin since Kraemer Basin had reduced recharge of less than 1,000 AF during February and March. Chloride concentrations at OCWD-KB1/1 continued to decline to near-GWRS levels of approximately 18 mg/L in the second quarter and remained low in the third quarter, confirming arrival of GWRS water recharged in Miraloma Basin within four months when Kraemer Basin had little or no recharge from March through September. Chloride concentrations subsequently rose sharply to 105 mg/L during the fourth quarter, demonstrating the shorter one-month arrival of large non-GWRS recharge volumes from Kraemer Basin during October through December.

Arsenic concentrations at OCWD-KB1/1 have remained below the relatively high pre-GWRS background levels of 5-10 µg/L that likely originated from SAR recharge in Kraemer Basin. Figure 6-4 shows that since 2013, intermittent arsenic peaks related to GWRS recharge in Kraemer or Miraloma Basins have remained at approximately 5 µg/L or less. These arsenic peaks were generally lower than the analogous arsenic peaks at AMD-10/1 from the same GWRS recharge events because of the proximity and faster flow path to OCWD-KB1/1 not allowing sufficient distance and time to mobilize arsenic before reaching this well. The non-detections of arsenic at OCWD-KB1/1 were contemporaneous with chloride increases at this well, indicating that these correspond to periods of other non-GWRS recharge in adjacent Kraemer Basin following GWRS recharge events.

6.4.2.2 Monitoring Well AMD-10

AMD-10/1 is screened in the uppermost Principal aquifer (screened from 292 to 312 ft bgs) adjacent to the northwest corner of Kraemer Basin (Figure 6-3). As documented in previous Annual Reports, chloride concentrations at AMD-10/1 (Figure 6-5) historically were not found to be influenced by Kraemer Basin recharge, which likely remained in the Shallow aquifer at this location. Since Miraloma Basin came on-line in July of 2016, when both Kraemer and Miraloma Basins are fully operational, chloride concentrations at AMD-10/1 typically indicate arrival of GWRS recharge from upgradient Miraloma Basin due to hydraulic interference of Kraemer Basin recharge in the Shallow aquifer; this forces Miraloma Basin recharge to first migrate downward into the uppermost Principal aquifer, before migrating westward beneath Kraemer Basin.

During 2022, Figure 6-5 shows that chloride concentrations at AMD-10/1 started the year relatively low (19 mg/L) in the first quarter due to the arrival of GWRS recharge from Miraloma Basin in late 2021. Chloride concentrations decreased further to a low of 9 mg/L in the second quarter and remained low and stable at 10 and 12 mg/L during the third and fourth quarters, respectively. The consistently low chloride concentrations indicated the sustained arrival of nearly 100% GWRS water to this well, likely originating from Miraloma Basin which was on-line with GWRS recharge volumes of greater than 1,000 AF from late 2021 through the first three quarters of 2022.

At the slightly deeper nested monitoring wells AMD-10/2 and AMD-10/3, chloride concentration trends reflecting the operational and recharge source history at K-M-M-L Basins are typically more delayed and dampened compared to the shallowest zone due to extended transport through less permeable vertical flow paths and the associated mixing via dispersive transport. The typical flow path relationships observed at these wells are described below.

- At AMD-10/2 (screened from 440 to 460 ft bgs), chloride concentration trends in this Principal aquifer zone were very similar to the shallower AMD-10/1 since 2014 but were somewhat dampened and lagged by approximately 3-6 months (Figure 6-5). Prior to 2016, GWRS arrival events at AMD-10/2 were more dampened than at AMD-10/1 and thus chloride concentrations did not decline as low as GWRS levels, indicating arrival of much less than 100% GWRS water. After 2016, chloride trends at AMD-10/2 were less dampened and GWRS arrival events were similar in magnitude to AMD-10/1, declining to near GWRS levels during such events and likely attributable to the addition of La Palma Basin in 2016 which hydraulically induced Miraloma Basin recharge to migrate deeper within the Principal aquifer. The most recent example is demonstrated from the chloride peak in August 2021 decreasing sharply to a near-GWRS low of 14 mg/L in May 2022, consistent with and similar in magnitude to the chloride trend at AMD-10/1 and lagged by nearly 6 months.

- At AMD-10/3 (screened from 550 to 570 ft bgs), since 2018 the proportion of GWRS water present appears to be influenced by the magnitude of GWRS recharge at Miraloma Basin relative to nearby basins. During periods of greater overall recharge (e.g., 2017-2018) at K-M-M-L Basins, chloride concentrations experienced their first meaningful decrease indicating GWRS water arrival (Figure 6-5). It is hypothesized that under these conditions, GWRS recharge at Miraloma Basin may vertically migrate deeper near the basins than previously, taking the path of least resistance if the Shallow and uppermost Principal aquifers are largely mounded and thus creating hydraulic interference in this immediate area. During subsequent periods of relatively lower recharge at K-M-M-L Basins, the chloride concentrations at AMD-10/3 increased to levels indicating only residual or no GWRS water present, consistent with the presence of non-GWRS water originating from farther upgradient recharge (e.g., Anaheim Lake).

At the deeper monitoring well AMD-10/4 (screened from 774 to 794 ft bgs) chloride concentrations were relatively stable and remained at high background levels for several years ranging from approximately 90-110 mg/L until the second half of 2018 when chloride concentrations began to finally decrease enough to signal the arrival of GWRS water. This likely reflects the influence of GWRS recharge at La Palma Basin which began in 2016, as well as the aforementioned period of greater overall K-M-M-L Basins recharge from 2017-2018. The chloride trends from 2018-2022 at AMD-10/4 are similar to but more dampened than the corresponding chloride trends at its shallower counterpart AMD-10/3, as well as lagged by 3-6 months.

At the deepest monitoring well AMD-10/5 (screened from 934 to 954 ft bgs), chloride concentrations were also relatively stable and remained at high background levels until mid to late 2019 when chloride concentrations began to finally decrease enough to signal the arrival of some percentage of GWRS water. Figure 6-5 shows that chloride concentrations decreased notably from mid-2019 down to 73 mg/L by mid-2020; this could be related to the trend observed at the slightly shallower AMD-10/4 observed approximately one year prior. During 2021-2022, chloride concentrations at AMD-10/5 rose gradually to background levels, reaching a historical high of 116 mg/L in the fourth quarter of 2022. The 2022 increasing chloride trend was once again consistent with its shallower counterpart at AMD-10/4 and lagged by approximately 6-12 months.

Arsenic concentrations for all five zones at AMD-10 are shown on the lower graph of Figure 6-5 and are discussed below for AMD-10/1 and AMD-10/2. For the deeper zones AMD-10/3, AMD-10/4, and AMD-10/5, arsenic concentrations largely remained non-detect except for brief and intermittent detections slightly above the RDL of 1 µg/L and were consistently at or below pre-GWRS background levels. The lack of any notable arsenic increase in these deeper zones at AMD-10 was consistent with the chloride trends discussed above which indicated arrival of GWRS water at much less than 100% due to dispersive transport along these deeper and slower flow paths.

As shown in Figure 6-5, arsenic concentrations at AMD-10/1 increased slightly above the MCL of 10 µg/L in 2013-2014, contemporaneous with lower chloride concentrations, indicating sustained arrival of near-100% GWRS water. Arsenic concentrations subsequently declined to a historical low of 1.4 µg/L (just above the RDL and well below pre-GWRS background levels) in August 2014 after these two successive GWRS water arrival events.

Similar declines in arsenic concentrations at AMD-10/1 to near or below the RDL in 2016, 2017, 2018, and late-2020/early-2021 likely coincided with the arrival of other recharge sources as indicated by the contemporaneous chloride increase in all four cases.

Following the larger arsenic peak in 2013-2014 at AMD-10/1 (Figure 6-5), successive arsenic peaks in early-2017, early-2019, and late-2021/2022 were also related to sustained arrival of large percentages of GWRS water but were progressively diminished in magnitude with the most recent arsenic peak in late-2021/2022 being the lowest and remaining below 5 µg/L (within pre-GWRS background levels).

During 2022, arsenic concentrations at AMD-10/1 remained relatively stable, ranging from 2.9 to 3.7 µg/L (Figure 6-5), consistent with sustained arrival of near-100% GWRS water throughout the year as evidenced by contemporaneously low chloride concentrations at this well (Figure 6-5). These 2022 arsenic concentrations are within the range of pre-GWRS background concentrations.

At AMD-10/2, arsenic concentrations gradually rose to a historical high of 9.9 µg/L in early-2016 as the percentage of GWRS water arriving at this well from Miraloma Basin finally increased to near-100% for the first time, as denoted by the contemporaneous gradual decrease in chloride concentrations to near GWRS levels (Figure 6-5). As was discussed above, subsequent GWRS arrival events were less dampened (after La Palma Basin on-line) and were very similar to those at AMD-10/1 but lagged by 3-6 months. Therefore, similar to AMD-10/1, subsequent arsenic peaks were smaller than the 2016 peak due to arsenic mass removal with each GWRS arrival event.

During late-2021 and early-2022, arsenic concentrations at AMD-10/2 increased to similar levels as AMD-10/1 and remained slightly elevated for the remainder of 2022 at just over 3 µg/L (Figure 6-5). The sustained but relatively mild arsenic peak in 2022 was likely less than prior peaks due to both arsenic mass removal from prior GWRS arrival events and the 2022 GWRS arrival event never reaching 100% GWRS water as indicated by contemporaneous chloride concentrations slightly above GWRS levels.

6.4.2.3 Monitoring Well AM-7

AM-7/1 is screened in the Shallow aquifer (screened from 210 to 225 ft bgs) and is located approximately 2,000 feet west or downgradient of Kraemer Basin (Figure 6-3). Chloride concentration trends at AM-7/1 (Figure 6-6) have been very similar to those at OCWD-KB1/1 (Figure 6-4) but are typically lagged by 2-3 months and often dampened (i.e., greater dispersion) due to its farther distance downgradient from Kraemer Basin. This pattern is exemplified by the sustained arrival of GWRS water at AM-7/1 during the second half of 2016 (Figure 6-6), nearly identical to the declining chloride trend at OCWD-KB1/1 (Figure 6-4) but lagged by 2-3 months.

During 2022, chloride concentration trends at AM-7/1 (Figure 6-6) were once again consistent with those at OCWD-KB1/1 and were more dampened and lagged by 2-3 months. Chloride concentrations at AM-7/1 declined from 81 mg/L at the end of 2021 to 44 mg/L by the end of August 2022, likely indicating the arrival of some percentage of GWRS water from Miraloma Basin within six months since Kraemer Basin had little or no recharge from March through September of 2022. Chloride concentrations at AM-7/1 subsequently rose during the fourth quarter of 2022 to 61 mg/L in December, indicating the arrival of other non-GWRS water recharged in Kraemer Basin during the fourth quarter of 2022 and confirming the faster travel time of 2-3 months from Kraemer Basin to AM-7/1.

Arsenic concentrations at AM-7/1 are shown on the bottom graph of Figure 6-6 for the 10-year period 2013-2022. Arsenic concentrations declined to a low of approximately 2 µg/L below pre-GWRS background levels during December 2014 and remained low and stable through 2015, likely due to the arrival of other recharge sources having higher chloride concentrations following the 2012 sustained 100% GWRS event accompanied by higher arsenic concentrations at this well. These other recharge sources typically have arsenic concentrations slightly higher than these low reported concentrations of approximately 2 µg/L, but due in part to arsenic desorption during the preceding GWRS sustained arrival events, arsenic in these other recharge sources is likely being adsorbed onto the aquifer matrix surfaces, only to be desorbed again (albeit at much lower peak concentrations) with subsequent GWRS arrival events. Lesser magnitude cycles of arsenic concentration increase and decline were observed in 2016-2017 and 2019-2020.

During 2022, arsenic concentrations remained low and relatively stable at AM-7/1 but had a minor increase from 2.2 µg/L to 2.7 µg/L in the fourth quarter, likely related to a relatively small chloride decrease in the third quarter. This was likely caused by a minor percentage of GWRS water briefly arriving at this well but at much less than 100% and not sustained for long enough to cause a more significant arsenic increase.

6.4.2.4 Monitoring Well AMD-12

AMD-12/1 is located slightly downgradient from AM-7/1 (Figure 6-3) and is screened in the uppermost Principal aquifer (screened from 330 to 350 ft bgs), analogous to AMD-10/1 discussed above. Consistent with historical observations, Figure 6-7 shows that chloride concentration trends at AMD-12/1 during 2019 mimicked those at AMD-10/1 but were delayed by 2-3 months due to AMD-12/1 being farther downgradient from Kraemer and Miraloma Basins. For example, chloride concentrations at AMD-12/1 decreased sharply from May through August of 2019 down to GWRS levels, correlative with a similar chloride decline to GWRS levels at AMD-10/1 (Figure 6-5) three months prior. During 2022, chloride trends at AMD-12/1 were once again similar to those at AMD-10/1 but lagged by approximately three months, increasing slightly during the first half of the year to approximately 38 mg/L and then decreasing for the remainder of the year down to GWRS levels of 9 mg/L in November, indicating sustained arrival of GWRS water at this well once again during the second half of 2022 and likely originating from Miraloma Basin as was discussed above for AMD-10/1.

At the deeper AMD-12/2 and AMD-12/3, observed chloride trends were similar to those at the analogous AMD-10/2 and AMD-10/3, showing a delayed and dampened chloride arrival compared to the shallowest zone. This reflects extended transport through less permeable vertical flow paths and the associated mixing via dispersive transport and is described in more detail below.

- At AMD-12/2 (screened from 490 to 520 ft bgs), Figure 6-7 shows that chloride concentration trends in this somewhat deeper Principal aquifer zone appeared to correlate with the shallower AMD-12/1 but were usually dampened and delayed by approximately 5-6 months. More recent periods of lesser dampening (i.e., greater similarity) of the AMD-12/2 chloride peaks relative to AMD-12/1 may correspond to the lack of any significant GWRS recharge in Kraemer and Miller Basins and consistently reduced recharge in Miraloma Basin during most of 2022 (75% of GWRS Forebay recharge into La Palma Basin during 2022).

- At AMD-12/3 (screened from 595 to 615 ft bgs), Figure 6-7 shows that chloride concentration trends were much more dampened than at AMD-12/2 but not as stable as the progressively deeper zones at this well site. These trends are most consistently correlated with those observed upgradient at AMD-10/3, but lagged by approximately 3-

6 months, as evidenced by the decreasing chloride trend in 2020, increase in 2021 and first half of 2022, and slight decline in the second half of 2022 but remaining relatively high at near-background levels.

At the deeper monitoring wells AMD-12/4 (screened from 725 to 745 ft bgs) and AMD-12/5 (screened from 940 to 960 ft bgs), Figure 6-7 shows that the chloride trends were similar to AMD-10/4 and AMD-10/5 (Figure 6-5), screened at similar respective depths. Chloride concentrations at AMD-12/4 were relatively stable at background concentrations until the second half of 2018 when chloride concentrations decreased, signaling the arrival of GWRS water and likely reflecting the influence of GWRS recharge at La Palma Basin as discussed for AMD-10/4 in Section 6.4.2.2. The chloride trend from 2018-2022 at AMD-12/4 is similar to but more dampened than the corresponding chloride trends at shallower AMD-12/3, as well as lagged by 3-6 months.

At AMD-12/5, Figure 6-7 shows a similar but even more dampened chloride decline from mid-2019 down to 83 mg/L by mid-2020; this could be related to the trend observed at the slightly shallower AMD-12/4 observed approximately one year prior and likely represents a small percentage of GWRS arrival along this slower and more dispersive deep flow path.

Arsenic concentrations for all five zones at AMD-12 are shown on the bottom graph of Figure 6-7 and are discussed below for AMD-12/1 and AMD-12/2. For the deeper zones AMD-12/3, AMD-12/4, and AMD-12/5, arsenic concentrations ranged from non-detect to less than 2 µg/L since approximately 2014 and were slightly less than pre-GWRS background levels that ranged from non-detect to 3 µg/L with fewer non-detects.

At AMD-12/1, arsenic concentration trends (Figure 6-7) mimicked those at AMD-10/1 (Figure 6-5) but were delayed by 2 to 3 months similar to the chloride trends discussed above since AMD-12/1 is located farther downgradient from Kraemer and Miraloma Basins. For example, arsenic concentrations at AMD-12/1 (Figure 6-7) peaked slightly above the MCL of 10 µg/L in 2013-2014 similar to AMD-10/1 but lagged by 2-3 months and consistent with contemporaneously low chloride concentrations at GWRS levels (Figure 6-7).

During 2022, arsenic concentrations at AMD-12/1 remained relatively low and stable at approximately 2.5 µg/L during the first half of the year and then increased to 5.7 µg/L in the fourth quarter. This most recent period of somewhat elevated arsenic concentrations at AMD-12/1 was consistent with the contemporaneous decrease in chloride concentrations at this well (Figure 6-7) that eventually reached GWRS levels by the fourth quarter, indicating arrival of 100% GWRS water but not yet for a sustained duration by year's end.

At AMD-12/2, arsenic concentrations remained within pre-GWRS background levels, ranging from non-detect to less than 2 µg/L, unlike the GWRS-related arsenic increases observed farther upgradient at the analogous AMD-10/2. Arsenic mobilized farther upgradient closer to K-M-M Basins likely re-adsorbed onto the aquifer matrix downgradient of AMD-10/2 as the GWRS water effectively mixed with other groundwater along this more distant dispersive flow path to AMD-12/2.

6.4.2.5 Monitoring Well AM-8

At AM-8/1 (Figure 6-8), screened in the Shallow aquifer (screened from 268 to 285 ft bgs) and representing the compliance monitoring well located farthest downgradient from K-M-M-L Basins (Figure 6-3), chloride concentration trends were typically consistent with those at AM-7/1 (Figure 6-6), but lagged by about 2-6 months and typically more dampened due to dispersive transport along this more distant flow path. The range in lag time from AM-7 to AM-8 was likely due to a combination of seasonally varying groundwater velocities and recharge sources. Example historic and recent chloride trends at AM-8/1 demonstrating this phenomenon include (Figure 6-8):

- Chloride concentrations declined during late 2016 to a low of 15 mg/L in February 2017, indicating a relatively large proportion of GWRS water and corresponding to the observed chloride decline at AM-7/1 about six months prior to a low of 8 mg/L in August 2016 (Figure 6-6). These observations were consistent with the recharge of GWRS water in Kraemer Basin from the second half of 2015 and throughout most of 2016.

- During 2022, chloride concentrations increased slightly in the second quarter to a high of 81 mg/L in June and was consistent with the chloride peak of 81 mg/L at AM-7/1 six months prior (Figure 6-6). Chloride concentrations at AM-8/1 decreased slightly during the second half of the year down to 61 mg/L by November, once again consistent with and more dampened than the chloride decline six months prior at AM-7/1.

Arsenic concentrations at AM-8/1 (Figure 6-8) ranged from non-detect to 2.7 µg/L since 2013, with the upper end of this range corresponding to contemporaneous low chloride concentrations from GWRS recharge events, such as in 2013 and 2017. The non-detect periods for arsenic correspond to when higher chloride concentrations related to arrival of other non-GWRS recharge were observed at this well. Pre-GWRS background arsenic concentrations were at or below the RDL of 1 µg/L at AM-8/1. During 2022, arsenic concentrations at AM-8/1 remained low and stable from 1 to 1.3 µg/L.

6.4.2.6 Monitoring Well AM-10

AM-10/1 is located approximately 3,000 feet downgradient of both Kraemer and La Palma Basins (Figure 6-3) and screened in the Shallow aquifer (screened from 217 to 235 ft bgs). Figure 6-9 shows that chloride concentrations at AM-10/1 mostly remained below 10 mg/L from the second half of 2016 through the first half of 2021, indicating essentially 100% sustained GWRS water arrival at this well in the Shallow aquifer during that time. The brief increase in chloride concentrations at AM-10/1 to 16 mg/L in November 2018 indicated the arrival of some proportion of non-GWRS water at AM-10/1, likely resulting from the lack of GWRS recharge at La

Palma Basin two months prior during September 2018 (when there were no GWRS flows to K-M-M-L Basins). Similarly, the increase in chloride concentrations at AM-10/1 during the second half of 2021 to 25 mg/L by December was likely due to La Palma Basin being off-line with no recharge from August 15 to September 21 during a planned AWPF shutdown in August and cleaning of La Palma Basin in September. Previous tracer tests indicated that the travel time from Kraemer Basin to AM-10/1 (prior to La Palma Basin being on-line) was approximately 2 months for first arrival and nearly 5 months for peak arrival.

Arsenic concentrations at AM-10/1 (Figure 6-9) have ranged from non-detect to 2.9 µg/L since background monitoring began in 2014. Pre-GWRS background arsenic concentrations at this well ranged from non-detect (< 1 µg/L) to 1.7 µg/L. Arsenic concentrations at AM-10/1 began to gradually increase above the RDL in late-2014 and reached a maximum of 2.9 µg/L in December of 2016 one month after commencement of upgradient La Palma Basin with GWRS water. Since then, arsenic concentrations at AM-10/1 have gradually decreased likely due to arsenic mass removal and ranged from 1-2 µg/L during 2022.

6.4.3 Production Well

The closest downgradient potable production well is SCWC-PLJ2 (Figure 6-3) owned and operated by Golden State Water Company (formerly Southern California Water Company). As was shown previously on Figure 6-1, this well is located farther downgradient outside of the primary and secondary four-month boundary areas.

Other potable production wells are located outside the area influenced by the GWRS spreading operations at K-M-M-L Basins.

Table 6-3 summarizes 2022 water quality data at large system production well SCWC-PLJ2, which complied with all federal and state drinking water standards in 2022.

Well SCWC-PLJ2 is screened in the Principal aquifer and likely has never received 100% GWRS water as indicated by chloride concentrations in the well having never decreased to GWRS levels.

Historically, chloride concentrations in this well ranged from 80-100 mg/L prior to the commencement of GWRS recharge in Kraemer and Miller Basins in 2008 and then significantly decreased upon arrival of GWRS water from these basins in 2009 to nearly 20 mg/L. Since then, chloride concentrations at SCWC-PLJ2 have generally cycled within a range of 20-75 mg/L and ranged from 48-68 mg/L during 2022 (Table 6-3). Like the upgradient monitoring wells discussed previously, the proportion of GWRS water at this well fluctuates with recharge operations and supplies.

As shown in Table 6-3, arsenic concentrations at SCWC-PLJ2 during 2022 ranged from non-detect to 1.7 µg/L; the one detection of 1.7 µg/L occurred in June and was the first arsenic detection at this well since 2014. Previously, arsenic concentrations at SCWC-PLJ2 were low since the inception of GWRS recharge at Kraemer and Miller Basins in 2008, ranging from below the RDL of 1 µg/L to a one-time maximum of 2 µg/L. During 2022, there were no detections of either NDMA or 1,4-dioxane at SCWC-PLJ2 (Table 6-3).

Table 6-3. 2022 Water Quality for Potable Well Within the Influence of K-M-M-L Basins

OCWD Well Name	Well Depth (ft bgs)[1]	Perforation Interval (ft bgs)[1]	Distance from Recharge Site (ft)[2]	Concentration [3,4]								
				Arsenic (As), ug/L	Chloride (Cl) mg/L	Bromide (Br) mg/L	Total Dissolved Solids (TDS) mg/L	Nitrate Nitrogen (NO3-N) mg/L	Nitrite Nitrogen (NO2-N) mg/L	Total Organic Carbon (Unfiltered) (TOC) mg/L	n-Nitrosodimethylamine (NDMA) ng/L	1,4-Dioxane (14DIOX) ug/L
Large System Municipal Well												
SCWC-PLJ2	504	402 - 492	5,300	0.6 (ND - 1.7)	61.5 (48.4 - 67.5)	0.020 (ND - 0.068)	360 (270 - 400)	1.13 (0.98 - 1.41)	0.01 (ND - 0.027)	0.35 (0.29 - 0.38)	ND	ND

[1] Feet below ground surface

[2] Distance from purified recycled water spreading: Straight line shortest distance to eastern edge of Kraemer Basin, estimated to the nearest 100 feet

[3] Concentrations are annual averages with annual ranges in parenthesis for the given year

[4] ND: Not detected or less than the detection limit (For average calculations, ND results are applied as 10% of the reporting limit)

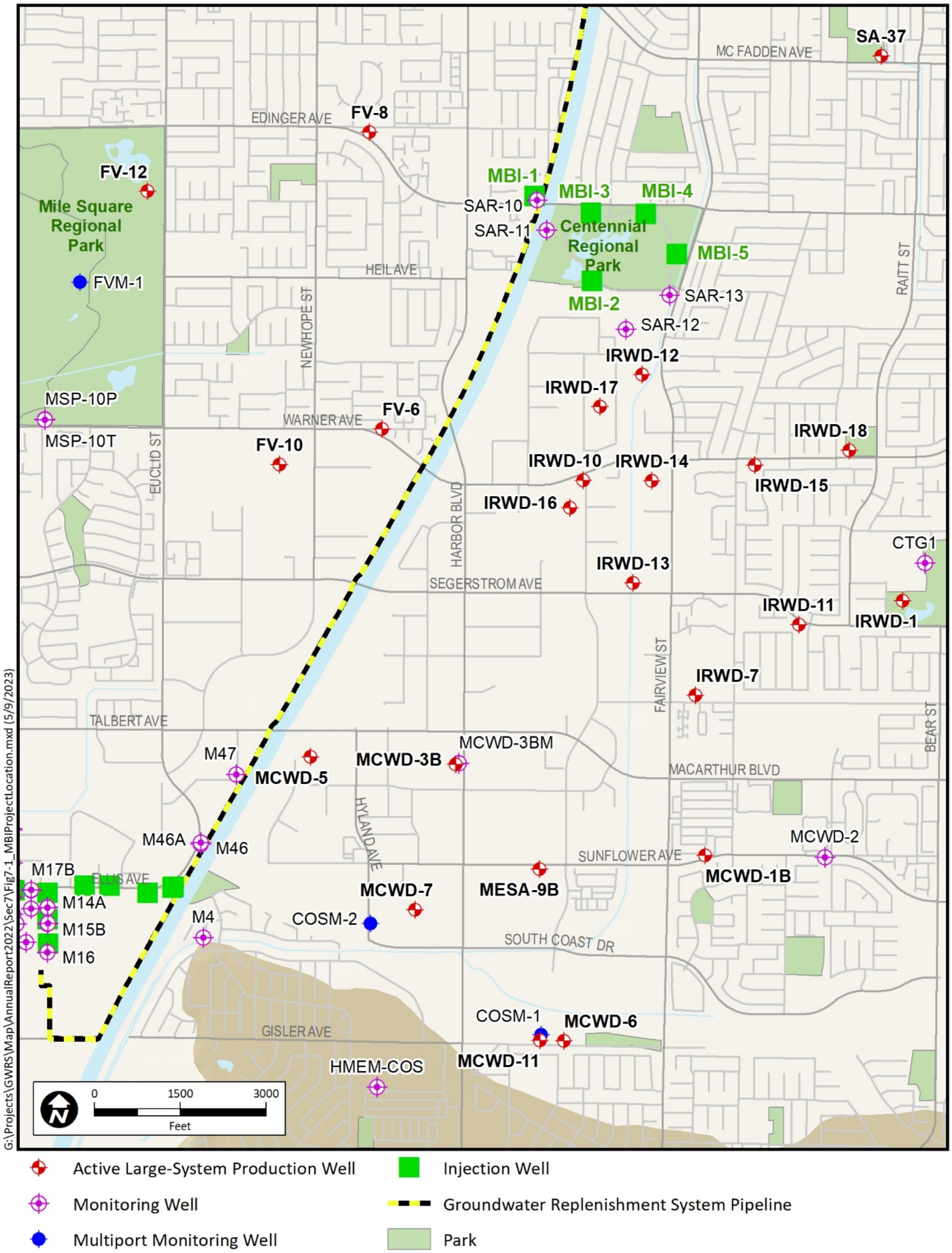
7. MBI PROJECT OPERATIONS

The overall Mid Basin Injection (MBI) Project was implemented in two parts: an initial Demonstration MBI (DMBI) Project that became operational in April 2015, and subsequent MBI Centennial Park Project that began operation in March 2020 (See Figure 1-1). An annual operations summary of the MBI Project including total injection water source, volumes, and flowrates, is presented in this section.

The primary objective of the MBI Project is to provide replenishment of a heavily pumped area of the Principal aquifer with purified recycled water from the GWRS AWPF. The MBI Project also increases the recharge capacity of the Basin, thereby freeing up recharge capacity in the OCWD Forebay spreading grounds for available SAR and imported water flows. Together, the DMBI Project (injection well MBI-1) and MBI Centennial Park Project (injection wells MBI-2, MBI-3, MBI-4, and MBI-5) comprise the MBI Project. Figure 7-1 shows the location of the MBI Project.

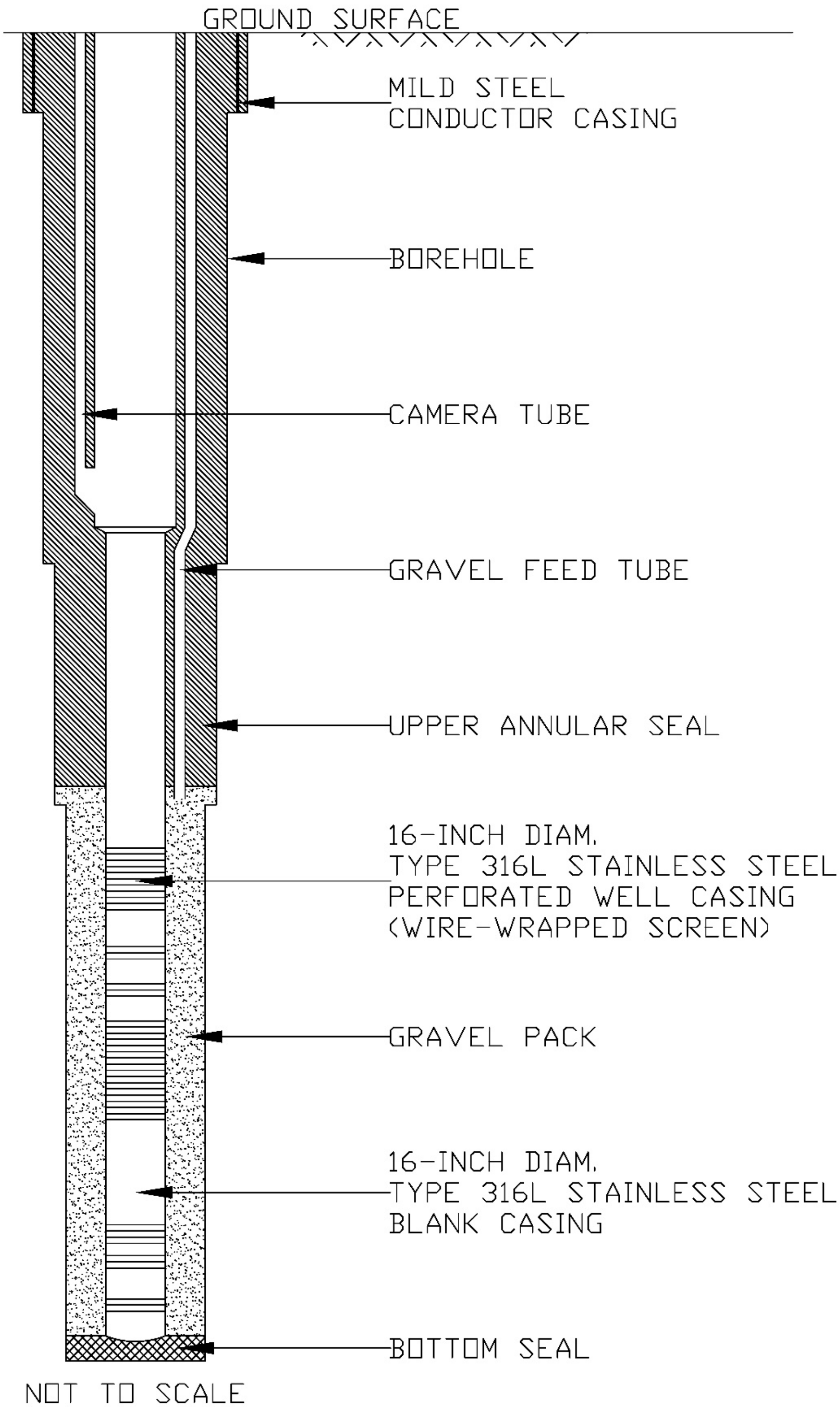
7.1 MBI Project Components

The MBI Project consists of five injection wells (MBI-1 through MBI-5) along with two nearby downgradient multi-depth nested compliance monitoring wells (SAR-12 and SAR-13), located approximately three miles north of the Talbert Barrier, along the GWRS Pipeline at the Santa Ana River and Edinger Avenue (Figure 7-1). As part of the DMBI Project, multi-depth monitoring wells SAR-10 and SAR-11 were also installed immediately downgradient of MBI-1; however, monitoring at SAR-10 and SAR-11 was no longer required as SAR-12 and SAR-13 now serve as the required permit compliance monitoring wells for the MBI Project (RWQCB, 2019 and RWQCB, 2022a). Figure 7-2 shows a generalized well construction diagram representing the five MBI wells, while Table 7-1 summarizes their well construction details. Figure 7-3 shows a photo of an MBI Centennial Park injection well vault. All MBI wells have injected exclusively 100% GWRS water, including MBI-1 starting in 2015 and the four additional wells in March 2020. The concurrent operation of all five injection wells marking the commencement of the full-scale intrinsic tracer test, as required by state regulations (CCR, 2018), is discussed further in Section 8 along with groundwater level and quality data at all four MBI Project monitoring wells.



SOURCE: OCWD (03/2023)

Figure 7-1. MBI Project Location Map



Note: Well construction details generalized to represent all five MBI wells. For screened interval depths, refer to Table 7-1 and for specific as-built diagrams of each injection well, refer to 2020 GWRS Annual Report.

Figure 7-2. Generalized MBI Well Construction Diagram

Table 7-1. MBI Well Construction Summary

MBI-1		MBI-2		MBI-3		MBI-4		MBI-5		
Screened Interval (ft bgs)	Screened Length (ft)	Screened Interval (ft bgs)	Screened Length (ft)	Screened Interval (ft bgs)	Screened Length (ft)	Screened Interval (ft bgs)	Screened Length (ft)	Screened Interval (ft bgs)	Screened Length (ft)	Aquifer Unit
530-540 595-605	10 10	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----	Upper Rho
660-710	50	645-675	30	655-680	25	650-675[1]	25	610-620[1] 630-665[1]	10 35	Lower Rho
----	----	695-720	25	715-735	20	702-722	20	680-715[1]	35	Upper Main
770-780	10	735-745	10	756-766	10	745-755	10	----	----	Main 1
800-830[2]	0	750-760 800-810	10 10	780-815	35	775-830	55	760-800[1]	40	Main 2
----	----	----	----	----	----	----	----	----	----	Main 3
970-980	10	920-930	10	945-965 975-985	20 10	930-940 955-975	10 20	915-935[1]	20	Main 4
990-1,000	10	980-995	15	1,005-1,015	10	----	----	----	----	Main 5
----	----	1,050-1,060	10	1,048-1,058	10	1,030-1,040	10	1,005-1,030[1]	25	Main 6
1,100-1,120	20	1,070-1,085	15	1,095-1,115	20	1,074-1,089	15	1,045-1,060[1]	15	Main 7
1,175-1,190	15	----	----	----	----	----	----	----	----	Main 8
Total:	135		135		160		165		180	

[1] Screened interval depths listed here are based on post-construction downhole video survery and differ from the depths listed in the GWRS Title 22 Engineering Report (OCWD, 2021).

[2] The screened interval from 800-830 ft bgs at MBI-1 was swaged off with a liner due to sand production during test pumping.

Figure 7-3. MBI Centennial Park Injection Well

7.2 MBI Project Injection Water Source, Volumes and Flow Rates

Purified recycled water produced by the GWRS AWPF and delivered via the GWRS Pipeline was the only source of water injected at the five MBI wells (MBI-1 through MBI-5) during 2022. No other water sources are available at the MBI well sites. Blending with other sources is not required (RWQCB, 2019 and RWQCB, 2022a). When the AWPF or the GWRS Pipeline are off-line, the MBI wells are also off-line.

A total volume of approximately 2,531 MG (7,769 AF) of purified recycled water was injected at the MBI Project wells during 2022. A minor volume of approximately 23 MG (70 AF) was pumped from the MBI wells during 2022 during the regular backwash events throughout the year to maintain the injection capacity. The total backwash volume during 2022 represented only 0.9% of total MBI injection. Monthly quantities of GWRS purified recycled water injected and backwash pumped at the MBI Project are summarized in Table 7-2 and illustrated on Figure 7-4.

Table 7-2. 2022 Monthly Injection and Backwash Quantities at MBI Project

Month	Total MBI GWRS FPW Injection[1]			Total MBI Backwash Pumping[1]	
	(Avg. MGD)	(MG)	(AF)	(MG)	(AF)
January	6.78	210.04	644.59	1.44	4.41
February	7.26	203.26	623.78	1.43	4.39
March	6.85	212.43	651.93	2.65	8.12
April[2]	5.50	165.09	506.64	1.48	4.56
May	7.92	245.55	753.55	1.73	5.30
June	7.14	214.25	657.50	3.22	9.90
July	7.11	220.40	676.39	1.55	4.75
August	7.26	225.16	691.00	2.35	7.20
September	7.05	211.50	649.07	1.86	5.70
October	7.03	217.91	668.75	1.61	4.93
November	6.96	208.93	641.19	1.73	5.32
December	6.35	196.90	604.27	1.90	5.82
Totals	**6.94**	**2,531.43**	**7,768.65**	**22.94**	**70.39**

[1] All MBI wells (MBI-1, MBI-2, MBI-3, MBI-4, and MBI-5) based on AWPF flow records. Average daily injection rates are based on the total number of days in each month. Refer to Table 7-4 for on-line daily average injection rates.

[2] Injection volume was limited by the planned AWPF shutdown, April 18-22.

As shown in Table 7-2, the average daily injection rate for the MBI Project during 2022 was 6.94 MGD and ranged from 5.50 MGD in April to 7.92 MGD in May. The MBI Project injection volumes and average daily injection rates were less in April because the MBI wells were off-line from April 16-22 for a planned AWPF shutdown related to GWRSFE construction activities. Total MBI injection volume during 2022 was 12% less than the prior year, despite fewer days off-line. This decrease was primarily due to more frequent reductions in injection flows in response to elevated injection levels.

Table 7-2 shows a total MBI backwash volume of 22.94 MG (70.39 AF) in 2022, an increase of over 25% relative to the 18.26 MG (56.02 AF) backwashed the prior year. The greater backwash volume during 2022 is attributed to an increase in backwash frequency at MBI-3 and MBI-5 from monthly to biweekly from February through the end of the year, as well as more operational days compared to 2021, when more extensive shutdowns reduced the number of backwashes at all wells.

Figure 7-4 shows that total monthly injection volumes were distributed somewhat evenly among the five MBI Project wells throughout 2022, with MBI-5 consistently receiving slightly more injection than the other wells, and MBI-3 receiving less. Figure 7-4 also shows that aside from April, when MBI wells were off-line for seven days due to an AWPF shutdown for GWRSFE construction, MBI Project injection volumes and average daily injection rates were relatively stable throughout the year and only minimally affected by seasonal trends such as regional water level fluctuations.

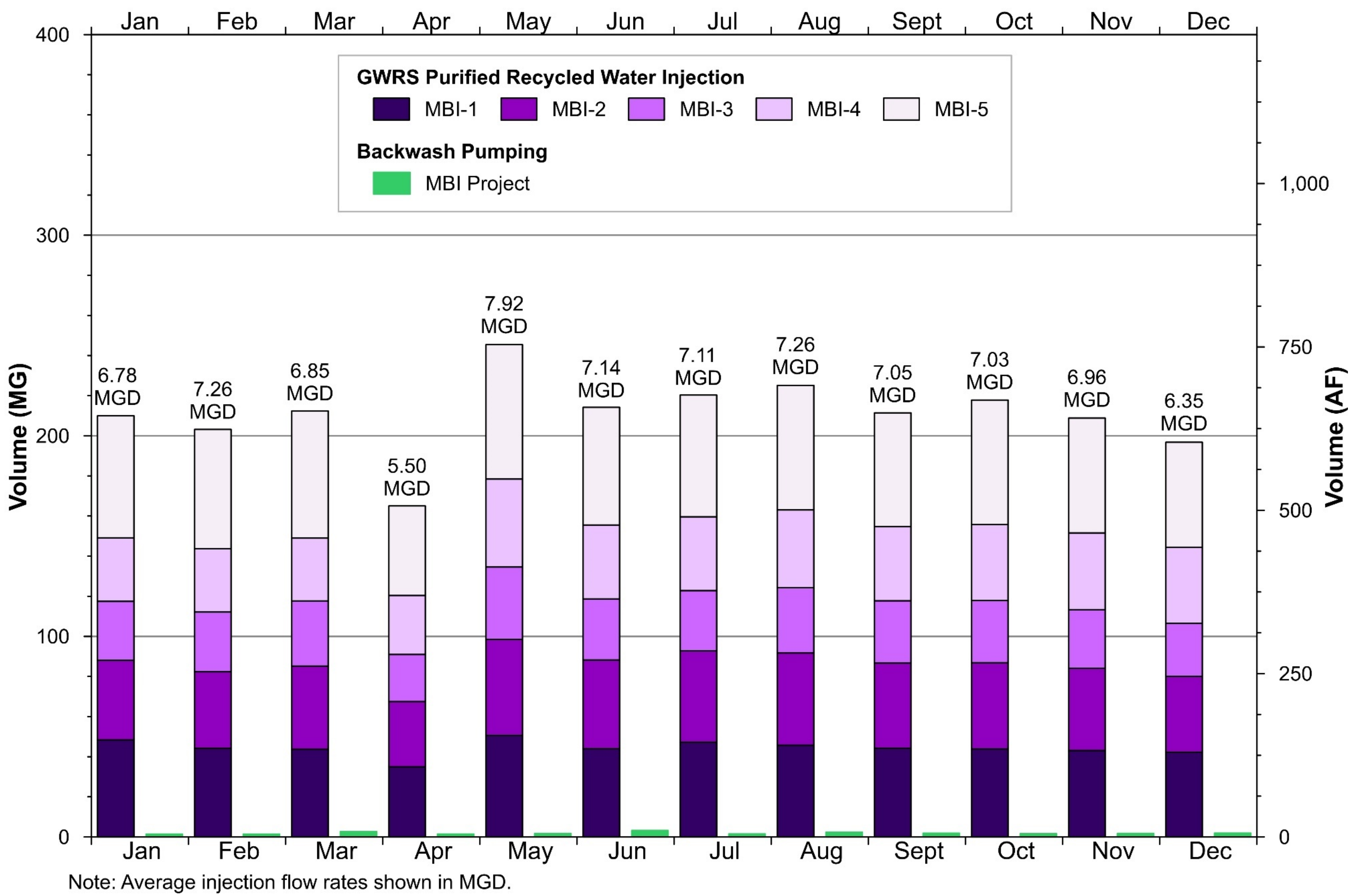


Figure 7-4. 2022 Monthly Injection and Backwash Quantities at MBI Project

Figure 7-4 also shows that during 2022 the average injection rate was stable from January through March, ranging from approximately 6.8 to 7.3 MGD, then decreased significantly in April due to the planned AWPF shutdown. The average injection rate then reached an annual high of 7.92 MGD in May as injection rates and yields increased in the weeks after the shutdown, an occurrence that has been seen regularly immediately after prolonged shutdowns. Additionally, to take advantage of the temporary improved injection conditions during that time, MBI-2 and MBI-4 injection rates were increased as an operational test for approximately three weeks in May. Monthly average injection rates remained stable at just over 7 MGD from June through October, then decreased slightly in the last two months of the year, likely in response to the seasonal rise in regional groundwater levels.

7.3 MBI Project Injection Rates and Yields

OCWD Operations staff continuously monitor operational data from the MBI Project injection wells to target optimal and sustainable operating conditions throughout the year. Optimal operating conditions targeted at each well consist of injection rate set point and backwash frequency, which are adjusted as needed.

An injection rate set point is programmed into the PCS for each MBI well as a practical low to high range for which the automated downhole flow control valve can feasibly operate to achieve the desired injection rate within these limits. To avoid excessive opening and closing of the flow control valves attempting to maintain a precisely constant injection rate, operational experience led to implementing an injection rate set point with a low to high range that spans 75 gpm for MBI-1 and 300 gpm for the four Centennial Park wells MBI-2 through MBI-5. For example, an injection rate set point with a low to high range of 1,100-1,400 gpm would be programmed for a Centennial Park well if the average injection rate were desired to be approximately 1,250 gpm. For simplicity, the average of the injection rate set point low to high ranges are herein referred to as the injection rate set points. The injection rate set points for MBI wells for 2021 and 2022 are listed in Table 7-3 and shown along with measured injection rates and injection yields in Figure 7-5a and Figure 7-5b. Adjustments are typically made to the injection rate set points after a backwash in response to well performance during the preceding backwash cycle for the purpose of maximizing injection volume over time without increasing the required backwash frequency.

Figure 7-5a and Figure 7-5b show MBI Project injection rates during 2021-2022. Injection operations were continuous throughout 2022 except for brief planned and unplanned AWPF shutdowns primarily related to GWRSFE construction, short-term power outages and operational issues, totaling 11 days off-line during 2022. Many of these shutdowns were less than one day duration and thus do not show up in Figure 7-5a and Figure 7-5b, except for the shutdowns of one day or more from April 16-22, June 8, December 5, and December 27. For a complete list of

Table 7-3. 2022 and 2021 MBI Project Injection Rate Set Points

Date[1]	Injection Rate Set Point[2] (GPM)				
	MBI-1	MBI-2	MBI-3	MBI-4	MBI-5
1/1/2021[3]	1,238	1,550	1,050	1,250	1,550
2/24/2021	---	---	---	1,050	---
5/25/2021	---	---	---	1,350	---
7/16/2021	---	---	---	---	1,850
9/15/2021	---	---	1,150	---	---
11/10/2021	---	1,250	---	1,150	---
1/1/2022	---	---	---	---	---
1/17/2022	---	1,050	950	1,050	1,650
2/2/2022	---	---	850	---	1,550
5/5/2022	---	1,250	---	1,150	---
5/11/2022	---	1,350	---	1,250	---
6/1/2022	---	1,250	---	1,050	---
6/15/2022	---	1,050	---	950	1,450
7/6/2022	---	---	---	---	---
8/3/2022	---	1,150	---	1,050	---
12/31/2022[3]	---	---	---	---	---

[1] Date of set point change following a backwash event.

[2] Tabulated set points are the average of the programmed low to high range setting.

[3] No set point change on this date (beginning/end of year).

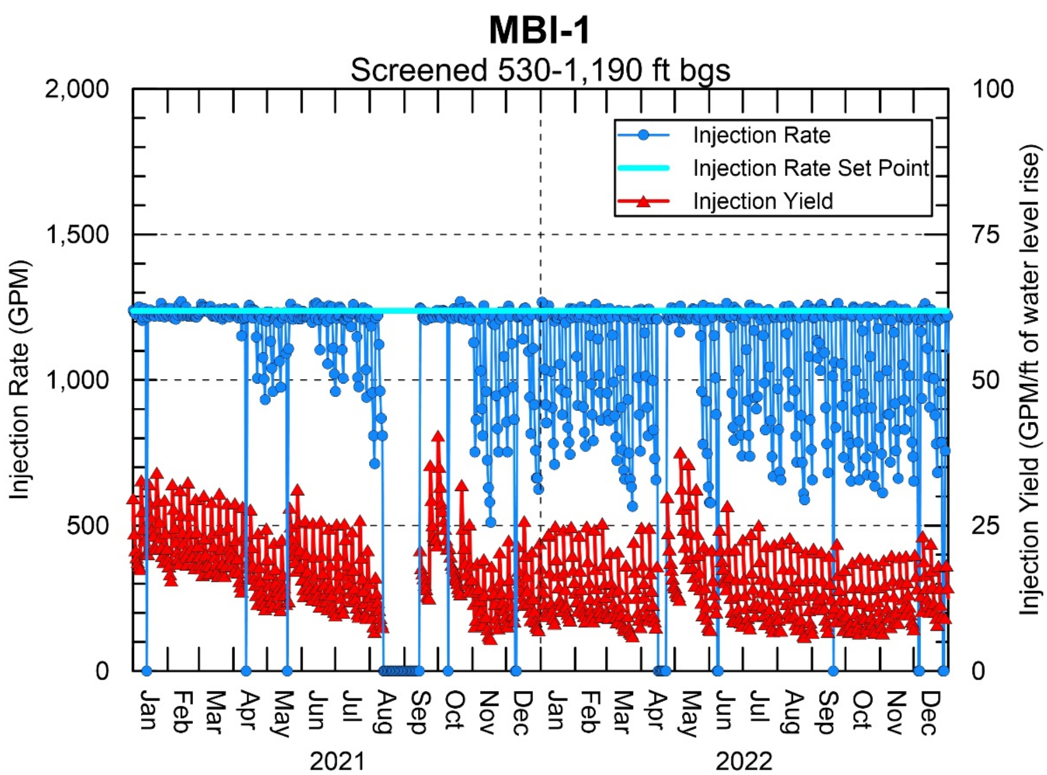


Figure 7-5a. 2021-2022 MBI-1 Injection Performance

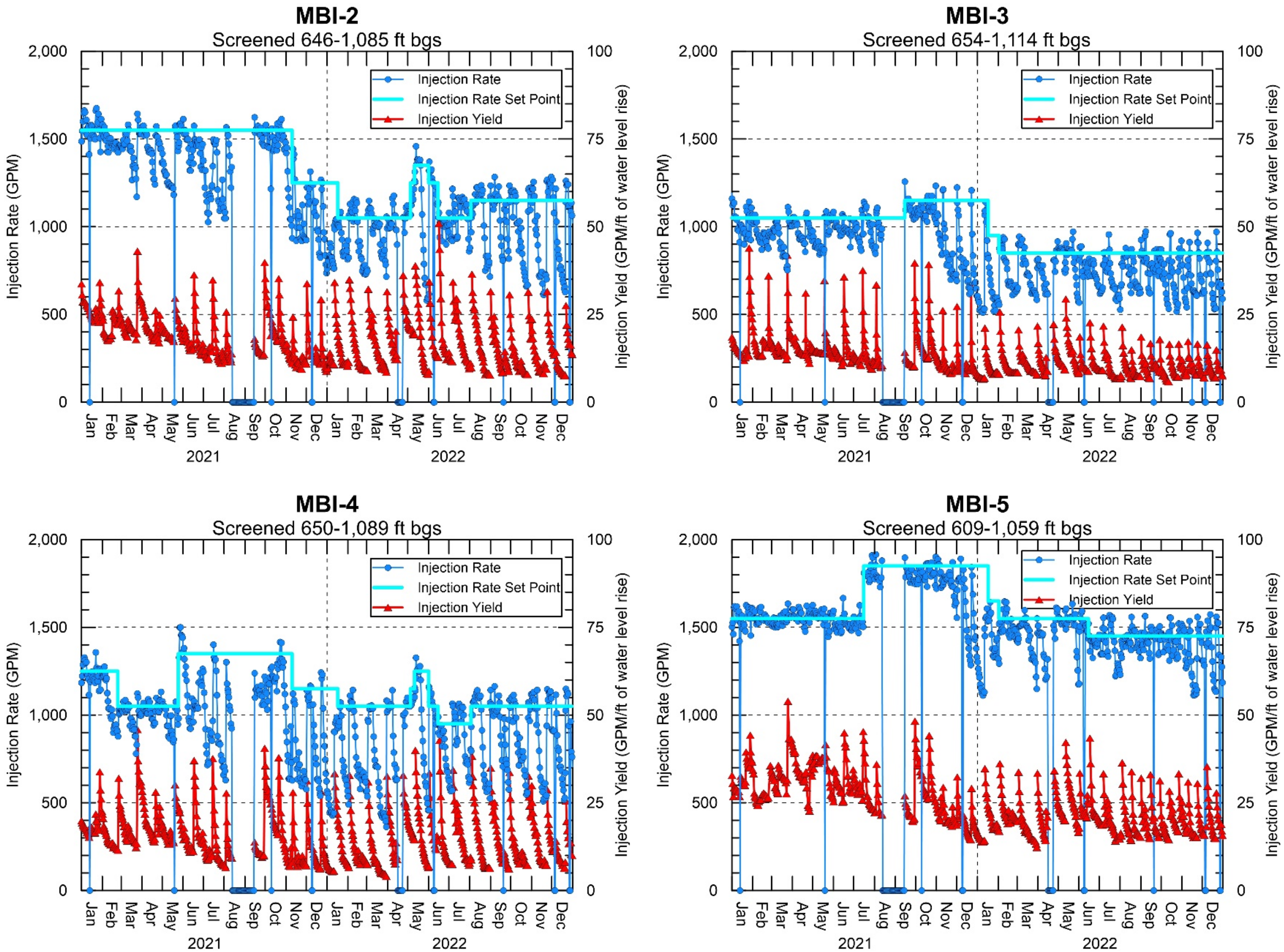


Figure 7-5b. 2021-2022 MBI Centennial Park Injection Performance

AWPF shutdowns, see Appendix F. To avoid irreversible injection well fouling and otherwise avoid elevated operating pressures, if the measured injection level within an MBI well rises to higher than 10 feet bgs, the injection rate is automatically reduced by the downhole flow control valve. Measured injection rates plotting below the lower limit of the concurrent set point range in Figure 7-5a and Figure 7-5b demonstrated these automatic injection rate reductions (AIRRs).

As shown on Figure 7-5a and Figure 7-5b, the average daily injection at MBI-1 during 2022 was 1,013 gpm (1.46 MGD), representing a decrease of 3% relative to the prior year. However, if only days when MBI-1 was operational are considered, the average daily injection at MBI-1 during 2022 was 1,042 gpm (1.50 MGD), representing a 9% decrease relative to the prior year. This can be compared to the short-term historically high injection rates from mid-December 2018 through early January 2019 of approximately 1,770 gpm (2.5 MGD) during injection capacity testing after relining of the Unit 1 GWRS Pipeline. As shown on Figure 7-5a, injection at MBI-1 was initially stable near the injection rate set point of 1,238 gpm (1.78 MGD) for the first three months of 2021, then became reduced and variable (prior to backwash events) due to AIRRs beginning in April 2021. The AIRRs continued through the end of 2022, aside from a brief period in May 2022, after the planned AWPF shutdown, when there was only one instance of an AIRR. Despite frequently high injection levels and subsequent AIRRs, the MBI-1 injection rate set point was unchanged at 1,238 gpm throughout 2021 and 2022.

The average daily injection at MBI-2 during 2022 was 951 gpm (1.37 MGD), representing a significant decrease of 22% relative to the prior year. If only days when MBI-2 was operational are considered, the average daily injection at MBI-2 during 2022 was 978 gpm (1.41 MGD), also a significant decrease of 27% relative to the prior year. As shown on Figure 7-5b, AIRRs began in March 2021 and continued frequently prior to each backwash event for the rest of the year and into 2022. For approximately three weeks in May 2022, MBI-2 injection rates were increased as an operational test, which resulted in a severe AIRR. The injection rate set point was decreased but AIRRs continued for the remainder of 2022, declining to near all-time lows (since commencement in March 2020) of around 650 gpm (0.94 MGD) in the last three months of the year.

The average daily injection at MBI-3 during 2022 was 689 gpm (0.99 MGD), representing a significant decrease of 20% relative to the prior year. If only days when MBI-3 was operational are considered, the average daily injection at MBI-3 during 2022 was 708 gpm (1.02 MGD), also a significant decrease of 25% relative to the prior year. As shown on Figure 7-5b, the injection rates at MBI-3 were subject to only minor AIRRs from early January 2021 until early November 2021, which then became more frequent and pronounced during 2022, declining to annual lows near 500 gpm (0.72 MGD) just prior to backwashing at various times throughout the year despite a reduced set point.

The average daily injection at MBI-4 during 2022 was 821 gpm (1.18 MGD), representing a moderate decrease of 11% relative to the prior year. If only days when MBI-4 was operational are considered, the average daily injection at MBI-4 during 2022 was 844 gpm (1.21 MGD), also representing a moderate decrease of 17% relative to the prior year. As shown on Figure 7-5b, AIRRs began in mid-February 2021 and continued throughout the year, increasing in frequency in the last two months of 2021 and reaching all-time lows in April 2022. For approximately three weeks in May 2022, MBI-4 injection rates were increased as an operational test, which resulted in a severe AIRR. The injection rate set point was subsequently decreased but AIRRs continued for the remainder of 2022, declining to around 500 gpm (0.72 MGD) in the last four months of the year.

The average daily injection at MBI-5 during 2022 was 1,342 gpm (1.93 MGD), representing a decrease of 7% relative to the prior year. If only days when MBI-5 was operational are considered, the average daily injection at MBI-5 during 2022 was 1,380 gpm (1.99 MGD), representing a decrease of 13% relative to the prior year. Figure 7-5b shows that MBI-5 was clearly the best performing MBI well during 2022, with injection relatively stable near the set points and limited AIRRs that never fell below 1,100 gpm (1.58 MGD).

The average daily injection rate of the five MBI wells combined during 2022 was 4,816 gpm (6.94 MGD) based on flow meters at each MBI well, representing a 12% (0.98 MGD) decrease relative to the prior year. The magnitude of this decrease was diminished due to 13 fewer days off-line during 2022 (11 days off-line compared to 33 days in 2021), but the main reason for the decrease in the average daily injection total was the AIRRs in response to elevated injection levels within each well casing. If only days when MBI wells were operational are considered, the average daily injection rate of the five MBI wells combined during 2022 was 4,952 gpm (7.13 MGD), representing a decrease of 18% relative to the prior year. Table 7-4 summarizes the average daily injection rates during both 2021 and 2022 for each of the five wells, showing that MBI-5 had the highest daily average injection rate and MBI-3 had the lowest during both years. Average daily injection rates decreased relative to the prior year for all five MBI wells, with that of MBI-1 decreasing the least (3%) and MBI-2 the most (22%).

Table 7-4. 2022 and 2021 MBI Project Average Daily Injection Rates

Average Daily Injection Rates	MBI-1		MBI-2		MBI-3		MBI-4		MBI-5	
	All Days	On-line Days	All Days	On-line Days	All Days	On-line Days	All Days	On-line Days	All Days	On-line Days
2022 Average (MGD)	1.46	1.50	1.37	1.41	0.99	1.02	1.18	1.21	1.93	1.99
2021 Average (MGD)	1.50	1.65	1.76	1.94	1.24	1.36	1.32	1.46	2.08	2.29
2022-2021 Change	-3%	-9%	-22%	-27%	-20%	-25%	-11%	-17%	-7%	-13%

Figure 7-5a and Figure 7-5b also show the variation of injection yield at the MBI Project wells during 2022. The injection yield is defined as the injection flow rate in gpm per foot of groundwater level rise from static conditions within the injection well and is comparable to the specific capacity for a production well. The repeating cyclical trend in the injection yield at each well was due to the recurring backwash events. Injection at the MBI Project wells resumed 30 minutes after each backwash to first allow groundwater levels to recover back to near-static conditions so that the injection yield could be accurately calculated for the next cycle. The first injection yield value following a backwash event is typically recorded one day after injection is resumed, allowing the injection mound to stabilize.

As expected, the injection yield was always highest immediately following a backwash, then quickly declining thereafter. For a given water source with stable water quality, the rate of injection yield decline is typically proportional to the injection rate; the higher the injection rate, the more frequently backwashing is required. In 2022, the backwash frequency at the MBI wells was generally based on the cumulative volume of water injected between backwashes since this volume dictates the amount of particulate matter that entered the well over the interval, with the exception of MBI-3 and MBI-5, where the backwash frequency was increased from monthly to biweekly from July through the end of the year as an operational test to attempt to restore injection capacity at these wells.

Figure 7-5a and Figure 7-5b show that during 2021 injection yields at all five MBI wells decreased from January until the AWPF shutdown on August 13. After MBI operations resumed on September 14, injection yields temporarily increased, indicating once again that extended shutdowns do temporarily increase injection yields. However, this increase was short-lived; after the first two backwash cycles, the injection yields subsequently decreased for the remainder of 2021, reaching historical lows in November and December. During 2022, injection yields at all five MBI wells remained very stable, increasing temporarily after the AWPF shutdown in April, but never decreasing to levels below those measured in December 2021.

During 2022, average daily injection yields were 14 gpm/ft at MBI-1, 16 gpm/ft at MBI-2, 11 gpm/ft at MBI-3, 14 gpm/ft at MBI-4, and 21 gpm/ft at MBI-5. Table 7-5 provides a comparison of average injection yields during 2022 and 2021 and shows that injection yields at all five MBI wells decreased in 2022 relative to the prior year. Basin storage was approximately the same between the two years and regional water levels increased by only 2-9 feet from 2021-2022 at MBI Project monitoring wells (see Section 8.3.2), indicating that the diminished injection yield in 2022 was likely a result of minor well clogging. Although injection yields at all five MBI wells were overall lower than the prior year, they did not decrease throughout 2022, perhaps indicating a stabilization in well performance with the lower injection rate set points.

Table 7-5. 2022 and 2021 MBI Project Average Injection Yields

Average Injection Yield	MBI-1	MBI-2	MBI-3	MBI-4	MBI-5
2022 Average (gpm/ft)	14	16	11	14	21
2021 Average (gpm/ft)	18	19	15	16	29
2022-2021 Change	-22%	-16%	-27%	-13%	-28%

7.4 MBI Project Backwash Pumping Rates and Yields

During 2022, MBI-1 was backwashed 51 times, MBI-2 and MBI-4 were each backwashed 15 times, and MBI-3 and MBI-5 were each backwashed 20 times. The duration of each backwash event was determined by the rate of sand production from the aquifer formation, with pumping continuing until the sand content decreased to a target of approximately 1 PPM. During 2022, backwash events averaged approximately 45 minutes at MBI-1, MBI-2, and MBI-4, and approximately 90 minutes at MBI-3 and MBI-5.

The pumping rate for each backwash event during 2022 is shown on Figure 7-6. Throughout the year, the backwash process was operated remotely with a pumping rate set point at 3,500 gpm at MBI-1, MBI-2, MBI-4, and MBI-5. At MBI-3, where greater backwash pumping rates have been found to produce large quantities of fine sand from the aquifer formation, the backwash pumping rate set point was 1,500 gpm throughout the year. The lower pumping rate set point at MBI-3 was based on the results of a dynamic video survey performed in January 2021 for the purpose of determining the optimum backwash pumping rate with minimal sand production. The pumping rates of all MBI backwash events were very stable throughout 2022 due to consistent backwash pumping rate set points, with the minor variations in the pumping rates likely caused by fluctuations in regional groundwater levels.

Figure 7-6 also shows the backwash pumping yield or specific capacity for all MBI Project backwash events during 2022. The pumping levels used to determine the pumping yields were measured at the end of each backwash event. Figure 7-6 shows that MBI pumping yields generally remained higher and stable during the first half of 2022, then decreased during the second half of the year. The decrease in pumping yields did not have a clear correlation with regional groundwater trends observed at MBI Project monitoring wells SAR-12 and SAR-13 (discussed in Section 8.3.2) and therefore may have been the result of minor well clogging. The pumping yields at MBI-1 decreased from approximately 39 gpm/ft in January down to 35 gpm/ft in December. Over the same period, the pumping yields decreased from approximately 41 gpm/ft to 35 gpm/ft at MBI-3 and from approximately 52 gpm/ft to 49 gpm/ft at MBI-5. Pumping yields at MBI-2 and MBI-4 remained relatively unchanged over the course of 2022.

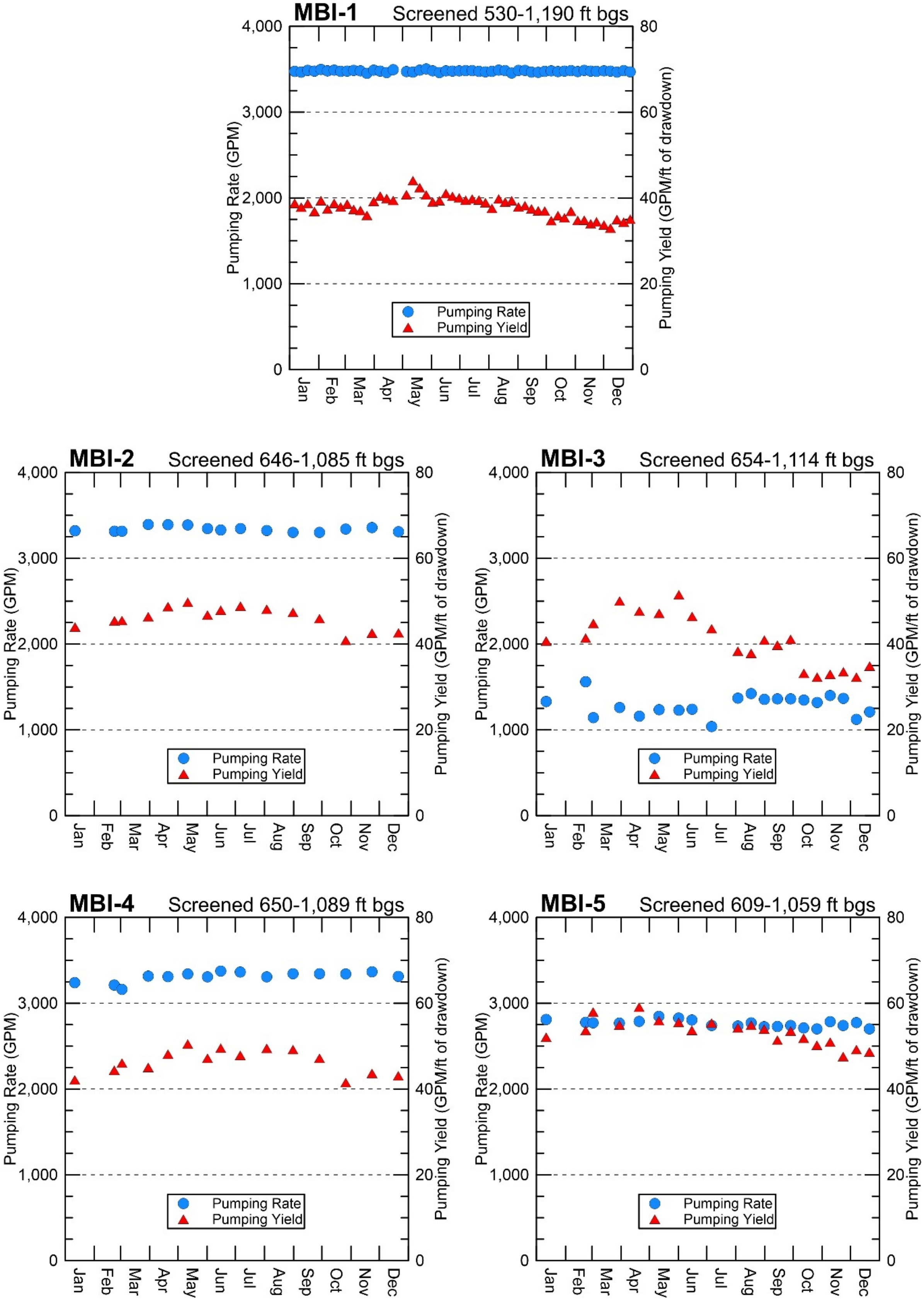


Figure 7-6. 2022 MBI Project Backwash Pumping Performance

A comparison of the average backwash pumping yields of the MBI wells during 2021 and 2022 is shown in Table 7-6. Similar to the injection yields described in Section 7.3, the average MBI pumping yields during 2022 were moderately lower than the prior year with the most significant declines seen at MBI-1 (-10%) and at MBI-3 (-7%).

Table 7-6. 2022 and 2021 MBI Project Average Backwash Pumping Yields

Average Pumping Yield	MBI-1	MBI-2	MBI-3	MBI-4	MBI-5
2022 Average (gpm/ft)	38	46	41	46	53
2021 Average (gpm/ft)	42	48	44	48	55
2022-2021 Change	-10%	-4%	-7%	-4%	-4%

The required backwash frequency provides a gauge of injection well performance. For a given injection rate, the longer the time required between backwashes, the better the injection performance (i.e., the slower the rate of clogging). Based on early operational data prior to relining of the Unit 1 GWRS Pipeline, backwash pumping at approximately three times per week was required for MBI-1 to achieve and maintain its design injection rate of 2 MGD (1,400 gpm). From 2016 to August 2018, slightly lower injection rates averaging 1.5 MGD (1,000 gpm) had resulted in a more acceptable weekly backwash frequency. Post-rehabilitation of the Unit 1 GWRS Pipeline, MBI-1 operational data in 2018 and 2019 indicated a higher sustainable injection rate of 1.7 to 2 MGD with a backwash frequency of one week, which is still more frequent than required by the modern injection wells at the Talbert Barrier (4-8 weeks). Potential reasons for the faster rate of injection yield decline and thus more frequent backwashes at MBI-1 include the following:

- Differences in local geology at the MBI-1 site versus the Talbert Barrier;
- Higher sustained injection rate; and
- Previously accumulated particulate matter from erosion of the GWRS Pipeline mortar lining prior to relining.

The four MBI wells in Centennial Park have generally been backwashed monthly since they came on-line in March 2020. Based on the decline in injection yields observed at each of the four wells during 2021, the frequency of backwash events was increased at MBI-3 and MBI-5 during the second half of 2022 in an attempt to mitigate the loss of injection capacity. This operational test has continued into 2023 and the results will be presented in next year's Annual Report.

Inspection of all five MBI wells geologic drill cuttings revealed an absence of coarse-grained sediments and rare medium-grained sediments, with fine-grained sediments making up the majority of those encountered. The predominance of finer sediments indicates a less permeable aquifer and reduced injection capacity. The fine-grained sediments also tend to physically clog faster than coarse-grained sediments if any particulates are present in the injection water.

As was discussed in Section 3.4, the GWRS purified recycled water has been shown to cause some erosion (breakdown or shedding) of the inner lining of certain reaches of the Talbert Barrier pipeline as well as the interior cement mortar lining of the large 13-mile GWRS Pipeline to the Forebay, which also supplies the MBI wells. As such, Unit 1 of the GWRS Pipeline (from the AWPF product water pump station to the MBI-1 turnout) was rehabilitated during the summer of 2018 by epoxy coating the interior mortar lining to reduce the particulate loading to MBI-1 and eventually to the four MBI wells in Centennial Park which came on-line in March 2020. The epoxy coating in Unit 1 was last inspected in August 2021 and deemed to be in good condition with minor blisters that have split open (comprising less than 1% of the total epoxy area) which will be repaired in the next few years.

8. GROUNDWATER MONITORING AT THE MBI PROJECT

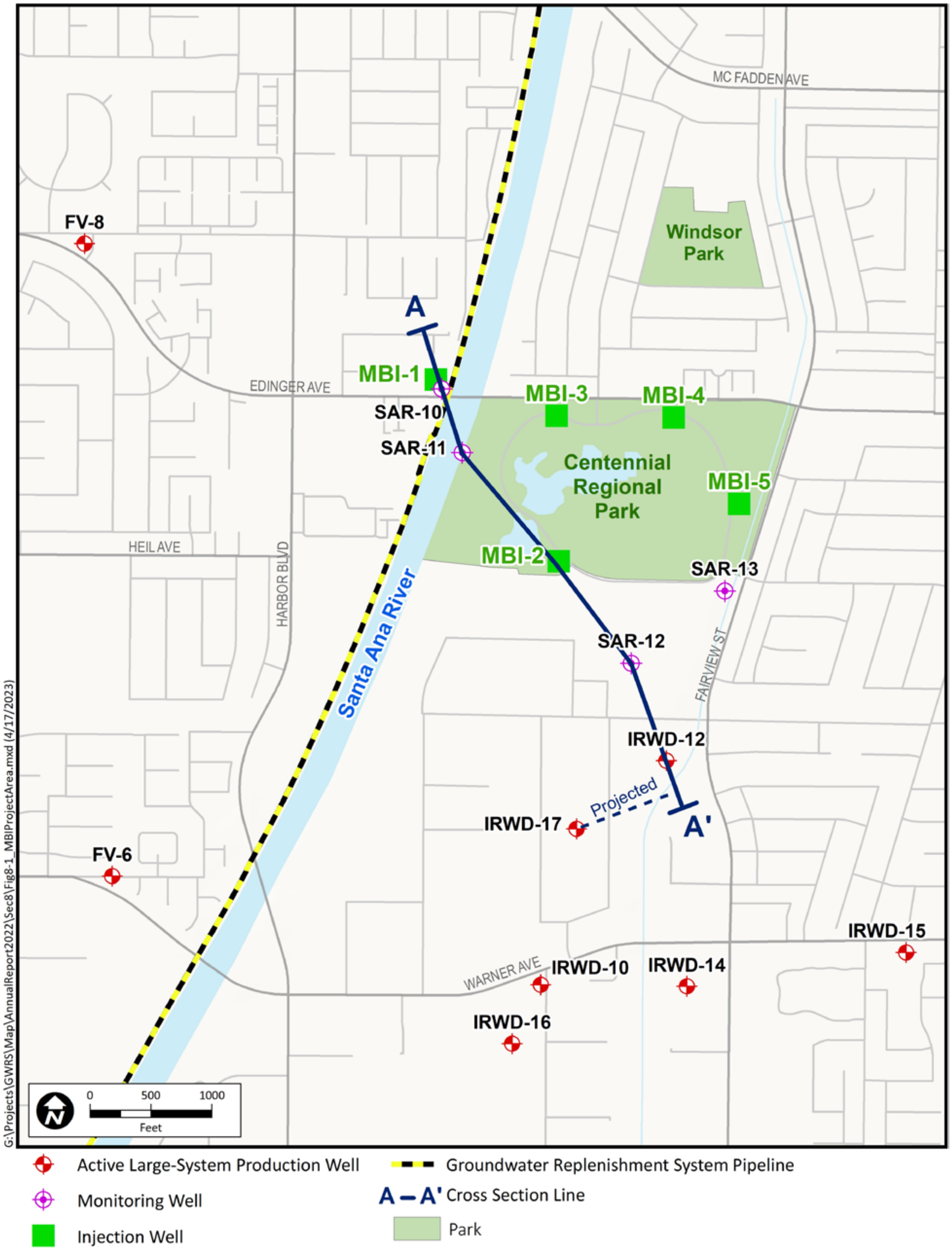
OCWD has maintained a comprehensive groundwater monitoring program throughout the Basin for decades, testing ambient groundwater for various organic, inorganic, and microbiological constituents at OCWD monitoring wells and potable drinking water wells.

As a part of the DMBI project, OCWD began groundwater monitoring activities in 2012 at nested monitoring wells SAR-10 and SAR-11, prior to injecting GWRS purified recycled water at injection well MBI-1 in April 2015. Figure 8-1 shows the location of the MBI Project monitoring wells. Nested monitoring wells SAR-12 and SAR-13 were constructed during late 2017 as part of the subsequent MBI Centennial Park Project. As discussed in Section 7, these two wells were strategically located downgradient of MBI-1 and the four newer MBI wells in Centennial Park, along the flow path towards the nearest drinking water wells IRWD-12 and IRWD-17. SAR-12 and SAR-13 serve as the two required downgradient compliance monitoring wells (CCR, 2018; RWQCB, 2019; RWQCB, 2022a) for the combined five injection well MBI Project which went on-line in March 2020. Data from all four monitoring wells (SAR-10, SAR-11, SAR-12, and SAR-13) are included in this section.

Commencement of GWRS purified recycled water injection at MBI-2, MBI-3, MBI-4, and MBI-5 on March 18, 2020, along with continued injection of GWRS water at MBI-1, marked the start of the full-scale intrinsic tracer test to comply with requirements (RWQCB, 2019) to track the injected GWRS water signal as it migrated to SAR-12 and SAR-13 and farther downgradient to drinking water production wells IRWD-12 and IRWD-17. For purposes of the intrinsic tracer test, all five MBI wells were placed fully on-line on the same day and were operated at relatively high and stable injection rates to the extent possible for the remainder of 2020, except for a three-week off-line period from April 24 to May 13 related to a planned AWPF shutdown for GWRSFE construction activities and GWRS Pipeline inspection.

This section presents the following for calendar year 2022:

- Aquifers in the MBI Project area;
- Overview of groundwater monitoring program;
- Groundwater elevations and directions of flow;



SOURCE: OCWD (03/2023)

Figure 8-1. MBI Project Area and Well Location Map

- Groundwater quality; and
- Groundwater modeling for the MBI tracer test.

8.1 Aquifers in the MBI Project Area

Earlier studies (DWR, 1934; DWR, 1967) divided the Basin into the Forebay and Pressure areas. As was discussed in Section 6, the Forebay refers to the inland area of intake or recharge generally characterized by coarse-grained high permeability sediments (e.g., sands and gravels) and unconfined aquifer conditions, allowing for surface percolation of applied water to replenish the Basin. In contrast, the Pressure area refers to the coastal and central regions of the Basin where the presence of intervening fine-grained low-permeability clay and silt deposits creates confined or pressurized aquifer conditions at depth, thus making large-scale percolation of surface water impractical in these areas. Therefore, the most feasible method of recharge in the Pressure area is by direct injection into targeted confined aquifers.

For the purposes of the OCWD Basin-wide Groundwater Flow Model (Phraner, et al., 2001; OCWD, 2004b) and the Annual Groundwater Storage Change calculation (OCWD, 2007), the Basin has been vertically characterized into three distinct aquifer systems: (1) Shallow, (2) Principal, and (3) Deep. Over 90% of groundwater production in the Basin occurs from the Principal aquifer system. The approximate vertical intervals of the three aquifer systems in the vicinity of the MBI Project are presented in Table 8-1. The Principal and Deep aquifers are both approximately 1,000 feet thick in the MBI Project area and both rise and thin slightly to the southeast towards the IRWD Dyer Road Well Field (DRWF), conforming to the Basin's overall synclinal structure that plunges to the northwest towards the Buena Park area (Herndon and Bonsangue, 2006).

Table 8-1. Approximate Aquifer System Depths in the MBI Project Area

Shallow Aquifer (ft bgs)	Principal Aquifer (ft bgs)	Deep Aquifer (ft bgs)
0 – 250	250 -1,250	1,250 – 2,250

Figure 8-2 shows a schematic geological cross-section through the MBI Project area, extending to the southeast to IRWD-12. Since the cross-section in Figure 8-2 is a generalized schematic, it shows both IRWD-12 and IRWD-17, which are the two nearest municipal production wells directly downgradient from the MBI Project. Figure 8-1 presented earlier shows the schematic cross-section alignment (A-A'), with IRWD-17 being perpendicularly projected onto that alignment.

Extrapolating the same aquifer naming scheme used in the Talbert Barrier area from earlier studies (see Section 4 and DWR, 1966), Figure 8-2 shows that the Shallow aquifer system is comprised of only the Alpha aquifer in the MBI Project area since the Talbert aquifer is not present in this vicinity.

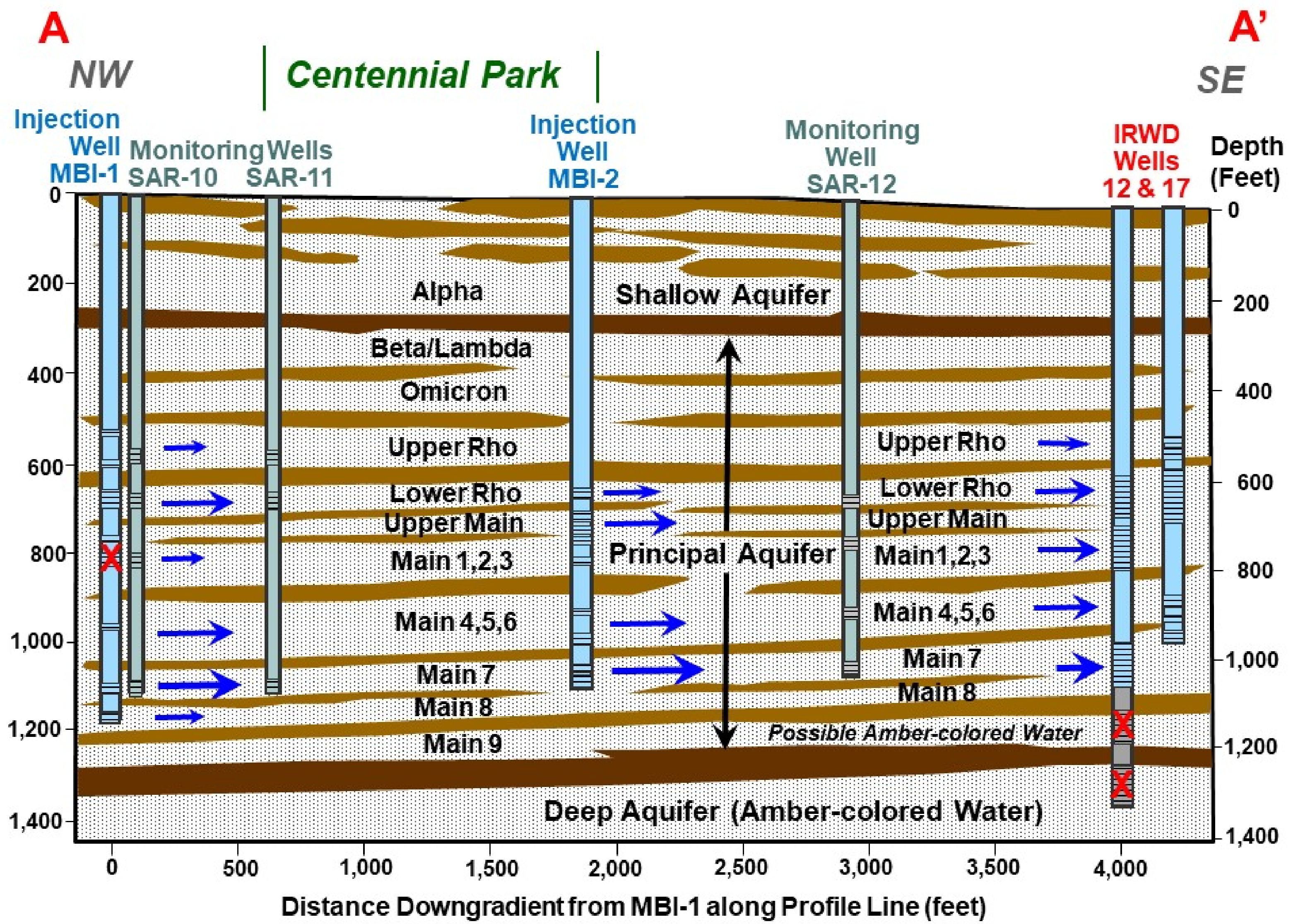


Figure 8-2. Schematic Geological Cross Section Through the MBI Project Area

The Principal aquifer system, from shallowest to deepest, consists of the following individual aquifers:

- Beta and Lambda aquifers, often locally merged;
- Omicron aquifer;
- Upper Rho aquifer;
- Lower Rho aquifer; and
- Main aquifer.

The Main aquifer is the most prolific and thickest aquifer within the Principal aquifer system, typically segregated into multiple discrete subunits separated by low-permeability aquitards that are not entirely laterally extensive (Figure 8-2). Although these Main aquifer subunits tend to be somewhat hydraulically connected to one another with only minor vertical head gradients between them, they were individually correlated across the MBI Project area based on lithologic and geophysical logs from the MBI injection and monitoring wells. Based on the MBI well logs, these Main aquifer subunits have varying hydraulic conductivities and thicknesses that affect the rate of injected GWRS water transport. The individual Main aquifer subunits were numbered from 1 to 9 (from shallow to deep, respectively) with some of these subunits (*e.g.,* subunits 1, 2, and 3) being grouped together based on the interpreted stratigraphy, as shown in Figure 8-2.

Due to the synclinal structure of the Basin plunging to the northwest, the aquifers comprising the Principal aquifer system rise slightly to the southeast from MBI-1 to the nearest production wells, IRWD-12 and IRWD-17. The shallowest Principal aquifer system zones (Beta and Lambda) were interpreted to be approximately 50 feet shallower at IRWD-12 and IRWD-17, while the deepest Principal aquifer system zones (Main 8 and Main 9) were interpreted to be as much as 100 to 150 feet shallower at IRWD-12 and IRWD-17 than at the MBI-1 site (Figure 8-2). The correlated aquifer names and depths in the MBI Project area and the nearby production wells were based on review of all hydrogeologic data for the MBI wells and nearby production wells, including geophysical logs, existing OCWD Basin-wide geologic cross-sections in the vicinity, and depth-specific groundwater level and quality data, especially from SAR-10, SAR-11, SAR-12, and SAR-13.

All five MBI wells were screened entirely within the Principal aquifer system and were constructed similarly to nearby production wells (Figure 8-2, Table 7-1).

The Principal aquifer system has significantly lower groundwater levels than the Shallow and Deep aquifer systems in the MBI Project area and throughout most of the Basin, due to the large volume of pumping from the Principal aquifer system. Therefore, the greatest need for replenishing the Basin in the MBI Project area is within the Principal aquifer system, especially due to the proximity to the IRWD DRWF, where pumping often lowers groundwater levels to 100 feet below mean sea level in the summer months.

Downward vertical gradients typically exist between the individual aquifer units comprising the Principal aquifer system in the MBI Project area and throughout the larger Pressure area of the Basin, with groundwater levels generally becoming progressively lower with each successively deeper Principal aquifer system unit; groundwater levels are typically highest in the shallowest Beta and Lambda aquifers, and lowest in the deepest Main aquifer subunit. These vertical gradients have consequences for injection well performance. For production or injection wells screened across these Principal aquifer system units, groundwater level differences can cause wellbore flow under static or idle conditions, effectively producing water from screened intervals with higher head (pressure) and injecting this same water back out of the well into screened intervals with lower groundwater head. Under pumping and injection conditions, such groundwater level differences and each unit's transmissivity can significantly influence the amount of water pumped from or injected into each screened interval (OCWD, 2010).

Spinner log tests have been performed at MBI-1 and the four MBI wells in Centennial Park to determine the relative contribution of each individual screened interval during backwash pumping and injection conditions. At MBI-1, pumping and injection spinner log tests were conducted in August 2015, but then a new injection spinner log test was conducted at MBI-1 in July 2020 when injection spinner logs were also completed at the four MBI wells in Centennial Park. The pumping and injection contribution within each Principal aquifer system unit varies considerably from one MBI well to another (refer to Table 8-2 of the 2021 Annual Report for the percent contribution of pumping versus injection for each screened interval) and is likely caused primarily by differences in aquifer thickness, screened interval length, and hydraulic conductivity at the different MBI locations. These local heterogeneities in the MBI Project area are confirmed and consistent with the lithologic and geophysical logs at the five MBI wells.

8.2 Groundwater Monitoring Program

The MBI Project follows a groundwater monitoring program like those conducted within the other GWRS recharge areas (Talbert Barrier and K-M-M-L Basins). SAR-12 and SAR-13 serve as the two required downgradient compliance monitoring wells in both the older (CCR, 2018; RWQCB, 2019 and 2020a) and newer (RWQCB, 2022) GWRS permits for the combined five injection well MBI Project. Data from all four MBI monitoring wells (SAR-10, SAR-11, SAR-12, and SAR-13) are included in this section, and their screened interval depths and aquifer zones are summarized in Table 8-2.

Nested monitoring wells SAR-10 and SAR-11 were screened in Principal aquifer system zones corresponding to individual screened intervals at MBI-1 for the purposes of monitoring the fate and transport of the injected GWRS purified recycled water from the DMBI Project. SAR-10 has four separate monitoring well casings each screened at different depths and nested together in one borehole, while SAR-11 has three nested monitoring well casings (Figure 8-2). Similarly, SAR-12 and SAR-13 were screened in Principal aquifer system zones corresponding to individual

Table 8-2. Monitoring Wells at the MBI Project

OCWD Well Name	Date Completed	Nearest Injection Well [1]	Approximate Distance and Direction from MBI well	Nearest Drinking Water Well	Well Depth (ft bgs)	Aquifer Name
SAR-10/1[2]	05/10/2012	MBI-1	80 ft SE	IRWD-12	590-600	Upper Rho
SAR-10/2[2]	05/10/2012	MBI-1	80 ft SE	IRWD-12	690-710	Lower Rho
SAR-10/3[2]	05/10/2012	MBI-1	80 ft SE	IRWD-12	800-820	Main 2
SAR-10/4[2]	05/10/2012	MBI-1	80 ft SE	IRWD-12	1,100-1,115	Main 7
SAR-11/1[2]	11/10/2011	MBI-1	650 ft SE	IRWD-12	592-602	Upper Rho
SAR-11/2[2]	11/10/2011	MBI-1	650 ft SE	IRWD-12	675-690	Lower Rho
SAR-11/3[2]	11/10/2011	MBI-1	650 ft SE	IRWD-12	1,100-1,110	Main 7
SAR-12/1	01/15/2018	MBI-2	1,000 ft SE	IRWD-12	605-625	Lower Rho
SAR-12/2	01/15/2018	MBI-2	1,000 ft SE	IRWD-12	755-775	Main 2
SAR-12/3	01/15/2018	MBI-2	1,000 ft SE	IRWD-12	915-930	Main 4
SAR-12/4	01/15/2018	MBI-2	1,000 ft SE	IRWD-12	1,045-1,055	Main 7
SAR-13/1	10/30/2017	MBI-5	500 ft S	IRWD-12	600-620	Lower Rho
SAR-13/2	10/30/2017	MBI-5	500 ft S	IRWD-12	750-770	Main 2
SAR-13/3	10/30/2017	MBI-5	500 ft S	IRWD-12	910-930	Main 4
SAR-13/4	10/30/2017	MBI-5	500 ft S	IRWD-12	1,045-1,055	Main 7

[1] The closest injection well is not necessarily the fastest source of injection water based on estimated arrival times and inferred groundwater flow directions.

[2] Monitoring well sites SAR-10 and SAR-11 are not compliance wells per the old GWRS permit (RWQCB, 2019) and new GWRS permit (RWQCB, 2022). Monitoring at these sites continues voluntarily.

screened intervals at the four MBI wells in Centennial Park (MBI-2 through MBI-5) for the purposes of monitoring the fate and transport of the injected GWRS water from the MBI Project. SAR-12 and SAR-13 both have four nested monitoring well casings and are screened in the same aquifer zones except they are not screened in the Upper Rho aquifer like SAR-10 and SAR-11 because MBI-2 through MBI-5 do not inject into the Upper Rho aquifer (Figure 8-2 and Table 8-2).

One of the main constituents monitored along the injection flow path is arsenic since mobilization of aquifer sediment-bound arsenic has been shown to occur at some locations in association with the recharge and injection of GWRS purified recycled water. Total arsenic, other metals, and general minerals such as chloride, sulfate, and TDS were sampled at least quarterly at SAR-10 and SAR-11 from 2012 through 2022 and from 2018 through 2022 at SAR-12 and SAR-

13. Dissolved arsenic, dissolved vanadium and selected other constituents have been sampled at least quarterly as part of the metals mobilization monitoring program since April 2015 (when MBI-1 was placed on-line with GWRS water) at SAR-10 and SAR-11 and since 2018 at SAR-12 and SAR-13.

Groundwater levels at SAR-10, SAR-11, SAR-12, and SAR-13 were manually measured approximately monthly during 2022. In addition, all zones of all four wells were equipped with automated data loggers and pressure transducers for at least daily groundwater level monitoring prior to commencement of the MBI Project intrinsic tracer test in March 2020 to monitor the associated rise in groundwater levels. The monthly hand-measured water levels were used to verify that the pressure transducers were accurate and within acceptable calibration limits.

Groundwater level and quality results from all four monitoring wells have been instrumental in determining groundwater flow patterns and velocities emanating from the MBI Project area. Data from these four monitoring wells were also used to help refine and calibrate a groundwater flow and transport model of the MBI Project area as discussed in Section 8.5.

8.3 Groundwater Elevations and Directions of Flow

This section discusses groundwater elevations and groundwater flow paths within the Principal aquifer system in the MBI Project area.

8.3.1 Principal Aquifer System

For the MBI Project, the Principal aquifer system is of primary concern since all five MBI wells are screened in this aquifer zone, as are the nearest downgradient production wells (IRWD-12 and IRWD-17) that will receive injected GWRS water from the project. Principal aquifer system groundwater elevations vary considerably due to seasonal fluctuations in the amount and location of Basin pumping, as well as year-to-year changes in Basin groundwater storage. However, regional groundwater flow directions have remained relatively stable in the greater MBI Project area over the last several years.

Figure 8-3 shows interpreted groundwater elevation contours and inferred groundwater flow directions for the Principal aquifer system for June 30, 2022. Groundwater levels from SAR-10/4, SAR-11/3, SAR-12/4, and SAR-13/4, all screened in the Main 7 Principal aquifer subunit (Table 8-2), were used to help construct and constrain these Basin-wide regional contours in the MBI Project area, and all five MBI wells were operational at the time of the groundwater level measurements. Also, IRWD-12 and IRWD-17 were both on-line pumping during the time of the groundwater level measurements and therefore did not have a static water level measurement to help constrain the contours downgradient of the MBI Project. As shown on Figure 8-3, groundwater elevations in the Principal aquifer system were approximately 50 feet below mean sea level in the northwest portion of the MBI Project area between SAR-10 and SAR-11, approximately 3 feet higher than in June 2021. In the southeast portion of the MBI Project area

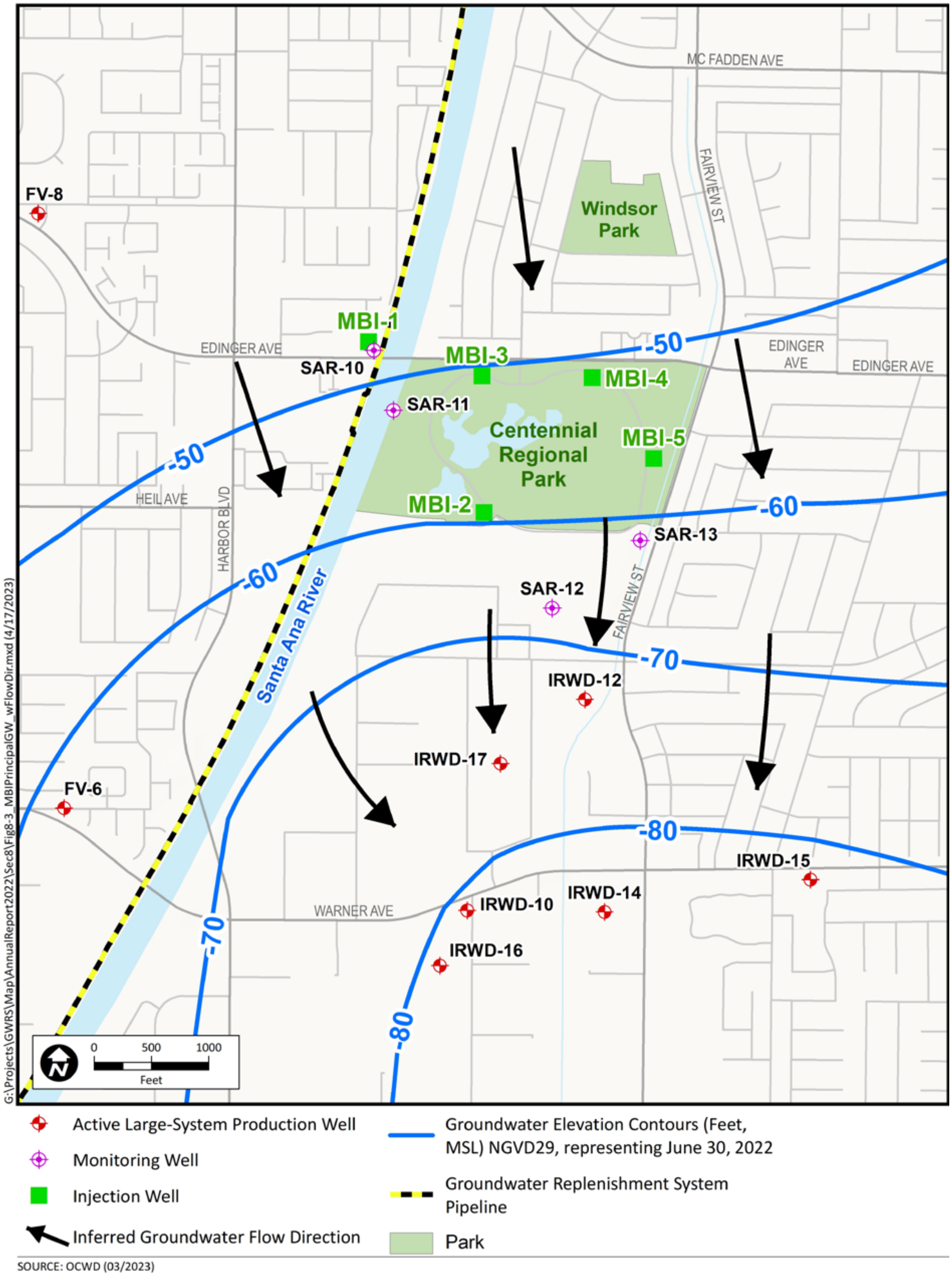


Figure 8-3. Principal Aquifer System Potentiometric Surface with Inferred Groundwater Flow Directions in the MBI Project Area During 2022

between SAR-12 and SAR-13, Principal aquifer system groundwater elevations were approximately 65 feet below mean sea level, the same elevation as in June 2021. The minor increase in groundwater elevations of 0-3 ft in the Principal aquifer system in the MBI Project area is consistent with observations throughout the Basin as there was no change in Principal aquifer system storage from June 2021 to June 2022. The uniformity of the groundwater flow directions and gradients between the two years throughout the greater MBI Project area is attributed to comparable pumping at the IRWD DRWF and injection at the MBI Project in 2021 and 2022.

Based on the Principal aquifer system groundwater elevation contours in Figure 8-3, the inferred groundwater flow direction in the MBI Project area is to the south towards the IRWD DRWF, as compared to southeasterly in years prior to MBI Project wells coming on-line.

The closest downgradient production wells to the MBI Project are IRWD-12 and IRWD-17, both located approximately 2,200 feet downgradient from the nearest MBI wells, MBI-5 and MBI-2, respectively. As such, the inferred groundwater flow directions in Figure 8-3 indicate flow from MBI-5 towards IRWD-12 and from MBI-2 towards IRWD-17. Figure 8-3 shows that Principal aquifer system groundwater elevations near IRWD-12 at the end of June 2022 were approximately 72 feet below mean sea level, just 3 feet higher than in June 2021 and consistent with the minor rise in Principal aquifer system groundwater levels observed throughout the Pressure area of the Basin and in the four monitoring wells during that period. Due to continued MBI Project injection, the hydraulic gradient across the localized Centennial Park injection site in June 2022 was almost exactly as it was in June 2021, which is slightly flatter than in years prior to the MBI Project wells coming on-line. Also like June 2021, the gradient was much steeper south of Centennial Park towards the IRWD DRWF relative to years prior to the MBI Project wells coming on-line. However, in addition to the effects of MBI Project injection, the hydraulic gradient in this area can also be significantly influenced by variations in the timing and amount of pumping from nearby production wells, especially in the IRWD DRWF.

8.3.2 Monitoring Well Trends

Groundwater level hydrographs for MBI Project monitoring wells SAR-10, SAR-11, SAR-12, and SAR-13 are shown on the upper graph of Figure 8-4, Figure 8-5, Figure 8-6, and Figure 8-7, respectively. These figures also show chloride concentrations, which are discussed in Section 8.4.1 and NDMA concentrations, which are discussed in Section 8.4.2. Figure 8-4 and Figure 8-5 show groundwater level, chloride, and NDMA data from 2014 through 2022, which includes over one year of ambient background data before MBI-1 came on-line in April 2015. Figure 8-6 and Figure 8-7 show groundwater level, chloride, and NDMA data from 2018 through 2022, which includes two years of background data before the MBI Project came on-line in March 2020. All four MBI Project monitoring wells are screened in the Principal aquifer system, with separate Groundwater level trends at the MBI Project monitoring wells typically follow a seasonal pattern:

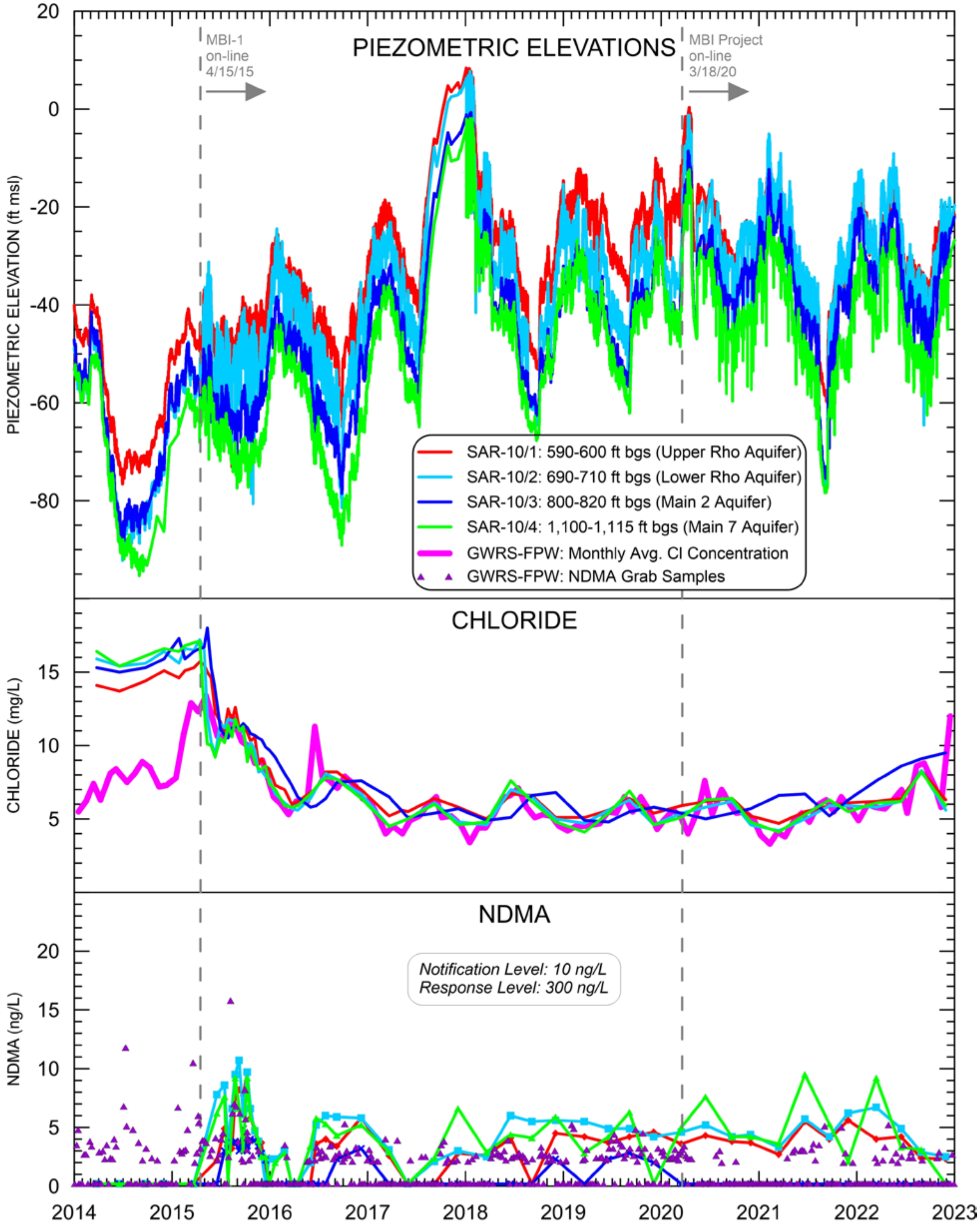


Figure 8-4. Monitoring Well SAR-10 Piezometric Elevations, Chloride Concentration, and NDMA Concentration

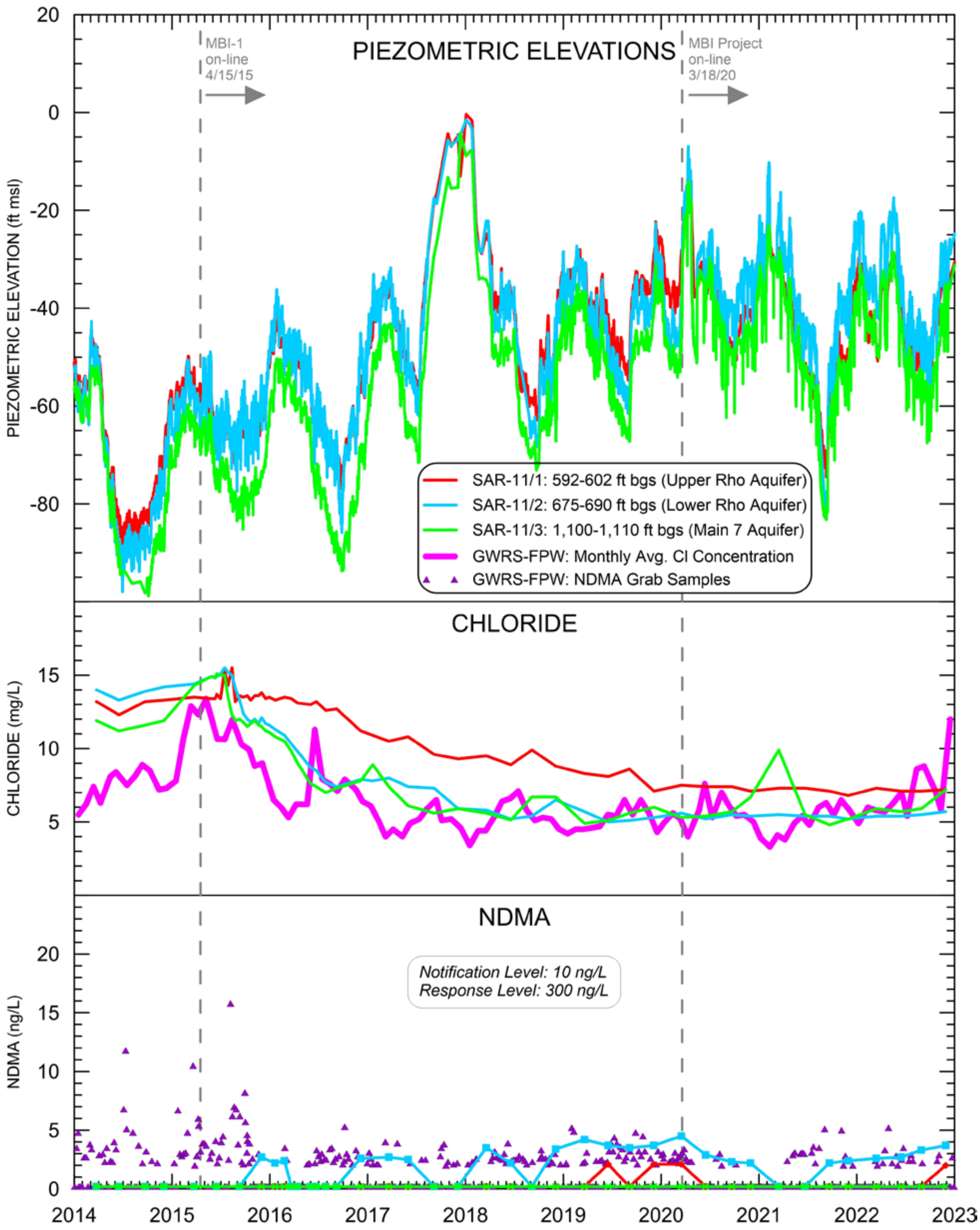


Figure 8-5. Monitoring Well SAR-11 Piezometric Elevations, Chloride Concentration, and NDMA Concentration

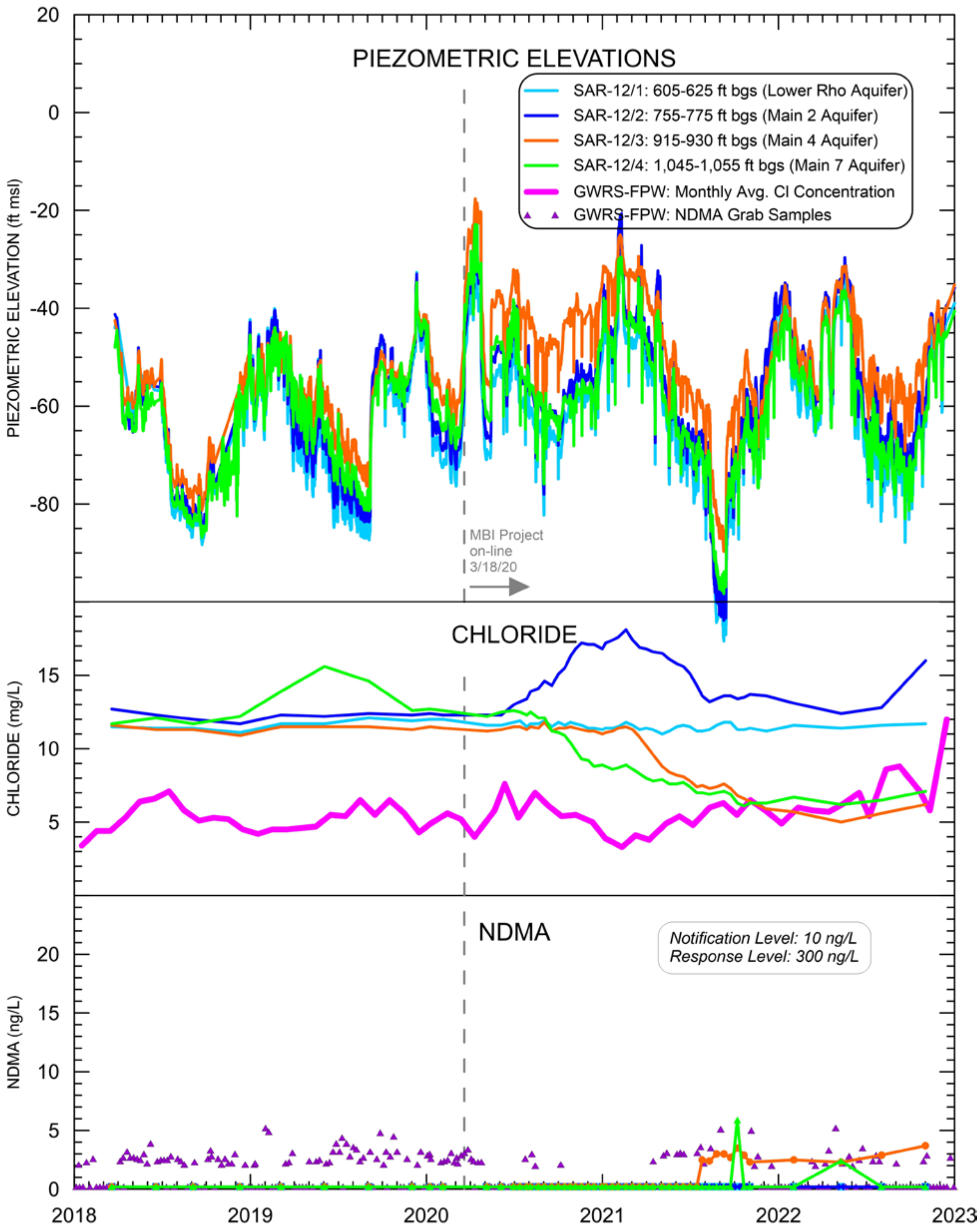


Figure 8-6. Monitoring Well SAR-12 Piezometric Elevations, Chloride Concentration, and NDMA Concentration

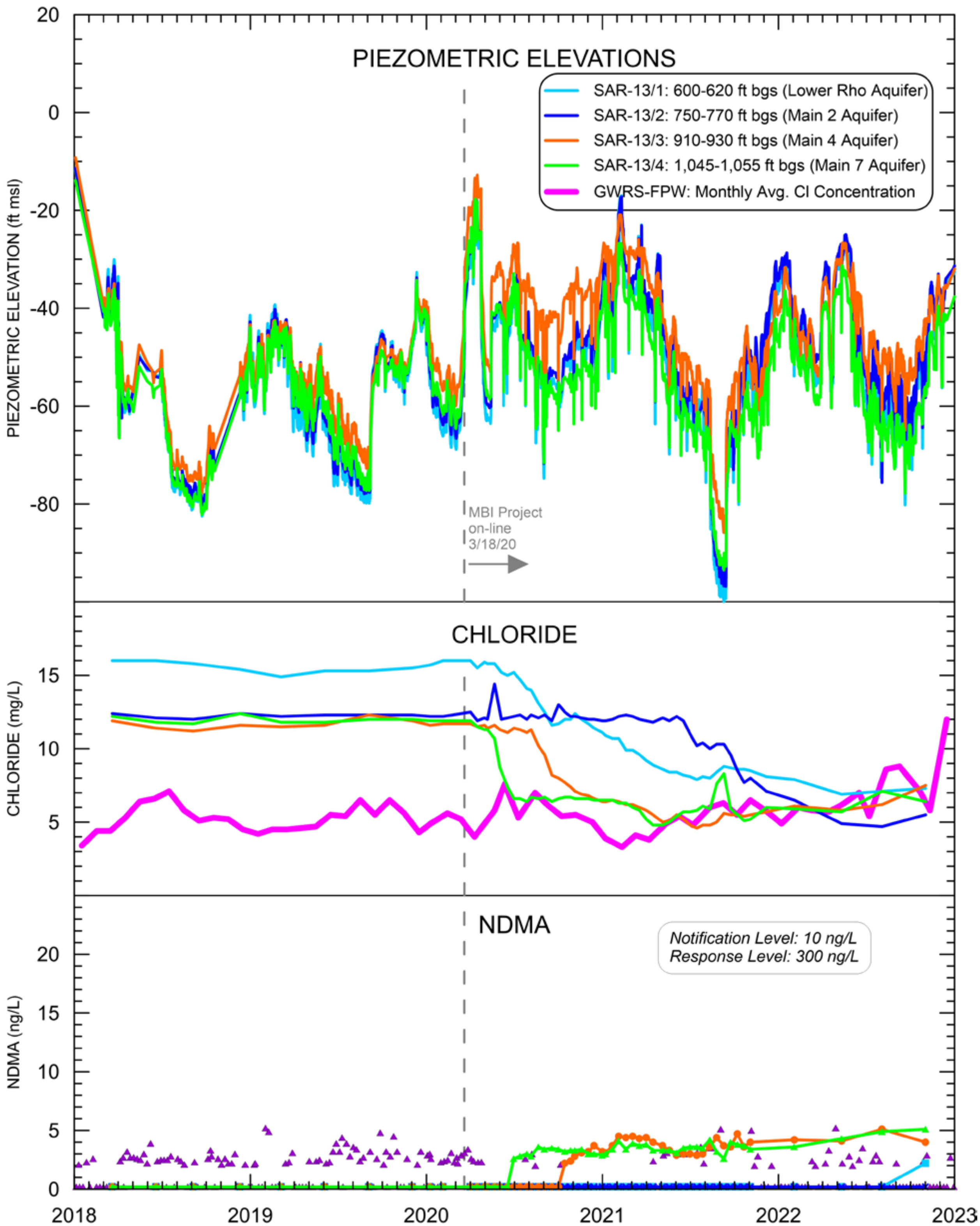


Figure 8-7. Monitoring Well SAR-13 Piezometric Elevations, Chloride Concentration, and NDMA Concentration

(1) rising and/or remaining high during the winter and early spring months, (2) declining in the late spring and summer months, and (3) recovering somewhat in the late fall months near the screened casings in the Upper Rho, Lower Rho, and Main aquifers, corresponding to selected screened intervals at the MBI Project injection wells MBI-1 through MBI-5 and production wells IRWD-12 and IRWD-17. The screened interval depths and targeted aquifer names are shown in Table 8-2 and on Figure 8-4 through Figure 8-7 for the four depth-specific monitoring wells.

All zones at SAR-10 (Figure 8-4), SAR-11 (Figure 8-5), SAR-12 (Figure 8-6), and SAR-13 (Figure 8-7) were equipped with automated data loggers for frequent (at least daily) monitoring of groundwater levels throughout the periods shown on the four figures, except for pressure transducer malfunctions, in which case only monthly hand-measured water levels were available for those periods.

end of the year. In the MBI Project area, these seasonal trends largely result from seasonal water demands which lead to increased pumping during the summer and reduced pumping during the winter, and to a lesser degree from increased Forebay recharge (both natural and managed) from local rainfall and captured SAR storm flows during the winter months.

During 2022, Principal aquifer system groundwater levels at the MBI Project monitoring wells followed the typical seasonal pattern, with the exception of the typical rise in the winter and early spring months being interrupted by a temporary decline during February and March; this is believed to be due to increased IRWD DRWF pumping stemming from unusually dry conditions (only one inch of rainfall January-March). IRWD DRWF pumping was subsequently reduced in April and May and groundwater levels resumed their typical seasonal increase, peaking in late May, before typically declining to an annual minimum in September and then increasing for the remainder of the year.

At all four MBI Project monitoring wells, groundwater levels at the end of 2022 in the Upper Rho, Lower Rho, and Main 2 aquifers were 2-3 feet higher than at the end of 2021, and groundwater levels in the Main 4 and Main 7 aquifers were 8-9 feet higher than at the end of 2021.

During 2022, Principal aquifer system groundwater levels at SAR-10 (Figure 8-4) and SAR-11 (Figure 8-5) were similar to one another and followed the typical seasonal pattern described above. The relatively large short-term fluctuations in groundwater levels of approximately 10-20 feet at both SAR-10 and SAR-11 were primarily due to MBI-1 injection and backwash pumping cycles. Principal aquifer system groundwater levels at SAR-12 (Figure 8-6) and SAR-13 (Figure 8-7) followed the same longer-term seasonal pattern as SAR-10 and SAR-11 but were typically 10-25 feet lower in elevation, as they are farther downgradient from the MBI Project wells and closer to the downgradient production wells (Figure 8-3). The large short-term fluctuations in groundwater levels at SAR-12 and SAR-13 were primarily due to production well operations at the nearby IRWD DRWF and to a lesser degree from injection and backwash pumping cycles at the four MBI Centennial Park wells.

As mentioned previously, downward vertical gradients typically exist between the individual aquifer units comprising the Principal aquifer system in the MBI Project area and throughout the larger Pressure area of the Basin, with groundwater levels generally becoming progressively lower with each successively deeper Principal aquifer unit. This downward vertical gradient is evident at SAR-10 (Figure 8-4) and SAR-11 (Figure 8-5) prior to the beginning of MBI-1 operations, with the highest groundwater elevations (heads) in the shallowest Upper Rho aquifer at SAR-10/1 and SAR-11/1 and the lowest heads in the lowermost Main 7 aquifer at SAR-10/4 and SAR-11/3. After the MBI Centennial Park wells came on-line in 2020, heads in the Lower Rho aquifer at SAR-10/2 and SAR-11/2 and Main 2 aquifer at SAR-10/3 rose in response to injection and thus became generally higher than in the Upper Rho aquifer which receives no Centennial Park injection. Heads in the deepest Main 7 aquifer remained the lowest after Centennial Park injection because of the high hydraulic conductivity of that zone preventing any substantial injection mounding.

At SAR-12 (Figure 8-6) and SAR-13 (Figure 8-7), the typical downward vertical gradient is not observed prior to or during MBI Centennial Park operations; this is likely due to their proximity to production wells IRWD-12 and IRWD-17, which both have their upper screened intervals within the same aquifer zones as the upper two zones at SAR-12 and SAR-13 (Figure 8-2). SAR-12 is located only 850 ft from IRWD-12, while SAR-13 is located 1,475 ft from IRWD-12, as compared to SAR-10 and SAR-11 which are both over 3,000 ft away from IRWD-12 (Figure 8-1) and thus have a much more dampened response to pumping from IRWD-12 and IRWD-17.

8.4 Groundwater Quality

Quarterly sampling continued at monitoring wells SAR-10 and SAR-11 during 2022 but has been voluntary since March 2020 as SAR-12 and SAR-13 became the official compliance wells for the MBI Project. SAR-10 and SAR-11 were voluntarily sampled more frequently in 2015 and 2016 around the startup of MBI-1 operations. Quarterly background sampling was conducted at monitoring wells SAR-12 and SAR-13 from March 2018 until February 2020 and then became compliance quarterly sampling in March 2020 with MBI Project startup. Beginning in mid-2020 and continuing through 2021, the sampling frequency at SAR-12 and SAR-13 was voluntarily increased to biweekly to track the injected GWRS water for the MBI intrinsic tracer test, then reduced back down to quarterly in the beginning of 2022. Groundwater quality data for 2022 are presented in Appendix K. The four MBI Project monitoring wells were tested for: (1) an extensive list of inorganic, organic, and radiological parameters, (2) the majority of the U.S. Environmental Protection Agency (EPA) Priority Pollutants, and (3) 1,4-dioxane and NDMA. During 2022, groundwater quality at SAR-10, SAR-11, SAR-12, and SAR-13 complied with all Federal and State Primary Drinking Water Standards. Three Secondary MCL exceedances occurred at the MBI monitoring wells during 2022: odor once at SAR-12/2, which was likely unrelated to injection of GWRS water at the MBI Project wells, and aluminum twice at SAR-10/1, which is discussed in Section 8.4.5.

This section describes groundwater quality at the four MBI Project monitoring wells for general constituents used as intrinsic tracers, 1,4-dioxane, NDMA, arsenic, vanadium, aluminum, and iron with comparison to their respective MCLs or other relevant water quality standards. Groundwater quality for production wells in the vicinity of the MBI Project is also summarized.

8.4.1 Monitoring Wells – Intrinsic Tracers Chloride and Sulfate

As discussed in Section 4 and Section 6 related to the Talbert Barrier and Anaheim Forebay recharge facilities, respectively, chloride has been effectively used as an intrinsic tracer of GWRS water in the subsurface arriving at nearby downgradient monitoring wells. Chloride is a conservative tracer and thus is expected to migrate at the same groundwater velocity as the injected water without any significant reactions with other constituents in the groundwater or the aquifer substrate. Fortunately for tracking purposes, GWRS-FPW has a very low and stable chloride concentration with an annual average ranging from 4-11 mg/L since commencement of GWRS in 2008. During 2015 and 2016 for the first two years of DMBI Project injection at MBI-1, GWRS-FPW chloride concentrations were 11 and 7 mg/L, respectively, and more recently ranged from 5-6 mg/L during 2017-2021. During 2022, the annual average chloride concentration of GWRS-FPW was 7 mg/L, with the monthly average ranging from 4-9 mg/L from January through November and increasing slightly to 12 mg/L in December due to an overall slight increase in TDS when the AWPF began receiving water from OC San Plant 2 for GWRS Final Expansion testing and commissioning. This slight increase in the December 2022 GWRS-FPW chloride concentration can be seen in Figure 8-4 through Figure 8-7.

The middle graphs of Figure 8-4 through Figure 8-7 show that ambient background chloride concentrations at all Principal aquifer subunits ranged from 11-17 mg/L prior to the commencement of GWRS injection. The lack of chloride variability between these aquifer subunits and the lack of seasonal chloride variation provided a reliable and stable antecedent chloride condition that was noticeably higher than GWRS water at all four monitoring wells. Also, as discussed in Section 8.4.7, chloride concentrations at the nearest downgradient production wells IRWD-12 and IRWD-17 were similarly stable within approximately the same range over a much longer historical period than the MBI Project monitoring wells.

At SAR-10, located approximately 80 feet downgradient of MBI-1, chloride concentrations declined rapidly to GWRS levels after the start of MBI-1 injection on April 15, 2015 (Figure 8-4). The fastest arrival of GWRS water occurred in less than two weeks in the deepest injection zone at SAR-10/4 (Main 7 aquifer), while the slowest arrival occurred in approximately 6 to 8 weeks in the shallowest injection zone at SAR-10/1 (Upper Rho aquifer). At SAR-11, located approximately 650 feet downgradient of MBI-1, the chloride concentration decline following the start of MBI-1 injection operations was more delayed and dispersed than at the more proximal SAR-10 (Figure 8-5). The fastest arrival of GWRS water occurred in approximately 13 weeks following initial MBI-1 operations and was also in the deepest injection zone at SAR-11/3 (Main 7 aquifer). During

2022, chloride concentrations at SAR-11/1, SAR-11/2, and SAR-11/3 (Figure 8-5) all remained at GWRS levels, indicating approximately 100% GWRS water in these zones.

At SAR-12, located approximately 1,025 feet downgradient of MBI-2, chloride concentration trends during 2022 were varied among the four well casings (Figure 8-6). At SAR-12/1 (Lower Rho aquifer), chloride concentrations remained stable at ambient levels throughout the year, indicating no arrival of GWRS water yet. At SAR-12/2 (Main 2 aquifer), chloride concentrations were elevated slightly above ambient concentrations to begin the year, then increased to 16 mg/L in November, seemingly similar to the trend seen in late 2020 and similar to ambient chloride levels seen in the same Main 2 aquifer zone at SAR-10/3 prior to commencement of MBI-1 injection in 2015. This gradual increase in ambient chloride concentrations has also been observed in nearby production wells in the greater Santa Ana area and is likely due to the gradual arrival of modern recharge from the Forebay area of the Basin. At both SAR-12/3 (Main 4 aquifer) and SAR-12/4 (Main 7 aquifer), chloride concentrations remained at GWRS-FPW levels throughout the year, indicating sustained 100% GWRS water in these zones.

At SAR-13, located approximately 725 feet downgradient of MBI-5, chloride concentrations remained below ambient levels at all four zones during 2022 (Figure 8-7), signaling sustained arrival of GWRS water in all. At SAR-13/1 (Lower Rho aquifer), chloride concentrations gradually declined from mid-August 2020 to a historical low of 7 mg/L in May 2022, finally indicating 100% GWRS water at this well. At SAR-13/2 (Main 2 aquifer), chloride concentrations decreased from ambient levels in June 2021 down to a historical low of 5 mg/L by May 2022 where they remained for the rest of the year, indicating sustained arrival of 100% GWRS water. At SAR-13/3 and SAR-13/4, chloride concentrations remained low at GWRS-FPW levels from mid- to late-2020 through 2022 due to a much faster flow path in these two deeper zones and indicating the sustained arrival of 100% GWRS water.

Sulfate was also used as an intrinsic tracer to estimate the arrival time of GWRS water at SAR-10, SAR-11, SAR-12, and SAR-13. Sulfate is typically considered less conservative than chloride in the subsurface but features a greater difference between the ambient background concentration at the MBI Project monitoring wells (32 to 44 mg/L) compared to the GWRS injection supply (approximately 1 mg/L). Over these relatively short travel distances from MBI-1 to SAR-10 and SAR-11 and from the MBI Centennial Park wells to SAR-12 and SAR-13, along with relatively constant injection, sulfate appeared to behave conservatively and yielded essentially the same GWRS arrival times as chloride but with more definitive breakthrough curves.

Figure 8-8 and Figure 8-9 show chloride and sulfate concentrations during 2015-2022 for all zones at SAR-10 and SAR-11, respectively, and Figure 8-10 and Figure 8-11 show chloride and sulfate concentrations during 2018-2022 for all zones at SAR-12 and SAR-13, respectively. In all cases, the concentration declines signaled the arrival of GWRS water to these wells, and the timing of the chloride and sulfate concentration declines were consistent with each other but were much

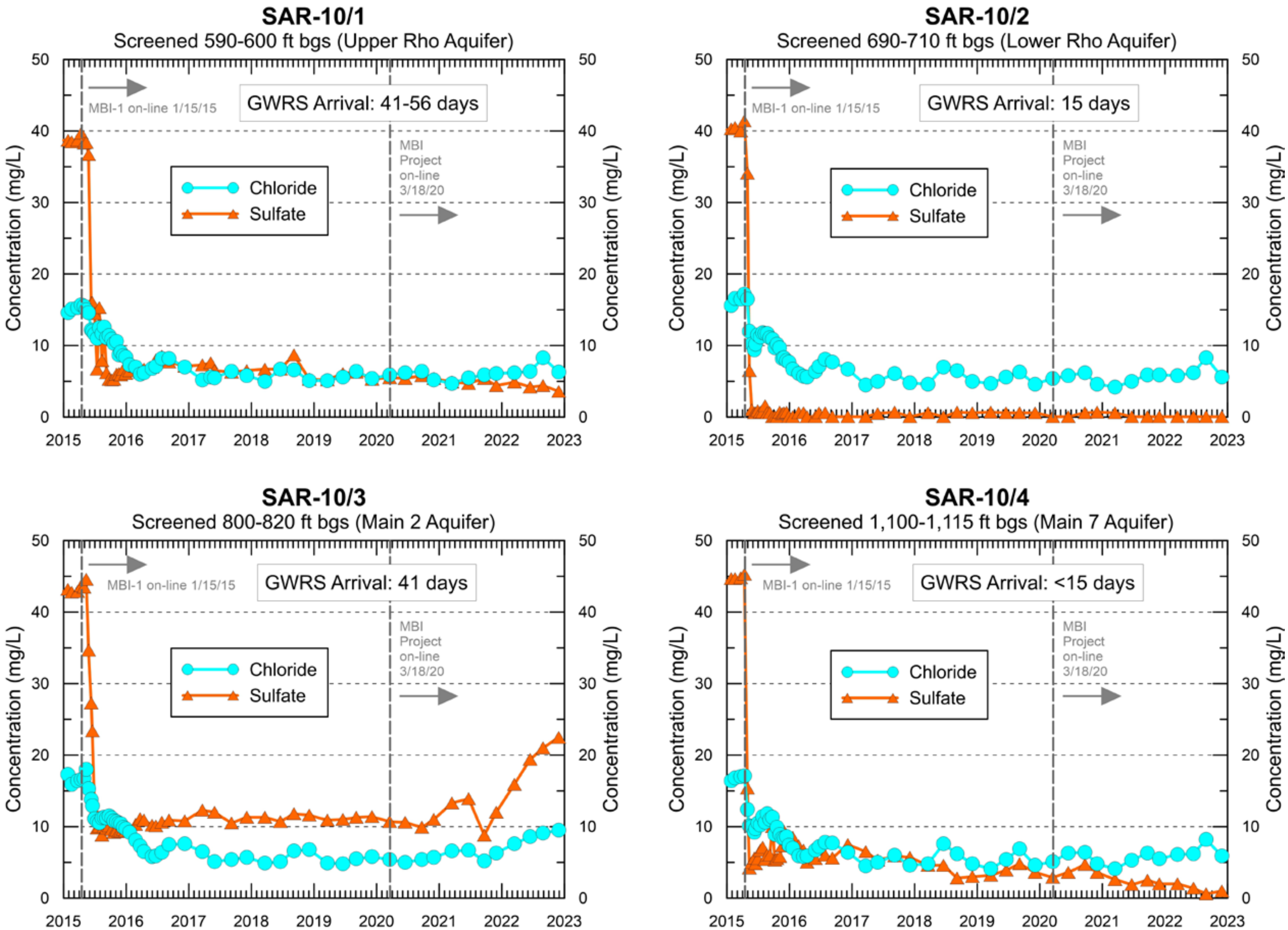


Figure 8-8. Monitoring Well SAR-10 Chloride and Sulfate Concentrations

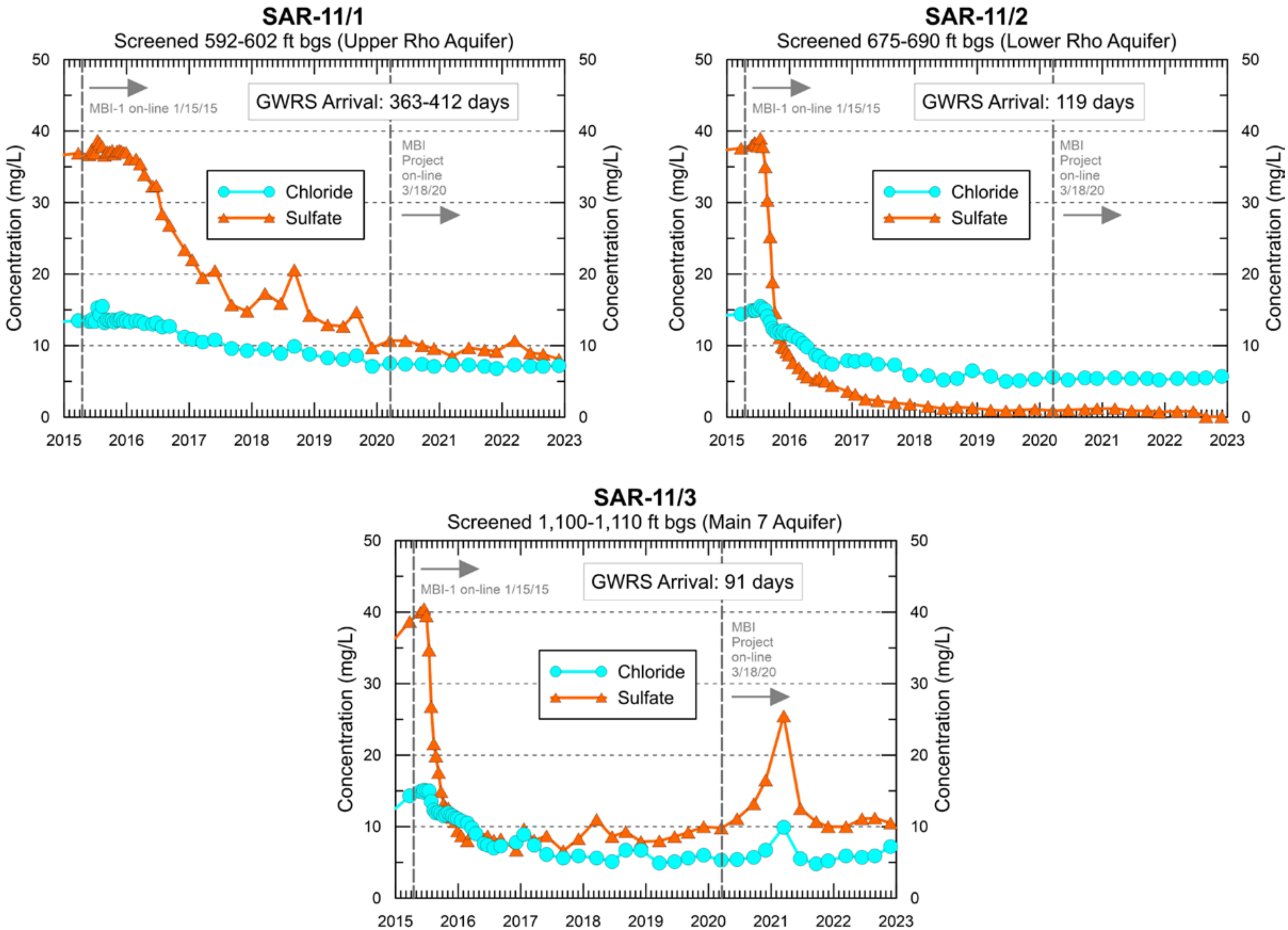


Figure 8-9. Monitoring Well SAR-11 Chloride and Sulfate Concentrations

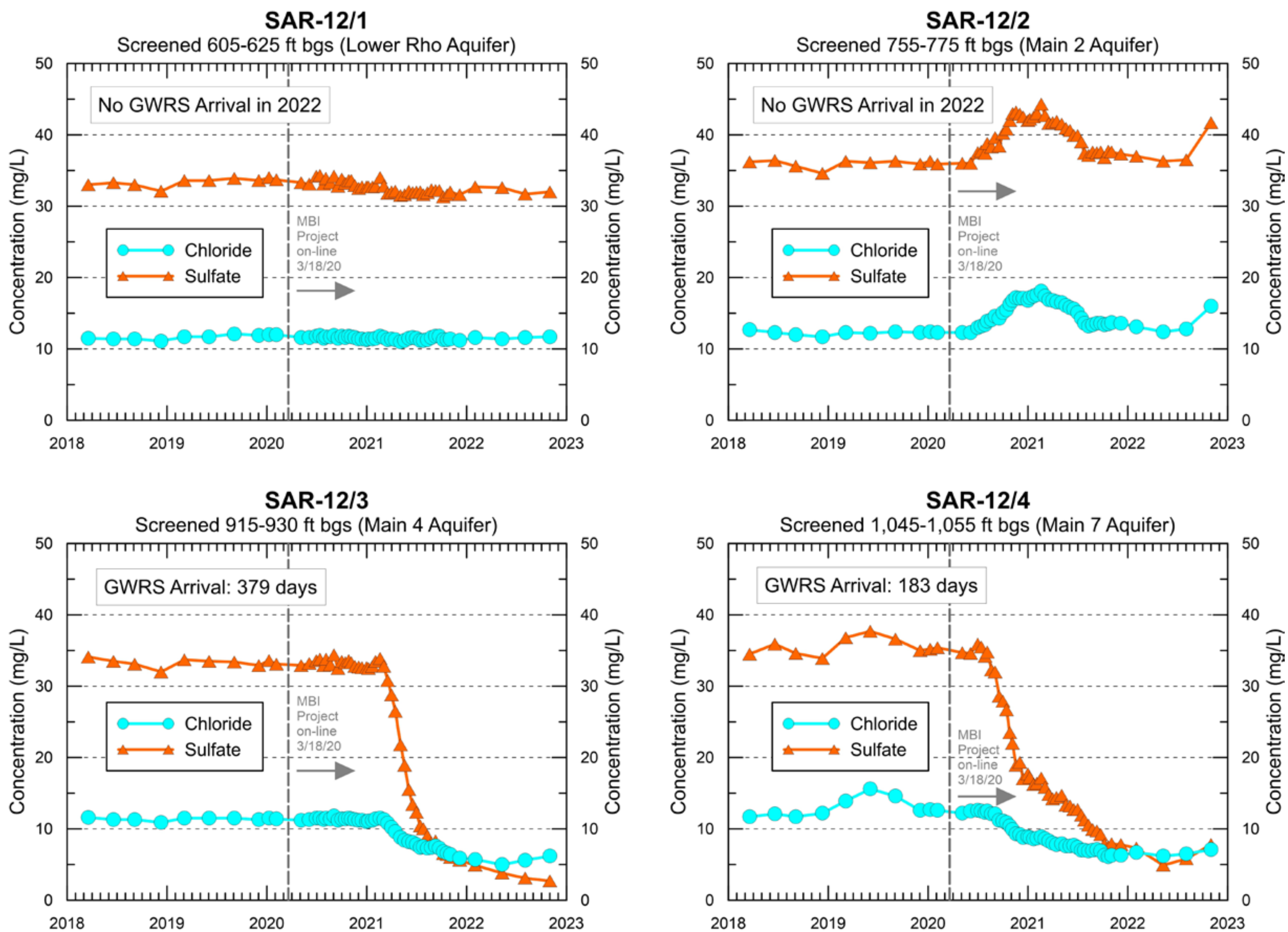


Figure 8-10. Monitoring Well SAR-12 Chloride and Sulfate Concentrations

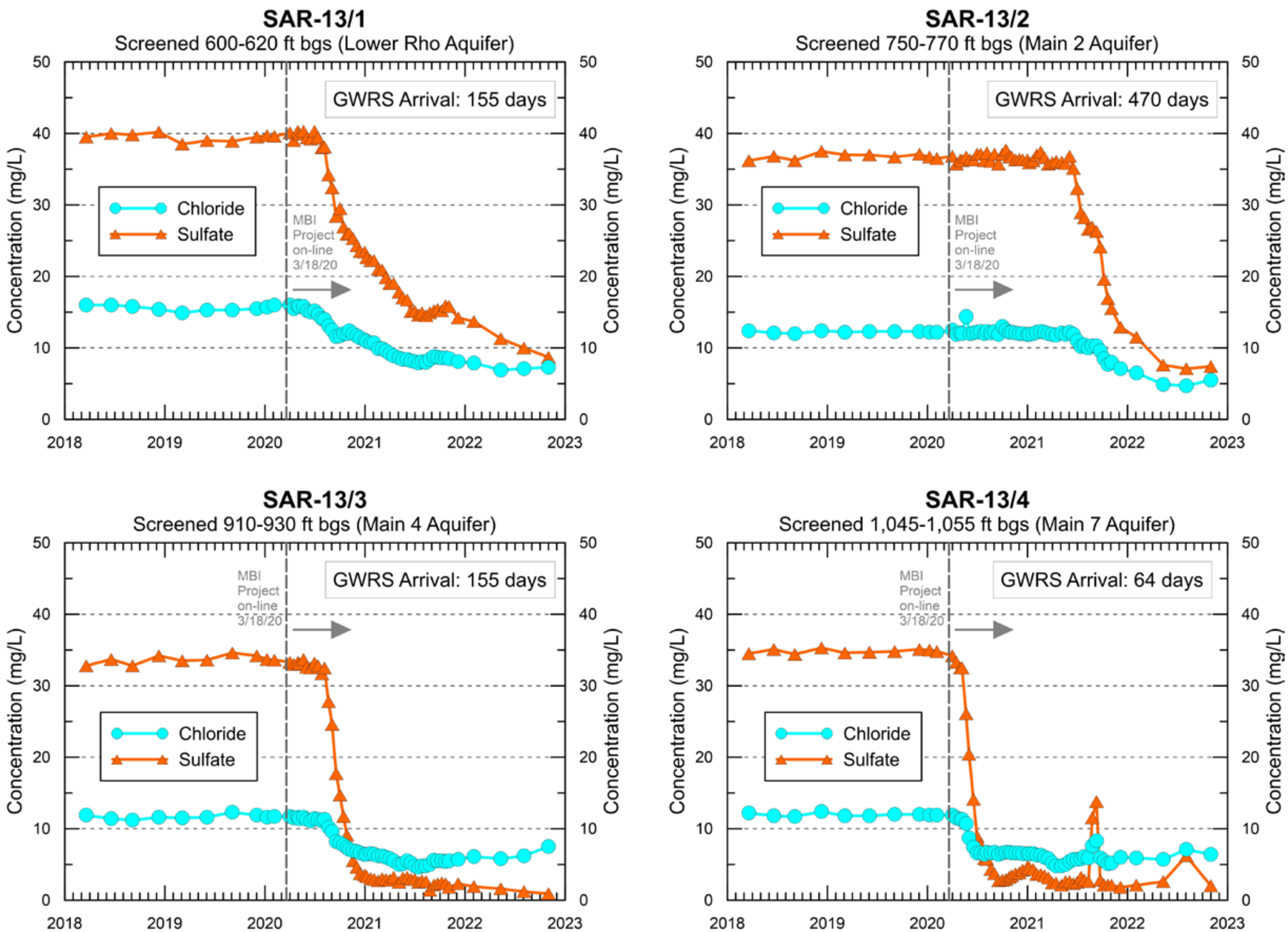


Figure 8-11. Monitoring Well SAR-13 Chloride and Sulfate Concentrations

more readily apparent with sulfate due to the larger range between ambient and GWRS-FPW sulfate concentrations.

Therefore, the estimated GWRS arrival times shown on each graph in Figure 8-8 through Figure 8-11 were based on the sulfate breakthrough curves but are the same as discussed above for chloride, except in the case of SAR-11/1 where breakthrough was only distinguishable for sulfate. As shown on Figure 8-9, breakthrough or arrival of GWRS water at SAR-11/1 was not apparent based on the relatively stable and low chloride concentrations at this well but finally became evident when sulfate concentrations began to decline in April 2016, approximately one year after injection operations began at MBI-1. At SAR-11/2 and SAR-11/3, the sulfate reduction breakthrough was much more obvious yet slightly more gradual than for these analogous zones at SAR-10 due to dispersion along the flow path farther downgradient from MBI-1. The breakthrough curves for those zones with GWRS arrival at SAR-12 and SAR-13 appear as gradual or even more gradual than those seen at SAR-11, due to the longer flow paths to these monitoring wells from the injection source.

Table 8-3 summarizes the GWRS water arrival time estimates for SAR-12 and SAR-13 during the MBI intrinsic tracer test in which all five MBI wells were fully on-line. The GWRS arrival time estimates for SAR-10 and SAR-11 from the DMBI operations in 2015-2016 were shown in Table 8-2 of the 2016 through 2019 Annual Reports. The GWRS arrival times for SAR-12 and SAR-13 in Table 8-3 were based on biweekly sulfate samples, with arrival defined as the date of the first sulfate sample whose concentration was 10-20 percent lower than the most recent ambient sulfate concentration. As mentioned previously, the fastest GWRS arrival occurred in the Main 7 aquifer zone at SAR-12/4 and SAR-13/4. This Main 7 aquifer zone also had the fastest GWRS arrival at SAR-10/4 and SAR-11/3 back in 2015.

Table 8-3. GWRS Water Arrival Time Estimates to SAR-12 and SAR-13

Monitoring Well	Screened Interval (ft bgs)	Aquifer Name	Distance from nearest MBI Well (ft)	Sulfate[1] Arrival Time (days)	Sulfate[1] Arrival Time (months)
SAR-12/1	605 – 625	Lower Rho	1,025 (MBI-2)	No Arrival	No Arrival
SAR-12/2	755 – 775	Main 2	1,025 (MBI-2)	No Arrival	No Arrival
SAR-12/3	915 – 930	Main 4	1,025 (MBI-2)	379	12.6
SAR-12/4	1,045 – 1,055	Main 7	1,025 (MBI-2)	183	6.1
SAR-13/1	600 – 620	Lower Rho	725 (MBI-5)	155	5.2
SAR-13/2	750 – 770	Main 2	725 (MBI-5)	470	15.7
SAR-13/3	910 – 930	Main 4	725 (MBI-5)	155	5.2
SAR-13/4	1,045 – 1,055	Main 7	725 (MBI-5)	64	2.1

[1] Sulfate biweekly sampling with arrival times based on 10 to 20% reduction from most recent ambient.

8.4.2 Monitoring Wells – 1,4-Dioxane and NDMA

In mid-2020, the RDL for 1,4-dioxane was lowered from 1.0 to 0.5 µg/L for both AWPF and groundwater samples analyzed by the OCWD Laboratory. As mentioned in Section 4.4.3, the revised laboratory method for 1,4-dioxane was approved by the SWRCB's Division of Water Quality (SWRCB, 2021) to comply with the updated Recycled Water Quality AWPF CEC monitoring requirements at the AWPF, incorporated as part of the latest GWRS permit Monitoring and Reporting Program (RWQCB, 2020a).

During 2022, all zones at the MBI Project monitoring wells SAR-10, SAR-11, SAR-12, and SAR-13 continued to be non-detect for 1,4-dioxane, as expected since historical ambient levels at all four monitoring wells and GWRS-FPW since 2015 were all non-detect.

As discussed in Section 4.4.3, OCWD has historically monitored for NDMA in the vicinity of the Talbert Barrier for GWRS permit compliance purposes and to track the release of NDMA within the aquifers receiving injection in the late 1990s and early 2000s from WF-21. Since then, through a combination of industrial source control, appropriate polymer selection and waste stream diversion at OC San, improved NDMA rejection by RO membranes, and UV treatment, the concentration of NDMA in GWRS-FPW has been significantly reduced (OCWD, 2015).

Any NDMA precursors that pass through the RO membranes and are not inactivated by the UV/AOP process, can subsequently form NDMA downstream due to the presence of residual combined chlorine and elevated pH created during the post-treatment lime addition process (See Section 2.2.4). From 2014 to late 2015, NDMA concentrations in GWRS-FPW increased relative to prior years, with an average of approximately 3 ng/L and three detections above the NL of 10 ng/L with the highest being 15.8 ng/L. In late 2015, a lower pH target of 8.5 was implemented in the post-treatment process. RO membrane replacement is thought to be effective in further reducing the amount of precursor passing through to the downstream processes, thus helping to limit NDMA reformation (OCWD, 2015). From late 2015 through 2022 the average NDMA concentration in GWRS-FPW in weekly monitoring was reduced to 1.2 ng/L, with only four detections slightly exceeding 5 ng/L.

Historical NDMA concentrations at SAR-10, SAR-11, SAR-12, and SAR-13 are shown in the lower portion of Figure 8-4 through Figure 8-7, respectively. The 2022 NDMA monitoring results at these wells are summarized below:

- At SAR-10 (Figure 8-4), concentrations remained below the notification level of 10 ng/L in all four zones, ranging from below the RDL to 9.2 ng/L.

- At SAR-11 (Figure 8-5), concentrations were consistently within the range of concurrent NDMA concentrations in GWRS-FPW at SAR-11/1 and SAR-11/2 and consistently non-detect at SAR-11/3. NDMA concentrations have been consistently lower at SAR-11 as compared to SAR-10 due to mixing via dispersive transport for the longer travel distance to SAR-11 and possible biodegradation, especially in the case of SAR-11/3.

- At SAR-12 (Figure 8-6), concentrations at SAR-12/1 and SAR-12/2 were consistently non-detect throughout the entire monitoring period of 2018-2022, as expected for zones without GWRS arrival. At SAR-12/3, concentrations were consistently non-detect until late-July 2021 approximately four months after initial GWRS arrival when concentrations rose to 2.5 ng/L and then up to 3.5 ng/L in early October before declining slightly to 2.3 ng/L by early November 2021. These low NDMA concentrations at SAR-12/3 were within the range of GWRS-FPW since injection began in March 2020 at the MBI wells and were likely indicative of an increasing percentage of GWRS water arriving at this well, as confirmed by the contemporaneously decreasing chloride concentrations (Figure 8-6). At SAR-12/3, NDMA concentrations remained within GWRS-FPW levels, ranging from 2.4 ng/L in May to 3.7 ng/L in November. At SAR-12/4, NDMA concentrations were also consistently non-detect for NDMA in prior years, until two minor increases to 5.9 ng/L and 2.4 ng/L in October 2021 and May 2022, respectively. The two NDMA increases may have been the result of older GWRS water injected at MBI-1 during 2015-2016 arriving at this well due to a temporary shift in the gradient shortly after the MBI wells came back on-line following extended shutdowns in 2021 and 2022.

- At SAR-13 (Figure 8-7), concentrations at SAR-13/1 and SAR-13/2 were consistently non-detect from 2018 into 2022, which is attributed to less than 100% GWRS water sustained at these zones after initial arrival, as indicated by chloride concentrations remaining above GWRS-FPW levels (Figure 8-7). At SAR-13/1, NDMA was first detected at 2.2 ng/L in November 2022, over two years after first arrival of GWRS water; at SAR-13/2, NDMA continued to be non-detect during 2022. At SAR-13/3 and SAR-13/4, NDMA concentrations were first measured above the RDL in October 2020 and June 2020, respectively, and remained consistently within the contemporaneous GWRS-FPW range of 2-5 ng/L through 2022, indicating sustained 100% GWRS water and confirmed by low chloride concentrations at GWRS-FPW levels of approximately 5 mg/L (Figure 8-7).

8.4.3 Monitoring Wells – Arsenic

As previously documented, the mobilization of arsenic from aquifer sediments has been observed at some locations downgradient of GWRS water injected at the Talbert Barrier and percolated in K-M-M-L Basins in the Anaheim Forebay area. Figure 8-12 and Figure 8-13 show dissolved arsenic and chloride concentrations during 2015-2022 for SAR-10 and SAR-11, respectively, and Figure 8-14 and Figure 8-15 show dissolved arsenic and chloride concentrations during 2018-2022 for SAR-12 and SAR-13, respectively. Dissolved arsenic is shown in these figures rather than total arsenic because total arsenic was only sampled quarterly for compliance

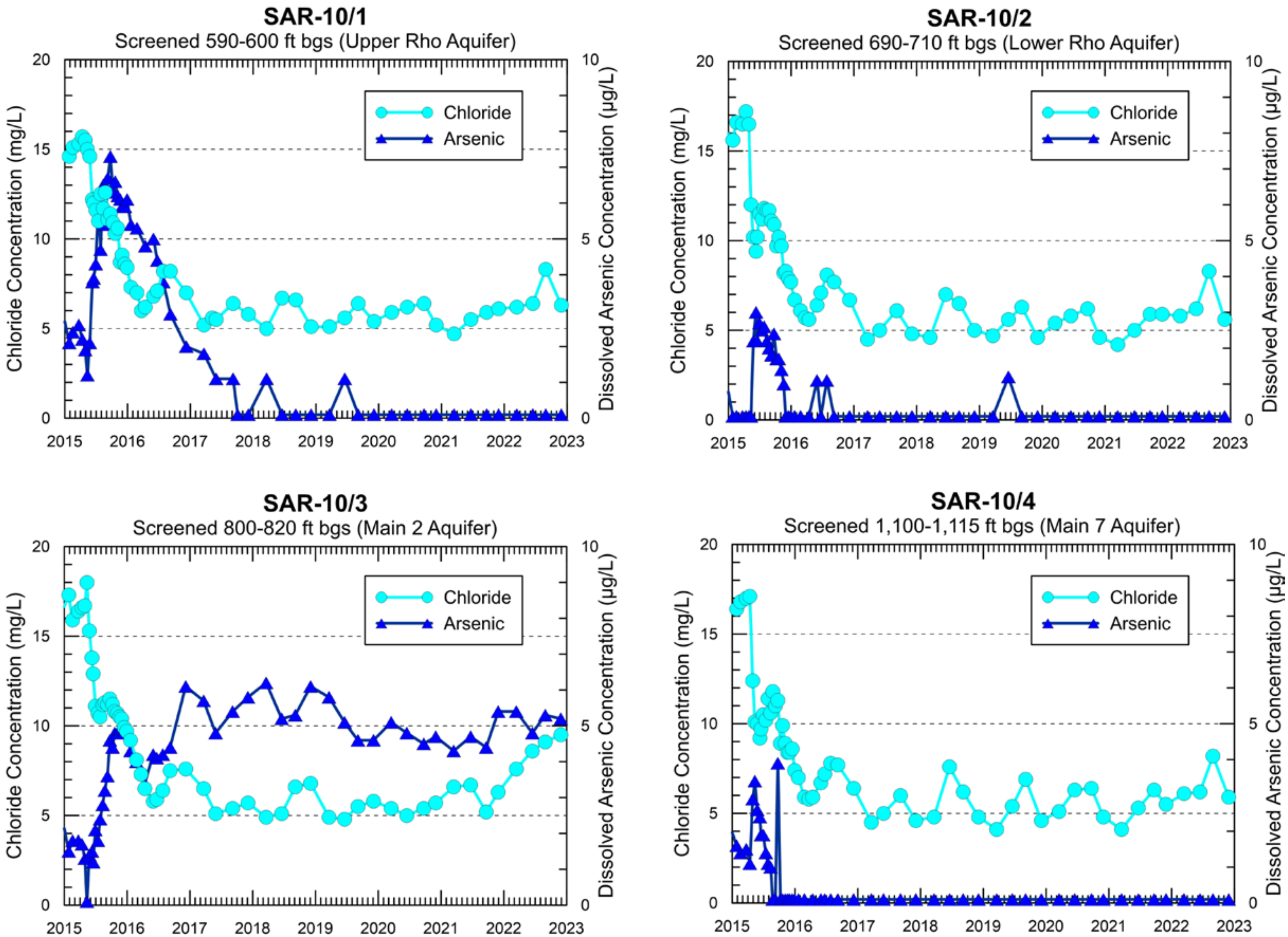


Figure 8-12. Monitoring Well SAR-10 Chloride and Dissolved Arsenic Concentrations

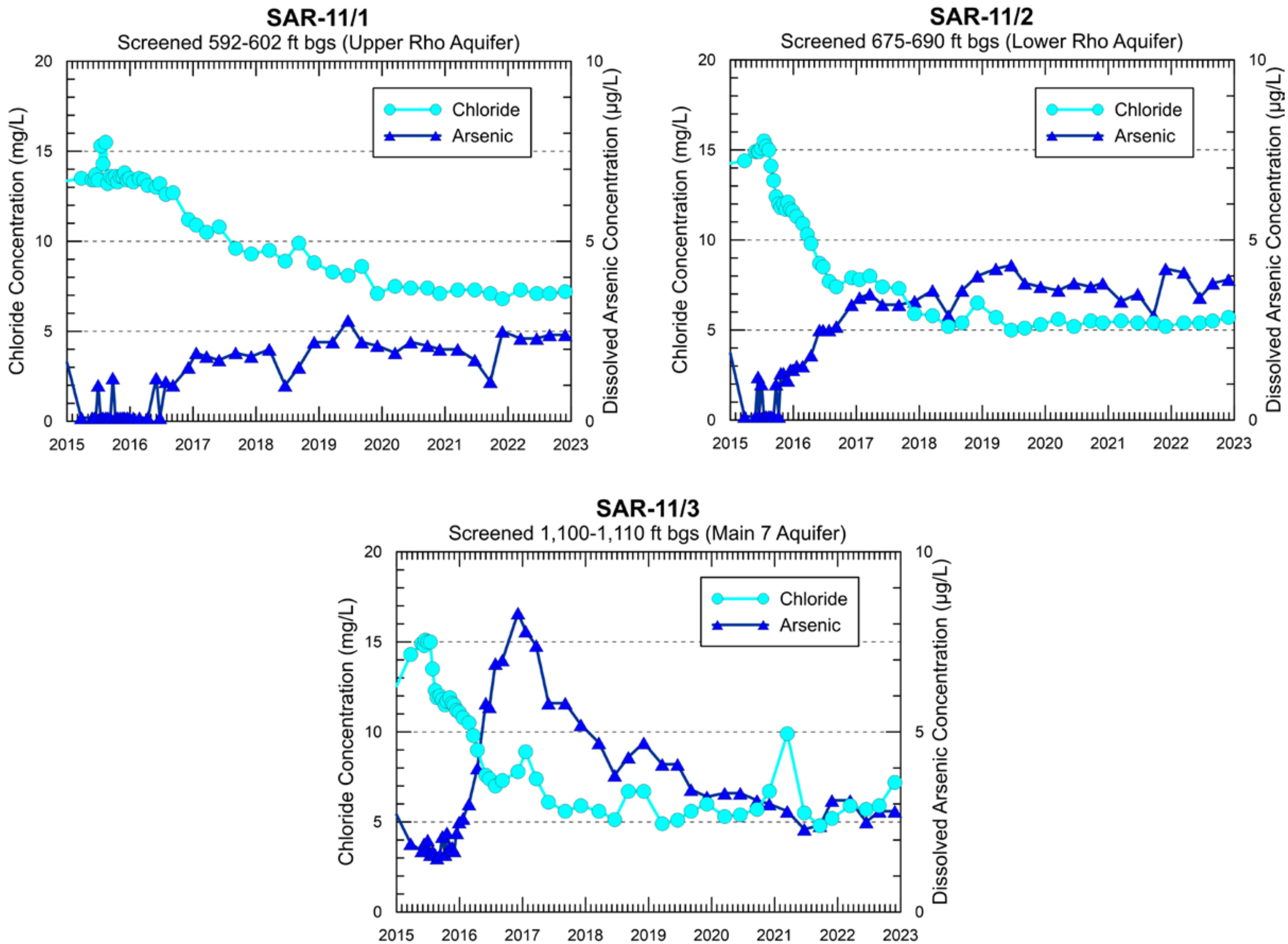


Figure 8-13. Monitoring Well SAR-11 Chloride and Dissolved Arsenic Concentrations

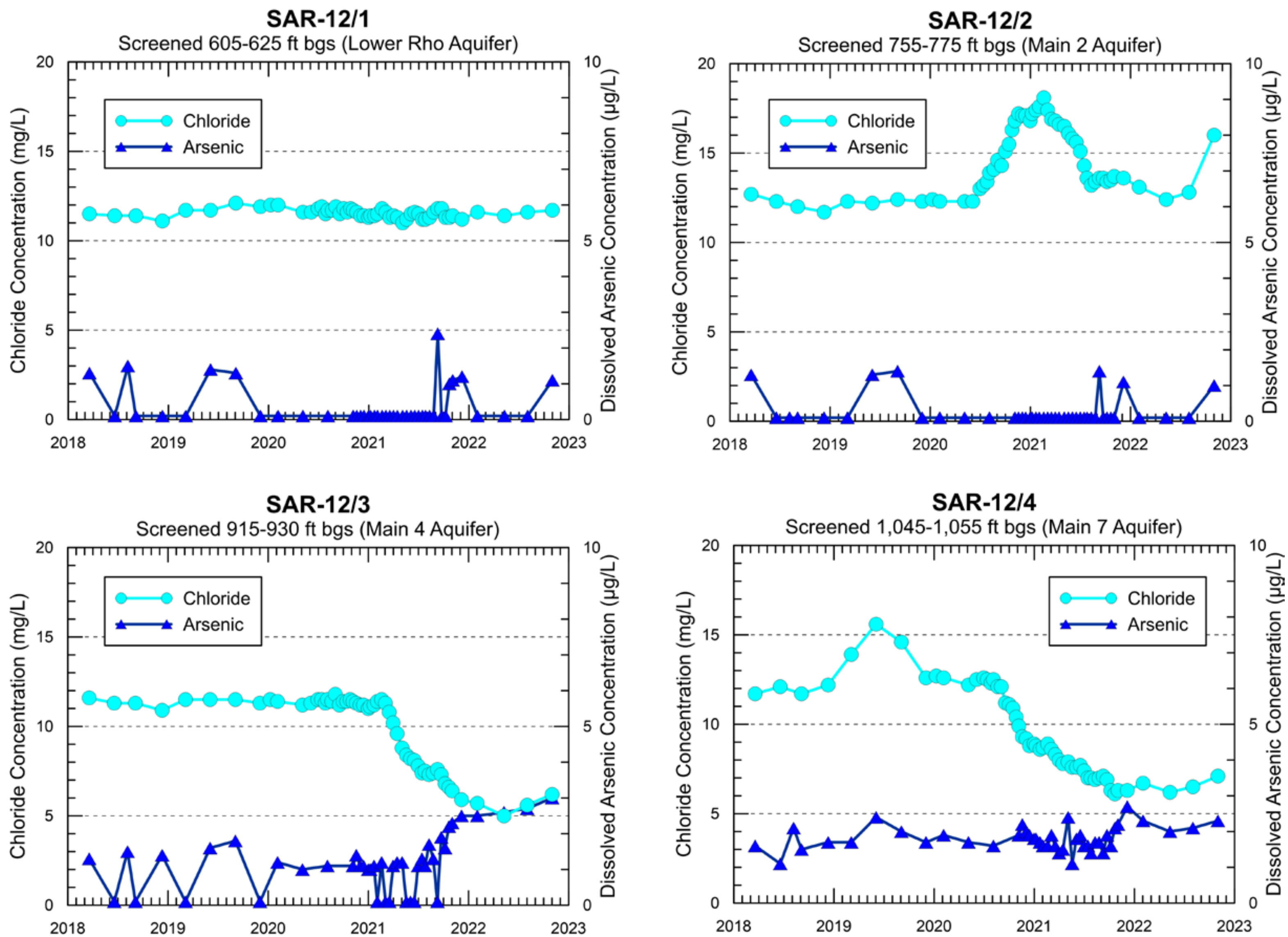


Figure 8-14. Monitoring Well SAR-12 Chloride and Dissolved Arsenic Concentrations

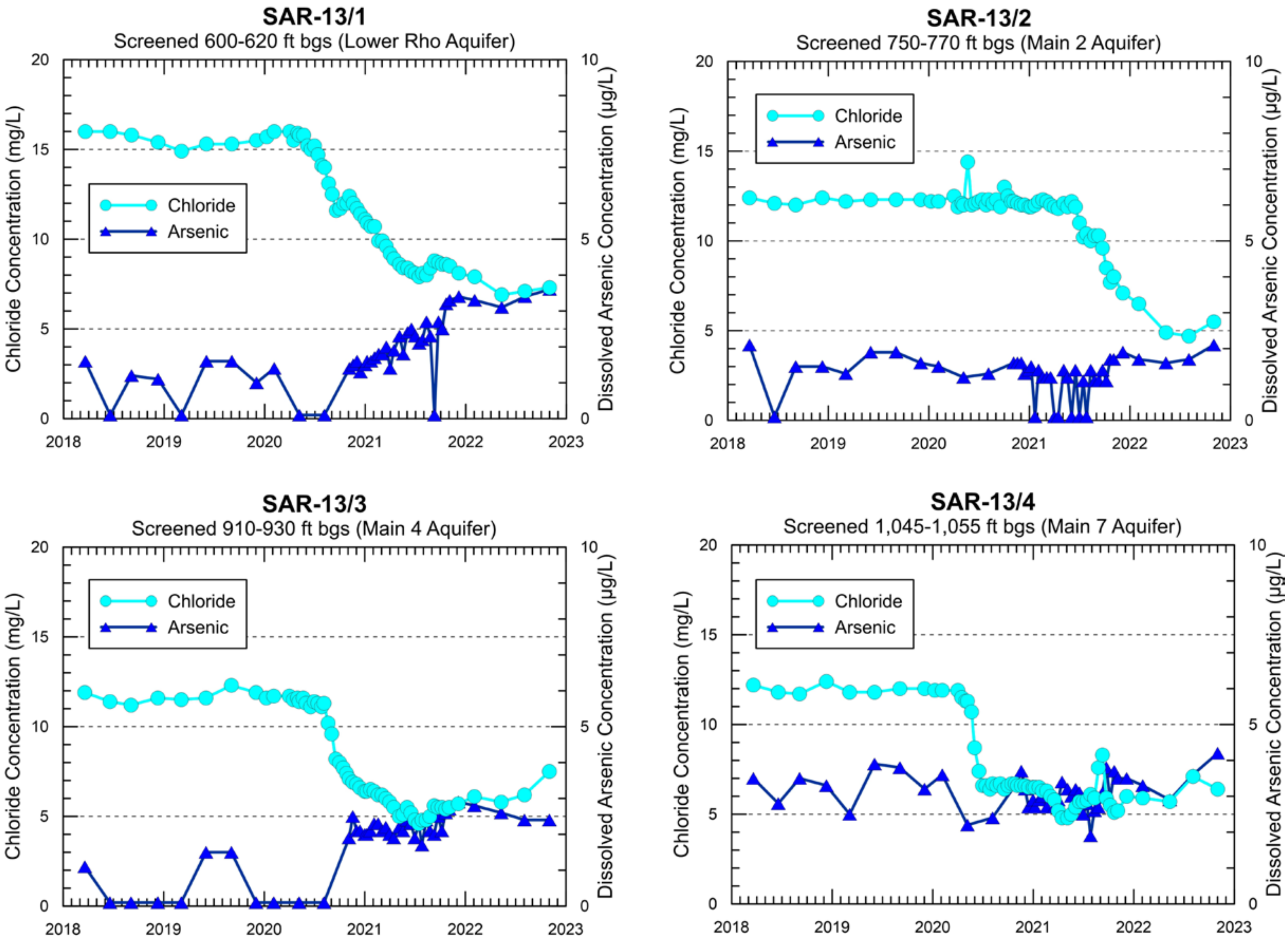


Figure 8-15. Monitoring Well SAR-13 Chloride and Dissolved Arsenic Concentrations

whereas dissolved arsenic was sampled much more frequently along with chloride. At SAR-10 and SAR-11 dissolved arsenic was sampled at the following intervals: monthly prior to MBI-1 injection; biweekly thereafter for the remainder of 2015; monthly during the first three quarters of 2016; and then quarterly thereafter. At SAR-12 and SAR-13 dissolved arsenic was sampled at the following intervals: quarterly from March 2018 to November 2020; biweekly until early November 2021; and then quarterly beginning in December 2021 and continuing through 2022. The dissolved arsenic concentrations were found to be consistent with and nearly equal to the quarterly total arsenic concentrations. Therefore, for the discussion that follows, dissolved arsenic will be referred to simply as arsenic.

At SAR-10, Figure 8-12 shows that the pre-injection ambient background arsenic concentration ranged from below the RDL of 1 µg/L to 2.5 µg/L for all four zones. With the arrival of GWRS water, arsenic concentrations increased along with the contemporaneous decline in chloride concentrations like what was observed in the Anaheim Forebay (Section 6.4.3). At SAR-10/1, SAR-10/2, and SAR-10/4, Figure 8-12 shows that arsenic concentrations peaked in late 2015 but remained below the MCL of 10 µg/L and have since gradually declined below pre-injection ambient levels due to localized arsenic mass removal from the sustained arrival of 100% GWRS water. A more detailed discussion of arsenic trends from 2015-2019 at SAR-10 and SAR-11 can be found in Section 8.4.3 of the 2019 Annual Report. During 2020-2022, arsenic concentrations at SAR-10/1, SAR-10/2, and SAR-10/4 remained below the RDL of 1 µg/L (Figure 8-12). At SAR-10/3, arsenic concentrations increased after the first arrival of GWRS water in 2015 and remained above pre-injection ambient background levels but well below the MCL of 10 µg/L through 2022 (Figure 8-12). As was previously discussed in Section 8.4.1 for SAR-10/3, sulfate concentrations of approximately 9 to 23 mg/L during 2016-2022 (Figure 8-8) were higher than those in GWRS-FPW, likely caused by oxidation of iron sulfide minerals and indicative of a somewhat different geochemical environment for arsenic mobilization compared to other zones at SAR-10.

At SAR-11, Figure 8-13 shows that the pre-injection ambient background arsenic concentrations were consistent with those at SAR-10, ranging from below the RDL to 3.0 µg/L for all three zones. At SAR-11/1 and SAR-11/2, arsenic concentrations gradually increased to slightly above ambient levels but well below the MCL of 10 µg/L beginning in 2016, contemporaneous with GWRS arrival, then stabilized in mid-2019 in the range of 2-4 µg/L, where they have remained through 2022. At SAR-11/3, arsenic concentrations increased abruptly with GWRS arrival and peaked at approximately 8 µg/L in late 2016, then slowly declined over the next four years and stabilized during 2020-2022 within the same range as SAR-11/1 and SAR-11/2 at 2-4 µg/L.

At SAR-12, Figure 8-14 shows that the pre-injection ambient background arsenic concentrations were consistent with those at SAR-10 and SAR-11, ranging from below the RDL to 2.4 µg/L for all four zones. At SAR-12/1 and SAR-12/2, Figure 8-14 shows that arsenic concentrations remained at ambient background levels during 2020-2022 since no GWRS water has arrived at these zones. At SAR-12/3, where GWRS water arrived in early April 2021, arsenic concentrations began increasing gradually in August 2021 to a historical high of 3.0 µg/L in November 2022, still well below the MCL of 10 µg/L. At SAR-12/4, where GWRS water arrived in mid-September 2020, arsenic concentrations remained relatively stable at ambient background levels throughout the first three quarters of 2021 until gradually increasing in the fourth quarter to just above ambient levels at 2.7 µg/L in December and have remained slightly elevated in the range of 2-3 µg/L through 2022.

Figure 8-15 shows that the pre-injection ambient background arsenic concentrations at SAR-13/1, SAR-13/2, and SAR-13/3 were consistent with those at all other MBI Project monitoring wells, while the pre-injection ambient background arsenic concentrations at SAR-13/4 were elevated relative to all others, ranging from 2.5-3.9 µg/L. Figure 8-15 shows that at SAR-13/1, where GWRS water arrived in mid-August 2020, arsenic concentrations gradually increased from early-2021 through 2022, reaching a historical high of 3.6 µg/L in November. At SAR-13/2, where GWRS water arrived in early July 2021, arsenic concentrations have remained within the range of background levels through 2022. At SAR-13/3, where GWRS water arrived in mid-August 2020, arsenic concentrations increased slightly in late-2020 from below the RDL to 2.6 µg/L in November 2020, and have since remained slightly elevated above background levels, ranging from 2.4 to 2.8 µg/L during 2022. At SAR-13/4, where GWRS water arrived in mid-May 2020, arsenic concentrations remained relatively stable within background levels until November 2022, when arsenic concentrations rose slightly to 4.2 µg/L.

The source of the arsenic release in the MBI Project area is likely the oxidation of iron sulfide minerals, such as pyrite, which was detected in some aquifer sediment samples collected from the DMBI Project well borings. Arsenic is known to associate with pyrite and can be released into the aqueous phase during oxidation by introducing oxidizing GWRS water into a geochemically reduced aquifer, as measured by oxidation-reduction potential (ORP). Prior to the arrival of GWRS water, all MBI Project monitoring well zones showed negative ORP, while GWRS water has positive ORP. However, the oxidation of pyrite can also create hydroferrous oxide (HFO) coatings on the aquifer mineral surfaces. These HFOs can provide additional sorption sites for arsenic and other species that are controlled by pH and other geochemical factors, thereby limiting the extent of mobilization. This geochemistry may help limit arsenic mobilization and may also help to explain sulfate concentrations in some of the zones at MBI Project monitoring wells (e.g., SAR-10/1, SAR-10/3, SAR-10/4, SAR-11/1, SAR-11/3, SAR-13/3, and SAR-13/4) never declining as low as GWRS-FPW levels despite chloride concentrations indicative of 100% GWRS water.

8.4.4 Monitoring Wells – Vanadium

Vanadium is regulated as a NL and RL contaminant in drinking water by DDW, with a NL of 50 µg/L and a RL of 500 µg/L. There is no state or Federal MCL for vanadium. The basis for the DDW NL and RL is a memo in 2000 from the California Office of Environmental Health Hazard Assessment to DDW (then within the California Department of Health Services), which cites non-cancer endpoints related to developmental and reproductive effects in rats (DDW, 2022; OCWD, 2015). Vanadium typically displays redox behavior similar to chromium, generally portioning strongly onto solids under reducing conditions and more weakly under oxidizing conditions.

Minor mobilization of vanadium has been previously observed with the arrival of GWRS water in the subsurface at a few monitoring wells near the Talbert Barrier and Anaheim Forebay, but all increases were temporary and remained well below the NL of 50 µg/L. At SAR-10 and SAR-11 sampling for dissolved vanadium was conducted monthly prior to MBI-1 injection, biweekly for the remainder of 2015, monthly during the first three quarters of 2016, and quarterly thereafter. At SAR-12 and SAR-13 sampling for dissolved vanadium was conducted quarterly from March 2018 to November 2020, biweekly from November 2020 until early November 2021, then quarterly beginning in December 2021. Dissolved vanadium concentrations were found to be consistent with and nearly equal to the quarterly total vanadium compliance samples. As such, for the discussion that follows, dissolved vanadium will be referred to simply as vanadium. In all zones at the MBI Project monitoring wells, pre-injection ambient background vanadium concentrations ranged from below the RDL of 1 µg/L to approximately 6 µg/L.

Similar to arsenic, vanadium concentrations have varied among the MBI monitoring wells with GWRS water, typically increasing immediately after GWRS arrival and then leveling off, and in cases with sustained 100% GWRS water, decreasing below ambient levels, likely due to mass removal. At SAR-10/4, vanadium concentrations increased most drastically with the arrival of GWRS water, rising sharply from a pre-injection background of approximately 3 µg/L to a maximum of 311 µg/L (above the NL but below the RL) in June 2015. Since that time, vanadium concentrations have asymptotically declined to pre-injection ambient levels, ranging from 1.9-2.6 µg/L during 2022. At all other MBI monitoring wells, vanadium concentrations during 2022 ranged from non-detect to 18.3 µg/L, all well below the NL of 50 µg/L. A more detailed discussion and graphs of vanadium trends at SAR-10 and SAR-11 can be found in Section 8.4.4 of the 2019 GWRS Annual Report and a more detailed discussion and graphs of vanadium trends at SAR-12 and SAR-13 can be found in Section 8.4.4 of the 2020 GWRS Annual Report.

Overall, vanadium concentrations at the MBI Project monitoring wells remained well below the NL during 2022. The lack of a more significant increase in vanadium concentrations at those zones with GWRS arrival at SAR-11, SAR-12 and SAR-13 indicated that the greater mobilization observed at SAR-10/4 in 2015 was likely a localized one-time effect.

8.4.5 Monitoring Wells – Aluminum

Aluminum is regulated via a California primary and secondary MCL of 1,000 µg/L and 200 µg/L, respectively, as well as a PHG of 600 µg/L. During 2022, total aluminum concentrations at SAR-10/1 twice exceeded the secondary MCL, with a result of 419 µg/L in August and a result of 303 µg/L in November, remaining well below the primary MCL. Prior to the onset of MBI-1 injection, total aluminum concentrations at SAR-10/1 ranged from 4.5-83.7 µg/L. With the arrival of GWRS water in June 2015, total aluminum concentrations at SAR-10/1 increased and were mostly above the Secondary MCL (Figure 8-16). During 2017, total aluminum at SAR-10/1 increased during the first quarter sampling event to a one-time peak value of 4,070 µg/L, before dropping back below the primary MCL for the remainder of the year, then below the secondary MCL and almost to ambient background levels in the first quarter of 2018. Total aluminum concentrations at SAR-10/1 remained at or just above ambient background concentrations for the remainder of 2018 and throughout 2019. The temporary increases above the secondary MCL in 2020, 2021, and 2022 each occurred after an extended shutdown of GWRS injection at MBI-1, likely causing temporary arrival of native groundwater (containing aluminum) to SAR-10/1, resulting in adsorption and subsequent desorption of aluminum once GWRS injection at MBI-1 resumes.

At SAR-10/2, SAR-10/3, and SAR-10/4, Figure 8-16 shows no increase in total aluminum with the arrival of GWRS water and only a slight and gradual increase in dissolved aluminum at all three zones, most pronounced at SAR-10/2, though they have all remained well below the Secondary MCL. The slight increase is likely caused by GWRS water desorbing and/or dissolving and transporting aluminum from aquifer minerals and is anticipated to decline after an extended period of sustained GWRS water strips the readily available aluminum.

Figure 8-16 shows no increase in total or dissolved aluminum at any of the zones at SAR-11 with the arrival of GWRS water.

Figure 8-17 shows total and dissolved aluminum concentrations at monitoring wells SAR-12 and SAR-13 for 2018-2022. At SAR-12/1, SAR-12/3 and SAR-12/4 ambient background total aluminum concentrations were in the range of those at SAR-10 and SAR-11 where they remained after the onset of MBI Project injection and through 2022. At SAR-12/2, ambient background total aluminum concentrations in 2018 and 2019 were elevated and more varied relative to those of SAR-10 and SAR-11 but remained low and stable after the onset of MBI Project injection in 2020 and through 2022.

Figure 8-17 shows that ambient background total aluminum concentrations at all zones at SAR-13 were elevated and more varied relative to those of SAR-10 and SAR-11. At SAR-13/1, SAR-13/3, and SAR-13-4 total aluminum concentrations did not increase above background ambient levels at any time from when GWRS water arrived at both zones in mid-August 2020 through 2022. At SAR-13/2, total aluminum concentrations increased to a one-time spike of 68.2 µg/L in November 2020, but with no GWRS arrival observed at SAR-13/2 prior to July 2021, the elevated one-time spike was likely an ambient background concentration as it was only marginally higher than the ambient concentration of 50 µg/L in early 2018. After the one-time spike in 2018, total aluminum concentrations at SAR-13/2 have remained consistently low at ambient background levels from 2019-2022.

As displayed on Figure 8-16 and Figure 8-17, no other MBI monitoring well zones at SAR-10, SAR-11, SAR-12, or SAR-13 have exhibited comparably significant increases in total aluminum as those

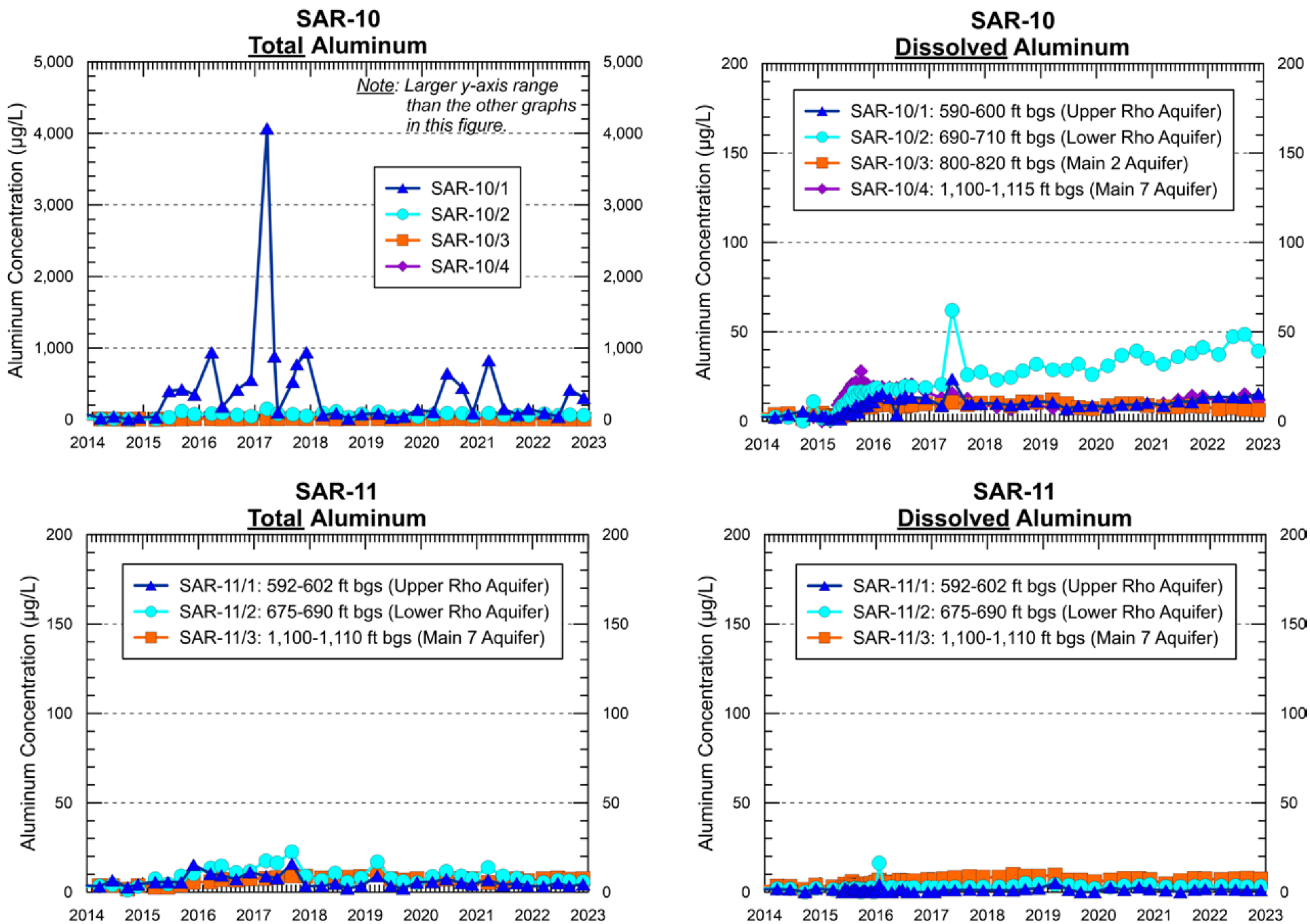


Figure 8-16. Monitoring Wells SAR-10 and SAR-11 Total and Dissolved Aluminum Concentrations

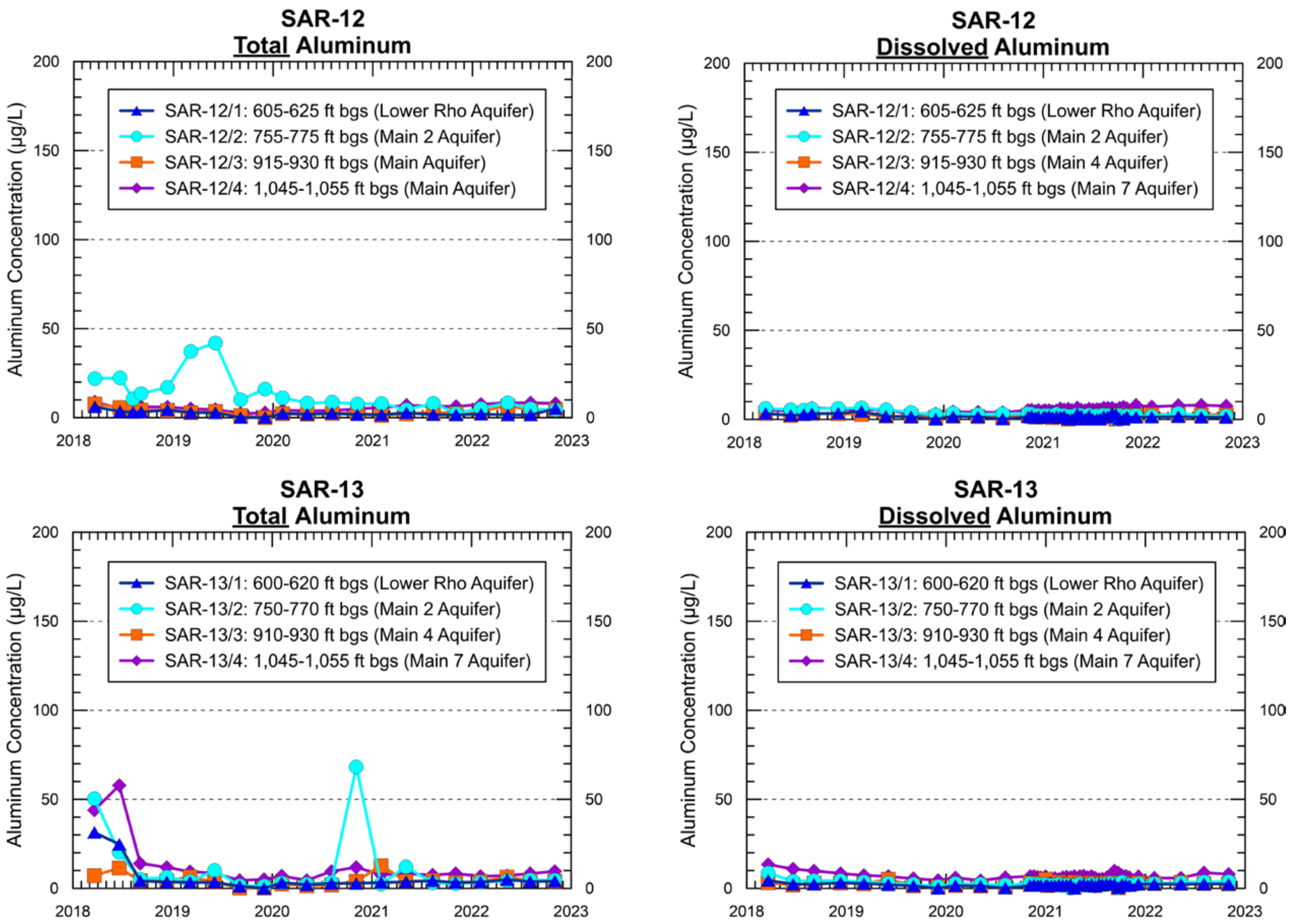


Figure 8-17. Monitoring Wells SAR-12 and SAR-13 Chloride and Total and Dissolved Aluminum Concentrations

observed at SAR-10/1, indicating a localized effect. In contrast to the SAR-10/1 results, the SAR-11/1 (equivalent aquifer interval at the downgradient monitoring well site) has displayed no increases in total aluminum with the arrival of GWRS water, with concentrations ranging from 2-16 µg/L, similar to pre-injection conditions. Furthermore, dissolved aluminum concentrations at SAR-10/1 have been much lower than those for total aluminum, ranging from 4.4-23.6 µg/L since GWRS water arrival in June 2015 (Figure 8-16), featuring only a subtle increase from the pre-injection background conditions; the lower dissolved aluminum concentrations indicated that localized particle association was contributing to the elevated total aluminum concentrations, potentially due to pH-mediated aluminum hydroxide dissolution from the SAR-10/1 aquifer zone.

8.4.6 Monitoring Wells – Iron

Iron is regulated via a California and Federal Secondary MCL, both set at 300 µg/L. Total iron concentrations at SAR-10/1 have followed a nearly identical trend as total aluminum since June 2015 and also peaked contemporaneously with aluminum in the first quarter of 2017 to 1,860 µg/L, well above the Secondary MCL. During 2022, total iron concentrations at SAR-10/1 remained below the secondary MCL, ranging from 51.6-176 µg/L. Dissolved iron concentrations at SAR-10/1 were considerably lower than for total iron, but also followed the general temporal trends, albeit at much lower concentrations. Similar to aluminum discussed above, the elevated total iron concentrations at SAR-10/1 were likely related to the arrival of GWRS purified recycled water in June 2015. The iron has likely been released by the oxidation of pyrite and other iron sulfide minerals known to occur in the Principal aquifer system. The oxidized iron can then potentially be resorbed to the aquifer mineral surfaces. No other MBI Project monitoring well zones at SAR-10, SAR-11, SAR-12, or SAR-13 had any concentrations above the background ambient range during 2022 nor have exhibited comparably significant increases in total iron as those observed at SAR-10/1, indicating a localized effect similar to what was observed for total aluminum.

8.4.7 Production Wells

Data for water samples collected from potable production wells in the vicinity of the MBI Project are summarized in Table 8-4. Municipal production wells IRWD-12 and IRWD-17 are the two nearest downgradient drinking water wells from the MBI Project, with IRWD-12 located 2,200 feet downgradient from the nearest injection well MBI-5 and IRWD-17 located 2,200 feet downgradient from the nearest injection well MBI-2 (Figure 8-3). Municipal production well FV-8 is located upgradient to the northwest of the MBI Project and FV-6 is located to the southwest and somewhat cross-gradient of the MBI Project based on the June 2022 Principal aquifer system groundwater elevation contours in Figure 8-3. The production wells listed in Table 8-4 and shown on Figure 8-3 are located less than one mile from the nearest MBI well.

As discussed in Section 8.4.1, chloride and sulfate have both been successfully used as intrinsic tracers to track the GWRS water injected to the downgradient MBI Project monitoring wells. As

Table 8-4. 2022 Water Quality for Potable Wells Within the Influence of the MBI Project

OCWD Well Name	Well Depth (ft bgs)[1]	Perforation Interval (ft bgs)[1]	Distance from Injection Site (ft)[2]	Concentration [3,4]								
				Arsenic (As), ug/L	Chloride (Cl) mg/L	Sulfate (SO4) mg/L	Total Dissolved Solids (TDS) mg/L	Nitrate Nitrogen (NO3-N) mg/L	Nitrite Nitrogen (NO2-N) mg/L	Total Organic Carbon (Unfiltered) (TOC) mg/L	n-Nitrosodi-methylamine (NDMA) ng/L	1,4-Dioxane (14DIOX) ug/L
Large System Municipal Wells												
FV-8[5]	864	312 - 844	3,097	ND[6]	30.4 (28.5 - 32)	61.5 (58.4 - 64.2)	340 (328 - 348)	1.45 (1.2 - 1.64)	ND	0.07 (0.06 - 0.09)	ND[6]	ND
IRWD-12	1,335	580 - 1,040	3,655	1.9 (1.6 - 2.1)	8.0 (7.4 - 9.2)	12.0 (10.9 - 13.1)	151 (136 - 166)	0.71 (0.65 - 0.78)	ND	0.04 (ND - 0.09)	ND	ND
IRWD-17	980	504 - 960	3,864	1.7 (1.6 - 1.9)	15.1 (14.1 - 16.3)	29.8 (27.4 - 32.4)	214 (194 - 310)	0.62 (0.59 - 0.66)	ND	0.04 (ND - 0.11)	ND	0.1 (ND - 0.5)
FV-6	1,120	370 - 1,110	4,867	ND[6]	35.2 (34.3 - 37)	65.2 (63.1 - 67.6)	330 (326 - 334)	0.90 (0.87 - 0.93)	ND	0.14 (0.12 - 0.18)	ND[6]	1.7 (1.3 - 2)

[1] Feet below ground surface

[2] Straight line shortest distance to the nearest DMBI injection well, estimated to the nearest 100 feet

[3] Concentrations are annual averages with annual ranges in parenthesis for the given year

[4] ND: Not detected or less than the detection limit (For average calculations, ND results are applied as 10% of the reporting limit)

[5] Upgradient from injection site

[6] Data from 2021

such, chloride and sulfate were also used to track the GWRS water signal at the nearest downgradient production wells IRWD-12 and IRWD-17, with the understanding that the GWRS signal could be more dampened due to dispersive transport farther downgradient and vertical blending from these long-screened interval production wells. The GWRS arrival times discussed in this section are estimates based on chloride and sulfate and are precursory to those based on Field Electrical Conductivity (F-EC) currently being used in the forthcoming MBI tracer test report as described in Section 8.5.

Figure 8-18 shows chloride and sulfate concentrations at IRWD-12 and IRWD-17 for the ten-year period 2013-2022. The relatively stable chloride and sulfate concentrations prior to 2020 confirmed that similar ambient concentrations as observed at SAR-10 and SAR-11 prior to MBI-1 injection were representative of longer-term regional conditions in this area. As shown on Figure 8-18, both chloride and sulfate concentrations were slightly higher at IRWD-17 than at IRWD-12, likely due to IRWD-17 being screened slightly shallower than IRWD-12. Mineral content and overall TDS tend to decrease with depth within the Principal aquifer system as these lower aquifer zones are more vertically removed from surficial recharge operations in the Forebay area of the Basin. As was shown in the schematic cross-section in Figure 8-2, IRWD-17 is screened in the same aquifers as MBI-1 (Upper Rho, Lower Rho, and Main), albeit with a slightly shallower bottommost screen, while IRWD-12 is only screened in the Lower Rho and Main aquifers. As discussed in Section 8.1, these Principal aquifer system zones are interpreted to be approximately 50-150 feet shallower at IRWD-12 and IRWD-17 than at MBI-1 due to the synclinal structure of the Basin dipping to the northwest.

Figure 8-18 shows that chloride and sulfate concentrations at IRWD-12 began to noticeably decline below stable ambient levels in the second half of 2020, continued their decline in 2021, and remained well below ambient background levels in 2022, thus confirming the arrival of an increasing percentage of GWRS water at this well. Based on the considerable magnitude of the sulfate reduction from 2020-2022, the 2020 GWRS arrival at IRWD-12 is interpreted to be from the 2020 MBI Project tracer test rather than from older GWRS injection at MBI-1. The same GWRS arrival criteria used for the MBI monitoring wells in Section 8.4.1 was used for IRWD-12, i.e., a chloride and sulfate decrease between 10 and 20 percent from the most recent ambient concentrations. At IRWD-12, a chloride and sulfate reduction of at least 10% was first observed on the 9/17/20 sample, yielding a GWRS arrival time of 182 days or approximately 6 months from the startup of the MBI Project tracer test on 3/18/20. This GWRS arrival time estimate at IRWD-12 yielded a consistent groundwater velocity as the 64-day GWRS arrival at SAR-13/4 (Main 7 aquifer) along the most likely flow path from MBI-5, which lends confidence that the GWRS arrival at IRWD-12 is from the MBI Project tracer test rather than from older MBI-1 injection.

Figure 8-18 shows that during 2022 chloride and sulfate concentrations at IRWD-17 continued the steady gradual decline that began in late-2020. At IRWD-17, a chloride and sulfate reduction

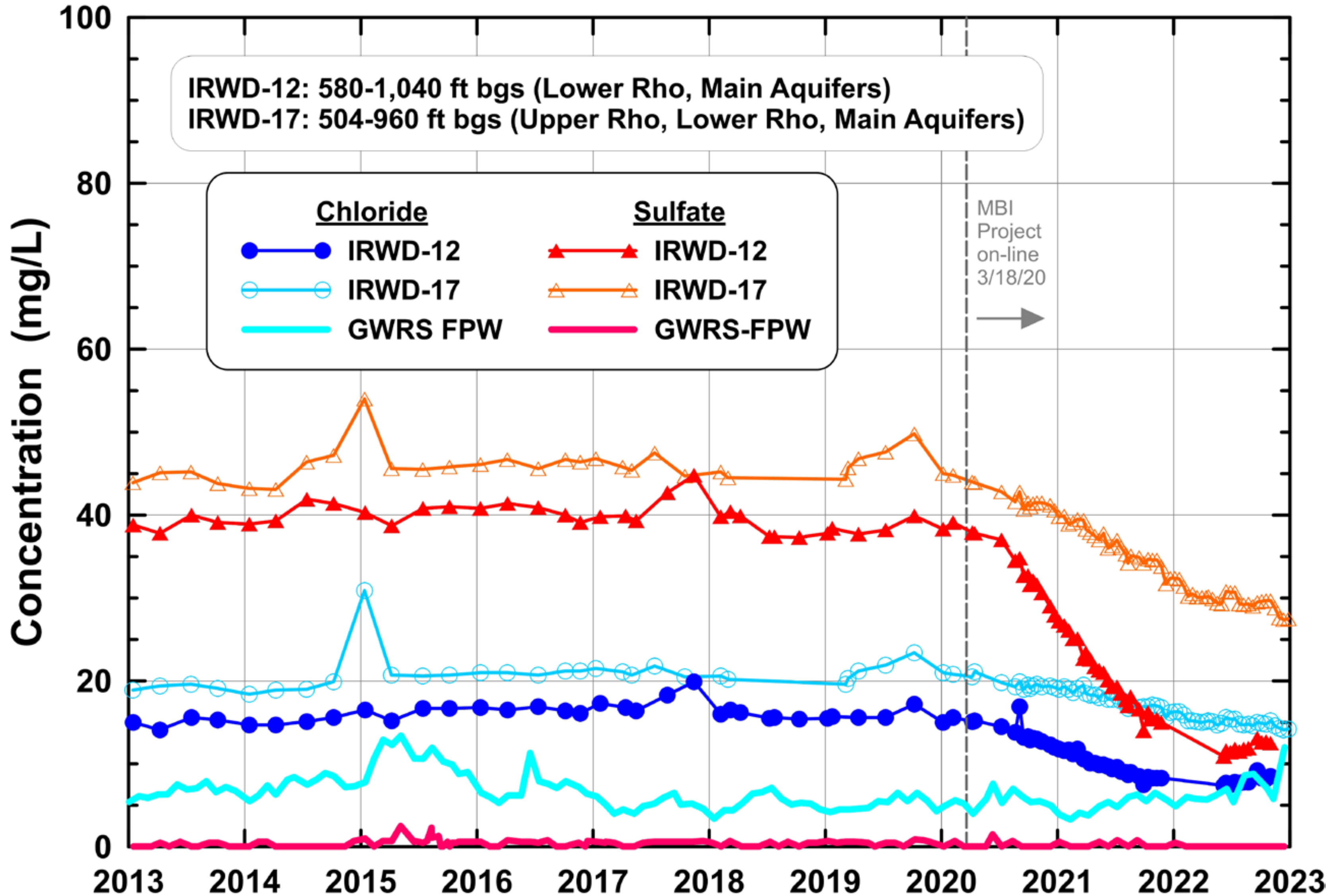


Figure 8-18. Wells IRWD-12 and IRWD-17 Chloride and Sulfate Concentrations

of at least 10% was first observed on the 4/13/21 sample, yielding a GWRS arrival time of 393 days or approximately 13 months from the startup of the MBI Project tracer test on 3/18/20.

Based on the travel distance of 2,200 feet and an estimated travel time of 182 days to IRWD-12, a groundwater velocity of approximately 12 feet per day was estimated, likely occurring via the Main 7 aquifer zone (Figure 8-2) which had the fastest GWRS arrival at all four MBI monitoring wells (SAR-10/4, SAR-11/3, SAR-12/4, and SAR-13/4). In fact, the 64-day GWRS arrival at SAR-13/4, if originating from MBI-5 (Figure 8-3), yields an equivalent groundwater velocity of approximately 12 feet per day. Based on the travel distance of 2,200 feet and an estimated travel time of 393 days to IRWD-17, GWRS arrival based on the dampened sulfate decrease would yield a slower groundwater velocity of approximately 6 feet per day from MBI-2 to this well, likely in the same Main 7 fast flow path zone. IRWD-17 is only partially screened in the Main 7 aquifer zone (Figure 8-2), likely explaining the more dampened response as compared to IRWD-12.

Currently the Title 22 regulations for direct injection of recycled water require a minimum of two months of response retention time for projects employing GWRS type treatment prior to withdrawal from a production well, with potentially additional retention required for pathogenic microorganism control depending on the credits granted for the pre-injection above ground treatment (CCR, 2018); under these regulations, GWRS is currently permitted for a minimum retention time of four months in the Anaheim Forebay area. The model-determined boundary areas currently permitted in the MBI area assume a primary boundary of three months and a secondary boundary of four months and will be subject to revision based on analysis of the tracer test modeling results (see Section 8.5).

IRWD-12 and IRWD-17 have shown minor detections of arsenic and vanadium over the last several years. During 2022, vanadium concentrations at both IRWD-12 and IRWD-17 remained within the historical range of 4.3-5.5 µg/L, well below the NL of 50 µg/L. Historically, arsenic concentrations at IRWD-12 have ranged from below the RDL of 1 µg/L to occasional detections up to 2 µg/L, thus remaining well below the MCL of 10 µg/L. During 2022, IRWD-12 had minor arsenic detections ranging from 1.6-2.1 µg/L, based on quarterly sampling. At IRWD-17, arsenic concentrations ranged historically from below the RDL to 2.4 µg/L. During 2022, IRWD-17 had minor arsenic detections ranging from 1.6-1.9 µg/L, based on six samples collected at least quarterly throughout the year.

IRWD-12 and IRWD-17 historically have had no detections of NDMA or 1,4-dioxane and through 2022 this trend has continued for both constituents at IRWD-12 and for NDMA at IRWD-17. However, IRWD-17 had a minor detection of 1,4-dioxane at a concentration of 1.1 µg/L just above the old RDL of 1 µg/L for the first time in July 2019 and confirmed with a resample at the same concentration in August 2019. During 2021 and 2022, IRWD-17 continued to have minor detections of 1,4-dioxane, ranging from 0.5-0.8 µg/L, just at or slightly above the new lower RDL of 0.5 µg/L implemented by the OCWD Laboratory in mid-2020. These minor detections of 1,4-

dioxane at IRWD-17 during the last four years likely indicate a small percentage of historical (pre-GWRS) injection water finally arriving at IRWD-17 from the Talbert Barrier approximately 2 miles away.

Production well FV-6 has also had low concentrations of 1,4-dioxane over recent years as well as during 2022 (Table 8-4), historically remaining less than 3 µg/L. Similar to IRWD-17, the low 1,4-dioxane concentrations at FV-6 likely indicated some percentage of pre-GWRS injection water from the Talbert Barrier arriving at this well.

8.5 Groundwater Modeling for MBI Tracer Test

A tracer test was required for MBI Project compliance to establish primary and secondary boundaries representing zones of controlled drinking water well construction as described in MBI Project Title 22 Engineering Report Supplement (OCWD, 2018) and the subsequent Regional Water Quality Board Amending Order R8-2019-0007 (RWQCB, 2019). Concurrent with the tracer experiment, the NWRI GWRS IAP recommended using MT3D mass transport (Zheng and Wang, 1999) modeling along with MODFLOW (Harbaugh and McDonald, 1996) and MODPATH (Pollock, 1994) to assist in the analysis and interpretation of observed downgradient tracer breakthrough.

Concurrent with the MBI tracer test which began March 18, 2020 with full-scale operations of all five MBI wells through the end of the year, OCWD refined the existing OCWD Talbert Model specifically in the MBI Project area and calibrated the flow model to observed groundwater levels at SAR-10, SAR-11, SAR-12, and SAR-13. The transport model was preliminarily calibrated to observed GWRS arrival time results at SAR-10 and SAR-11 from prior DMBI injection at MBI-1 (GWRS arrival had not yet been observed at SAR-12 and SAR-13 from the 2020 tracer test at the time of the original modeling work). Talbert Model refinements in the MBI Project area during 2020 included temporally extending the model calibration period through December 2019 and refining the lateral grid cell dimensions and the vertical layering in the MBI Project area based on the lithologic logs and geophysical logs of the MBI Project wells. During 2021, the Talbert Model was further extended through May 2021 to calibrate the flow and transport model to the MBI full-scale tracer test that began in March 2020 by including all monthly production and injection volumes from the Talbert Barrier and MBI wells and observed water level data from monitoring wells.

Modelling work undertaken during 2022 included additional improvements to both the flow and transport calibration as well as using F-EC for the final stage of the transport calibration. F-EC was chosen as the tracer of choice because it has one order of magnitude higher ambient concentrations than sulfate and thus a larger differential between ambient and GWRS-FPW levels, allowing for a more definite GWRS first arrival signal (greater than 10% decrease in F-EC) at the nearby monitoring wells and production wells. The model has been adequately calibrated and development is currently underway of a primary and secondary boundary area based on simulated GWRS arrival within the fastest flow path Main 7 aquifer zone (model layer 17) for the conservative condition of all five MBI wells simultaneously injecting at full capacity along with higher summer pumping rates at the downgradient IRWD DRWF. A finalized MBI Tracer Test Report detailing the modeling results is forthcoming.

ACRONYMS LIST

1,2,3-TCP	1,2,3-trichloropropane
ABF	ammonium bifluoride (antiscalant)
AF	acre-foot, acre-feet
AFY	acre-feet per year
AI	Aggressive Index or Aggressivity Index
AIRR	automatic injection rate reduction
AL	action level
AOP	advanced oxidation process
ARTIC	Anaheim Regional Transportation Intermodal Center
AS	activated sludge
AS1	OC San Plant No. 1 P1-82 Activated Sludge Plant 1
AS2	OC San Plant No. 1 P1-102 Activated Sludge Plant 2
ASTM	American Society for Testing and Materials (ASTM International)
ATP	adenosine triphosphate
AVG	average
AWC	American Water Chemicals
AWPF	advanced water purification facility
AWT	advanced water treatment
AWTO	advanced water treatment operator
Basin	Orange County Groundwater Basin
Basin Model	OCWD Basin-wide Groundwater Flow Model
bgs	below ground surface
BP	Basin Plan (Water Quality Control Plan for the Santa Ana River Basin)

BPL	UV reactor ballast power level
BPP	basin production percentage
BPS	barrier pump station
BWW	backwash waste
CA UCMR	California Unregulated Chemical Monitoring Regulations
CBOD	carbonaceous biochemical oxygen demand
CCPP	calcium carbonate precipitation potential
CDPH	California Department of Public Health (formerly DHS; now DDW)
CEC	chemicals of emerging concern or constituents of emerging concern
cfm	cubic feet per minute
CFS	cubic feet per second
CIP	clean-in-place
Cl^-	chloride
CLIP	California Laboratory Intake Portal (for DDW)
CPP	(Anaheim) Canyon Power Plant
CPTP	Coastal Pumping Transfer Program
CUP	Conjunctive Use Program
CY	calendar year
DBP	disinfection by-product
DDW	Division of Drinking Water, State Water Resources Control Board (formerly DHS, then CDPH)
DHS	California Department of Health Services (later CDPH, now DDW)
DMBI	Demonstration Mid-Basin Injection
DOC	dissolved organic carbon
DPW	decarbonated product water

DRWF	Dyer Road Well Field
DWEL	drinking water equivalent level
DWR	California Department of Water Resources
EC	electrical conductivity
EED	electrical energy dose
EPA	U. S. Environmental Protection Agency
F-EC	field electrical conductivity
FPW	finished product water or final product water (purified recycled water)
FPWB	finished product water bypass structure
ft	foot, feet
FV	Fountain Valley, City of Fountain Valley
GAC	granular activated carbon
GAP	Green Acres Project
GeoTracker	State water quality database (for RWQCB)
gpm, GPM	gallons per minute
GRRP	Groundwater Recharge Reuse Project
GSWC	Golden State Water Company (formerly Southern California Water Company)
GWRS	Groundwater Replenishment System
GWRSIE	Groundwater Replenishment System Initial Expansion
GWRSFE	Groundwater Replenishment System Final Expansion
HFO	hydroferrous oxide
hr	hour(s)
I	injection well numbering designation
I&E	instrumentation and electrical

IRWD	Irvine Ranch Water District
IWF-21	Interim Water Factory 21
kgal	thousand gallons
K-M-M-L	Kraemer-Miller-Miraloma-La Palma (Basins)
kW	kilowatt
kWh	kilowatt-hours
LLNL	Lawrence Livermore National Laboratory
LP	UV reactor lamp output
LRV	log reduction value (for pathogenic microorganisms)
LSI	Langelier Saturation Index
M	monitoring well numbering designation
m^3	cubic meter
m^3/day	cubic meters per day
MBI	Mid-Basin Injection
MCL	maximum contaminant level
MCWD	Mesa Water District (formerly Mesa Consolidated Water District)
Mesa Water	Mesa Water District
MF	membrane filtration
MFE	membrane filtration effluent (filtrate)
MFF	membrane filtration feed
MFL	million fibers greater than 10 microns in length per liter
MG	million gallons
mil gal	million gallons
mJ/cm^2	millijoules per square centimeter
MGD	million gallons per day

mg/L	milligrams per liter
micron	micrometer
mL	milliliters
MPN	most probable number
msl	mean sea level
MWD	Metropolitan Water District of Southern California
MWRP	Michelson Water Recycling Plant (IRWD facility)
na	not analyzed
N/A	not applicable
ND	non-detect, not detected (numerically designated as 10% of the reportable detection limit for purposes of calculating the average)
NDMA	N-nitrosodimethylamine
NdN	nitrification/partial denitrification
ng/L	nanograms per liter
NL	California Notification Level
nm	nanometers
nr	not reported
NR	Not Required
NS	not sampled
NTU	nephelometric turbidity unit
NWRI	National Water Research Institute
OC-44	MWD Turnout designation in Huntington Beach
OCHCA	Orange County Health Care Agency
OC San	Orange County Sanitation District (aka OCSD)
OCWD	Orange County Water District

OMMP	Operation, Maintenance, and Monitoring Plan
OOP	Operation Optimization Plan
ORP	oxidation reduction potential
%	percent
P1	OC San Reclamation Plant No. 1
P1 AS1	OC San Reclamation Plant No. 1 Activated Sludge Plant 1 (effluent)
P1 AS2	OC San Reclamation Plant No. 1 Activated Sludge Plant 2 (effluent)
P1 TF	OC San Reclamation Plant No. 1 Trickling Filter (effluent)
P2	OC San Treatment Plant No. 2
P2 TF/SC	OC San Treatment Plant No. 2 Trickling Filter/Solids Contact (effluent)
Panel	Independent Advisory Panel
PCS	process control system
PDT	pressure decay test
PEPS	Primary Effluent Pump Station
PFAS	Per- and polyfluoroalkyl substances
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonic acid
PISB	Primary Influent Splitter Box
PMCL	Primary Maximum Contaminant Level
PPM	parts per million
psi	pounds per square inch
PVDF	polyvinylidene difluoride
PWPS	product water pump station
Q	flow rate
Q1	secondary effluent from OC San Plant No. 1 (same as Q-1)

R	number of reactors in service in a UV train
RAS	return activated sludge
RDL	reportable detection limit
RfD	Reference Dose
RL	California Response Level
RO	reverse osmosis
ROF	reverse osmosis feed
ROP	reverse osmosis product
%RW	percentage recycled water (instantaneous; not averaged over 60 months)
RWC	recycled water contribution (monthly; averaged over 60 months)
RWQCB	Regional Water Quality Control Board, Santa Ana Region
SALS	Steve Anderson Lift Station (at OC San Plant No. 1)
SAR	Santa Ana River
SARI	Santa Ana Regional Interceptor
SARWQH	Santa Ana River Water Quality and Health (Study)
SCADA	supervisory control and data acquisition (see also PCS)
SCE	Southern California Edison
SCWC	Southern California Water Company, now Golden State Water Company
SEB	Southeast Barrier Pipeline
SMCL	secondary maximum contaminant level
SOC	synthetic organic compound
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
TF	trickling filter(s)
TIC	tentatively identified compound

TMP	transmembrane pressure
TOC	total organic carbon
TR	trace
ug/L, µg/L	micrograms per liter
µmhos/cm, µm/cm, um/cm	micromhos per centimeter
UPS	uninterruptible power supply
UR	unregulated chemicals requiring monitoring
µS	microsiemens (same as micromhos)
USEPA	United States Environmental Protection Agency
UV	ultraviolet (light exposure or irradiation)
UV/AOP	ultraviolet/advanced oxidation process
UVF	ultraviolet/advanced oxidation process feed
UVP	ultraviolet/advanced oxidation process product
UV%T, %UVT	percent UV Transmissivity
VFD	variable frequency drive
VOC	volatile organic compound
WF-21	Water Factory 21
WRMS	Water Resources Management System
YLWD	Yorba Linda Water District

REFERENCES

Bowell, R.J. 1994. *"Sorption of Arsenic by Iron Oxides and Oxyhydrides in Soils: Applied Geochemistry"*, Volume 9, Pages 279-286.

California Code of Regulations (CCR). 2018. *"Title 22, Division 4, Chapter 3, Article 5.2, Water Recycling Criteria".* October 1, 2018.

California Department of Public Health (CDPH), 2010. *"System No. 3090001 – Orange County Water District Interim Water Factory 21 and Groundwater Replenishment System Groundwater Recharge and Reuse at Talbert Gap Seawater Intrusion and Kraemer/Miller Basins – Water Recycling Requirements Revised Monitoring Frequency – Selected Analytes".* Letter to OCWD dated September 20, 2010.

California Department of Public Health (CDPH), 2012. *"System No. 3090001-Groundwater Replenishment System (GWRS) Title 22 Engineering Report Update".* Letter to OCWD dated May 11, 2012.

California Department of Public Health (CDPH), 2014. *"System No. 3090001 – Groundwater Replenishment System (GWRS) Title 22 Engineering Report Supplement."* Letter to OCWD dated June 30, 2014.

California Department of Water Resources (DWR). 1934. *"South Coastal Basin Investigation, Geology and Groundwater Storage Capacity of Valley Fill."* Bulletin No. 45.

California Department of Water Resources (DWR). 1966. *"Bulletin No. 147-1, Ground Water Basin Protection Projects, Santa Ana Gap Salinity Barrier, Orange County"*, December 1966.

California Department of Water Resources (DWR). 1967. *"Progress Report on the Groundwater Geology of the Coastal Plain of Orange County"*, July 1967.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2004. *Order No. R8-2004-0002, "Producer/User Water Recycling Requirements and Monitoring and Reporting Program for the Orange County Water District Interim Water Factory 21 and Groundwater Replenishment System Groundwater Recharge and Reuse at Talbert Gap Seawater Intrusion Barrier and Kraemer/Miller Basins"*. March 12, 2004.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2008. *Order No. R8-2008-0058, Amending Order No. R8-2004-0002, "Producer/User Water Recycling Requirements for the Orange County Water District Interim Water Factory 21 and Groundwater Replenishment System Groundwater Recharge and Reuse at Talbert Gap Seawater Intrusion Barrier and Kraemer/Miller Recharge Basins"*. July 18, 2008.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2011. *"Approval of Groundwater Monitoring Frequency Reduction Request for Selected Analytes – Water Recycling Requirements Order No. R8-2004-0002 for Orange County Water District's Groundwater Replenishment System, Fountain Valley, California."* Letter to OCWD dated March 14, 2011.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2012. *"Approval of Miraloma Basin for Recharge Operations – Producer/User Water Recycling Requirements Order No. R8-2004-0002 for Orange County Water District's Groundwater Replenishment System, Fountain Valley, California".* Letter to OCWD dated May 31, 2012.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2014a. *Order No. R8-2014-0054, "Amending Order No. R8-2004-0002, as amended by Order No. R8-2008-0058, Producer/User Water Recycling Requirements for Orange County Water District Interim Water Factory 21 and Groundwater Replenishment System Groundwater Recharge and Reuse at Talbert Gap Seawater Intrusion Barrier and Kraemer/Miller Recharge Basins, Orange County"*. December 12, 2014.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2014b. *Order No. R8-2014-0069, NPDES No. CA8000408, "Waste Discharge Requirements for the Orange County Water District, Groundwater Replenishment System Advanced Water Purification Facility Emergency Discharge to Reach 1 of Santa Ana River".* December 12, 2014.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2016. *Order No. R8-2016-0051, "Amending Order No. R8-2004-0002, as amended by Order No. R8-2008-0058 and Order No. R8-2014-0054, Producer/User Water Recycling Requirements for Orange County Water District Interim Water Factory 21 and Groundwater Replenishment System Groundwater Recharge and Reuse at Talbert Gap Seawater Intrusion Barrier and Kraemer/Miller Recharge Basins, Orange County"*. July 29, 2016.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2018. *"Letter from RWQCB to Jason Dadakis, OCWD, Approval of Groundwater Monitoring Program Modification for Selected Analytes – Water Recycling Requirements Order No. R8-1003-0002 for Orange County Water District's (OCWD) Groundwater Replenishment System, Fountain Valley, California".* February 27, 2018.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2019. *Order No. R8-2019-0007, "Amending Order No. R8-2004-0002, Producer/User Water Recycling Requirements for the Orange County Water District Groundwater Replenishment System, Orange County"*. March 22, 2019.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2020a. *"Monitoring and Reporting Program No. R8-2004-0002".* November 2, 2020.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB. 2020b. *Order No. R8-2020-0006 NPDES No. CAG998001, "General Waste Discharge Requirements for Discharges to Surface Waters that Pose an Insignificant (De Minimis) Threat to Water Quality".* June 19, 2020.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2021a. *Order No. R8-2021-0003, "Waste Discharge Requirements and Master Recycling Permit for Orange County Water District Advanced Water Purification Facility, Orange County".* March 12, 2021.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB) and U.S. Environmental Protection Agency, Region 9. 2021b. *Order No. R8-2021-0010, NPDES No. CA 0110604, Waste Discharge Requirements and National Pollutant Discharge Elimination System Permit for Orange County Sanitation District, Publicly Owned Treatment Works (Reclamation Plant No. 1, Treatment Plant No. 2, Collection System, and Outfalls).* June 18, 2021.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2022a. *Order No. R8-2022-0050, "Waste Discharge Requirements and Master Recycling Permit for the Orange County Water District Groundwater Replenishment System".* December 2, 2022.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2022b. *Order No. R8-2022-0002, NPDES No. CA8000408 "Waste Discharge Requirements and National Pollutant Discharge Elimination System Permit for the Orange County Water District Groundwater Replenishment System Advanced Water Purification Facility Emergency Discharge to Reach 1 of Santa Ana River"*. March 18, 2022.

California State Water Resources Control Board Division of Drinking Water (DDW). 2017. *"Orange County Water District, Groundwater Replenishment System (GWRS), System No. 3090001, Project No. 745, Comments on Section 60320.200 Groundwater Recharge Report",* Letter dated January 27, 2017.

California State Water Resources Control Board (SWRCB), Division of Drinking Water (DDW). 2018a. *"Letter to Milasol Gaslan, California Regional Water Quality Control Board, DDW Evaluation of Orange County Water District Groundwater Replenishment System's Groundwater Monitoring – Monitoring Reduction Request (3090001-704)"*. January 16, 2018.

California State Water Resources Control Board (SWRCB), Division of Drinking Water (DDW). 2018b. *"Letter to Milasol Gaslan, California Regional Water Quality Control Board, Conditional Approval Letter for the Orange County Water District's Groundwater Replenishment System Mid-Basin Injection Project (3090001-704)"*. September 18, 2018.

California State Water Resources Control Board Division of Drinking Water (DDW). 2022. *"Drinking Water Notification Levels and Response Levels: An Overview",* Updated November 1, 2022.

Clark, Jordan F. 2009. *"The 2008 Kraemer Basin Tracer Experiment Final Report"*, August 7, 2009.

DDB Engineering, Inc. 2021. *"Groundwater Replenishment System 2020 Annual Report".* June 2021.

DDB Engineering, Inc. 2022. *"Groundwater Replenishment System 2021 Annual Report".* June 2022.

Fakhreddine, et al. 2015. *"Geochemical Triggers of Arsenic Mobilization during Managed Aquifer Recharge".* Environmental Science & Technology, 2015, 49 (13), 7802-7809. June 9, 2015.

Freeze, R. Allan and John A. Cherry. 1979. *"Groundwater"*. Prentice-Hall, Inc., 604 pp.

Guo, W. and C.D. Langevin. 2002. *"User's Guide to SEAWAT: A Computer Program for Simulation of Three-Dimensional Variable-Density Ground-Water Flow."* U.S. Geological Survey, Techniques of Water-Resources Investigations 6-A7.

Ghyben, W.B. 1888. Nota in verband met de voorgenomen putboring nabij Amsterdam. *Tijdschrift van Let Koninklijk Inst. Van Ing.*

Harbaugh, A.W. and McDonald, M.G. 1996. *"User's documentation for MODFLOW-96, an update to the U.S. Geological Survey modular finite-difference ground-water flow model."* U.S. Geological Survey Open-File Report. 96-485.

Herndon, Roy L. and John D. Bonsangue. 2006. *"Hydrogeology of the Orange County Groundwater Basin – An Updated Overview"*, Geology of the Orange County Region, Southern California, 2006, Annual Field Trip Guide No. 33, South Coast Geological Society, Inc.

Herzberg, A. 1901. Die Wasserversorgung einiger Nordseebader. *J. Gasbeleucht. Wasserversorg., 44, pp. 815-819.*

Lawrence Livermore National Laboratory (LLNL). 2004. *"Final Report on Isotope Tracer Investigations in the Forebay of the Orange County Groundwater Basin"*. UCRL-TR-201735, January 2004.

National Water Research Institute (NWRI). 2004. *"Report of the Scientific Advisory Panel, Orange County Water District's Santa Ana River Water Quality and Health Study"*, August 2004.

National Water Research Institute (NWRI). 2021. *"Meeting 17 Panel Report, Review of the Orange County Water District Groundwater Replenishment System, based on an Independent Advisory Panel Meeting, October 29-30, 2020, Prepared by NWRI Independent Advisory Panel to Review the Groundwater Replenishment System",* January 6, 2021.

Orange County Sanitation District (OC San). 2022. *"FY 2021/22 Annual Report, Resource Protection Division, Pretreatment Program",* October 31, 2022.

Orange County Water District. 2004a. *"Santa Ana River Water Quality and Health Study, Final Report"*, October 2004.

Orange County Water District. 2004b. *"Groundwater Management Plan"*, March 2004.

Orange County Water District. 2005. *"Board of Directors Resolution No. 05-4-40. (Establishing a GWR System Buffer Area around the GWR System Injection Operation at the Talbert Gap Seawater Intrusion Barrier…)",* April 20, 2005.

Orange County Water District. 2007. *"Report on Evaluation of Orange County Groundwater Basin Storage and Operational Strategy"*, February 2007.

Orange County Water District. 2010. *"Demonstration Mid-Basin Injection well design and the potential for cross-aquifer wellbore flow and effects on injection and pumping operations, Technical Memorandum Prepared by Jason Dadakis"*. April 9, 2010.

Orange County Water District, 2012. *"Board of Directors Resolution No. 12-7-83",* July 18, 2012.

Orange County Water District. 2015. *"Demonstration Mid-Basin Injection Project: Initial Operations and Water Quality, Technical Memorandum Prepared by Jason Dadakis, John Bonsangue, and Justin McKeever"*, Technical Memorandum from OCWD to GWRS Independent Advisory Panel, October 14, 2015.

Orange County Water District, 2016. *"Board of Directors Resolution No. 16-7-98",* July 20, 2016.

Orange County Water District, 2018. *"Updated GWRS Operation Optimization Plan"*, April 17, 2018.

Orange County Water District and DDB Engineering, Inc. 2014. *"Title 22 Engineering Report Update Supplement for the Groundwater Replenishment System",* March 2014.

Orange County Water District and DDB Engineering, Inc. 2018. *"Title 22 Engineering Report Mid-Basin Injection Supplement for the Groundwater Replenishment System".* July 2018.

Orange County Water District and DDB Engineering, Inc. 2021. *"Title 22 Engineering Report for the Groundwater Replenishment System",* April 2021.

Orange County Water District and DDB Engineering, Inc. 2022. "*GWRS Operations Optimization Plan",* November 2022.

Phraner, R.W., B. Harley, E.G. Reichard, and B. Stollar. 2001. *"Findings of Model Advisory Panel - Transient Calibration of Multi-layer Basin Flow Model"*. Letter from Basin Model Advisory Panel to OCWD.

Pollock, D.W. 1994. "*User's Guide for MODPATH/MODPATH-PLOT. Version 3: A Particle Tracking Post-Processing Package for MODFLOW, the US Geological Survey Finite-Difference Ground-Water Flow Model."* U.S. Geological Survey Open-File Report. 94-464.

State Water Resources Control Board (SWRCB). 2018. *"Water Quality Control Policy for Recycled Water",* December 11, 2018.

State Water Resources Control Board (SWRCB). 2021a. *"Notice for conditional approval of OCWD Quality Assurance Project Plan",* Letter to OCWD dated June 7, 2021.

State Water Resources Control Board (SWRCB). 2021b. *"Approval for use of an in-house method for the 'Determination of 1,4-Dioxane and Other Targets in Water by Purge and Trap and Capillary Gas Chromatography/Mass Spectrometry' for monitoring 1,4-dioxane pursuant to the Water Quality Control Policy for Recycled Water (Recycled Water Policy)",* Letter to OCWD dated April 5, 2021.

State Water Resources Control Board (SWRCB). 2021c. *"Approval for use of an in-house method for the 'Chemical of Emerging Concern (CECs) for monitoring sucralose and sulfamethoxazole pursuant to the Water Quality Control Policy for Recycled Water (Recycled Water Policy)",* Letter to OCWD dated May 10, 2021.

State Water Resources Control Board (SWRCB). 2021d. *"Approval for use of an in-house method for the 'N-Nitrosodimethylamine (NDMA) Low Level" for monitoring NDMA and N-nitrosomorpholine (NMOR) pursuant to the Water Quality Control Policy for Recycled Water (Recycled Water Policy)",* Letter to OCWD dated May 10, 2021.

U.S. Environmental Protection Agency (USEPA). 2005. *"Membrane Filtration Guidance Manual"*, November 2005.

Welch, Alan H. and Kenneth G. Stollenwerk. 2003. *"Arsenic in Ground Water"*, Chapter 3, Pages 77-82.

Zheng, Chunmiao and Wang, Pu. 1999. *"MT3DMS: A Modular Three-Dimensional Multispecies Transport Model for Simulation of Advection, Dispersion, and Chemical Reactions of Contaminants in Groundwater Systems; Documentation and User's Guide."*

APPENDICES

Appendix A – Water Quality Requirements for Groundwater Replenishment System and Final Product Water Quality Data, January 1 through December 31, 2022

Appendix B – Laboratory Methods of Analysis

Appendix C – Water Quality Constituents with Laboratory Methods

Appendix D – Pathogen Log Reduction Value (LRV) Reports

Appendix E – Critical Control Points

Appendix F – Operator Certifications, Operations and Maintenance Summary and Calibration Records

Appendix G – Groundwater Quality Data at the Talbert Barrier

Appendix H – Talbert Barrier Monitoring Well Groundwater Quality Data, 1,4-Dioxane, NDMA and Selected Constituents

Appendix I – Groundwater Quality Data at the Anaheim Forebay

Appendix J – Anaheim Forebay Monitoring Well Groundwater Quality Data, 1,4-Dioxane, NDMA and Selected Constituents

Appendix K – Groundwater Quality Data at the Mid-Basin Injection Project Area

Appendix L – Mid-Basin Injection Project Area Monitoring Well Groundwater Quality Data, 1,4-Dioxane, NDMA and Selected Constituents

Appendix A

Water Quality Requirements for

Groundwater Replenishment System

and

Final Product Water Quality Data

January 1 through December 31, 2022

Advanced Water Purification Facility

Orange County Water District
Groundwater Replenishment System
2022 Annual Report

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1])
AVERAGES FOR ALL AVAILABLE DATA FOR 2022[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2022 Quarter 1	2022 Quarter 2	2022 Quarter 3	2022 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
Total Purified Recycled Water Flow	Plant Monitoring	N/A	MGD	89.65	81.75	84.98	91.41				≤ 100 / ≤ 130[5]
REQUIRED REVERSE OSMOSIS PRODUCT MONITORING[6]											
Ultraviolet Transmittance (UV%/T) at 254	Plant Monitoring	0.10%	%	97.5%	97.1%	97.1%	97.2%				>90%
Turbidity	Plant Monitoring	N/A	NTU	0.018	0.015	0.016	0.015		5		<0.2/0.5[7]
BIOLOGICAL											
E. Coli (Colilert - MPN/100mL) (ECOLIQ)	9223B	1	MPN	ND	ND	ND	ND				N/A
Estrogen Receptor alpha as 17-beta Estradiol (ERa17bES)	BIOASCEC	0.5	ng/L	ND	ND	ND	ND				3.5
Total Coliform (Colilert - MPN/100mL) (TCOLIQ)	9223B	1	MPN	ND	ND	0.142	ND				2.2
INORGANIC											
Aggressive Index (AI)	Plant Monitoring		A.I.	11.71	11.81	11.76	11.71				>11.0
Alkalinity-Phenolphthalein (ALKPHE)	2320B	1	mg/L	ND	0.258	0.39	ND				N/A
Aluminum (Al)	X200.8	1	ug/L	1.5	1.1	ND	ND	1,000	200		200[8]
Ammonia Nitrogen (NH3-N)	350.1	0.1	mg/L	0.16	0.27	0.57	0.47				N/A
Antimony (Sb)	X200.8	1	ug/L	ND	ND	ND	ND	6			6
Apparent Color (unfiltered) (APCOLR)	2120B	3	UNITS	ND	ND	ND	ND		15		15
Arsenic (As)	X200.8	1	ug/L	ND	ND	ND	ND	10			10
Asbestos (ASBESTOS)	100.2	0.18 - 0.2	MFL	ND	ND	ND	ND	7			7
Barium (Ba)	X200.8	1	ug/L	ND	ND	ND	ND	1,000			1,000
Beryllium (Be)	X200.8	1	ug/L	ND	ND	ND	ND	4			4
Bicarbonate (as CaCO3) (HCO3Ca)	2320B	1	mg/L	38.39	39.33	42.22	42.60				N/A
Bicarbonate (as HCO3) (HCO3)	CALC / UNKWQAN	1.2	mg/L	46.80	47.96	51.47	51.93				N/A
Biochemical Oxygen Demand (BOD)	5210B	2 - 2.4	mg/L	ND	ND	ND	ND				20/Mo; 30/wk
Boron (B)	X200.7	0.1	mg/L	0.2	0.24	0.27	0.29			1	N/A
Bromate (BrO3)	300.1B	5	ug/L	ND	ND	ND	ND	10			10
Bromide (Br)	300.1B / X1-300.0	0.01 - 0.1	mg/L	ND	ND	ND	ND				N/A
Cadmium (Cd)	X200.8	1	ug/L	ND	ND	ND	ND	5			5
Calcium (Ca)	X200.7	0.5	mg/L	13.63	13.70	13.56	14.57				N/A
Calcium Hardness (CaHRD)	X200.7	0.25	mg/L	34.05	34.22	33.87	36.36				N/A
Carbonate (as CaCO3) (CO3Ca)	2320B	1	mg/L	ND	0.54	0.82	ND				N/A
Cation-Anion meq balance (CATANI)	UNKWQAN		RATIO	-11.15	-6.22	-3.20	-4.79				N/A
Chlorate (CLO3)	300.1B	10	ug/L	ND	ND	15.8	13.70			800	N/A
Chloride (Cl)	X1-300.0	0.5	mg/L	5.6	6.3	7.60	8.30		250		55[9]
Chlorite (CLO2)	300.1B	10	ug/L	ND	ND	ND	ND	1,000			1,000
Chromium (Cr)	X200.8	1	ug/L	ND	ND	ND	ND	50			50
Cobalt (Co)	X200.8	1	ug/L	ND	ND	ND	ND				N/A
Copper (Cu)	X200.8	1	ug/L	ND	ND	ND	ND		1,000	1,300	1,000[10]
Corrosivity (CORROS)	2330B	-100	S.I.	-0.53	-0.38	-0.34	-0.53				N/A
Cyanide (CN)	X1-335.4	5	ug/L	ND	ND	ND	ND	150			150
Electrical Conductivity (EC)	2510B	1	uS/cm	97.29	98.86	107.60	106.36		900		900
Fluoride (F)	X1-300.0	0.1	mg/L	ND	ND	ND	ND	2			2
INORGANIC (Continued)											
Free Chlorine (FRCL2)	4500CLF	0.1	mg/L	ND	ND	ND	ND				N/A

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1])
AVERAGES FOR ALL AVAILABLE DATA FOR 2022[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2022 Quarter 1	2022 Quarter 2	2022 Quarter 3	2022 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
Gadolinium (Gd)	X200.8	10	ng/L	ND	ND	ND	ND				N/A
Hexavalent Chromium (CrVI)	X1-218.7	0.2	ug/L	ND	ND	ND	ND				10
Hydrogen Peroxide (H2O2)	4500H202 / H2O2	0.1	mg/L	2.315	2.467	2.592	2.717				N/A
Hydroxide (as CaCO3) (OHCa)	2320B	1	mg/L	ND	ND	ND	ND				N/A
Iron (Fe)	X200.7	5	ug/L	ND	ND	ND	ND		300		300
Lead (Pb)	X200.8	1	ug/L	ND	ND	ND	ND			15	15[11]
Magnesium (Mg)	X200.7	0.5	mg/L	ND	ND	ND	ND				N/A
Manganese (Mn)	X200.8	1	ug/L	ND	ND	ND	ND		50	500	50[12]
Manganese (dissolved) (Mn-DIS)	X200.8	1	ug/L	ND	ND	ND	ND				N/A
Mercury (Hg)	X200.8	1	ug/L	ND	ND	ND	ND	2			2
Nickel (Ni)	X200.8	1	ug/L	ND	ND	ND	ND	100			100
Nitrate (NO3)	CALC / UNKWQAN	0.4	mg/L	3.366	3.511	3.531	3.268	45			45
Nitrate + Nitrite Nitrogen (NO3NO2-N)	4500NO3F	0.1	mg/L	0.799	0.844	0.911	0.807	10			10[13]
Nitrate Nitrogen (NO3-N)	4500NO3F	0.1	mg/L	0.758	0.794	0.797	0.739	10			3[13]
Nitrite (NO2)	CALC / UNKWQAN	0.007	mg/L	0.138	0.165	0.372	0.221				N/A
Nitrite Nitrogen (NO2-N)	4500NO3F	0.002	mg/L	0.042	0.05	0.113	0.067	1			1
Organic Nitrogen (ORG-N)	X1-351.2	0.1	mg/L	0.013	0.013	ND	0.013				N/A
Perchlorate (CLO4)	332.0	2	ug/L	ND	ND	ND	ND	6			6
pH (pH)	4500H+B	1	UNITS	8.2	8.333	8.346	8.167				6 - 9
Phosphate Phosphorus (orthophosphate) (PO4-P)	365.1	0.01	mg/L	ND	ND	ND	ND				N/A
Potassium (K)	X200.7	0.5	mg/L	0.2	0.383	0.733	0.567				N/A
Selenium (Se)	X200.8	1	ug/L	ND	ND	ND	ND	50			50
Silica (SIO2)	4500SIOC	1	mg/L	1.1	1.1	1.4	1.1				N/A
Silver (Ag)	X200.8	1	ug/L	ND	ND	ND	ND		100		100
Sodium (Na)	X200.7	0.5	mg/L	6.3	6.967	8.833	8				45[14]
Strontium (Sr)	X200.8	1	ug/L	3	2.4	2.6	2.6				N/A
Sulfate (SO4)	X1-300.0	0.5	mg/L	0.2	ND	ND	ND		250		100[15]
Surfactants (MBAS)	5540C	0.02	mg/L	ND	ND	ND	ND		0.5		0.5
Suspended Solids (SUSSOL)	2540D	2.5	mg/L	ND	ND	ND	ND				20/Mo; 30/wk
Temperature (Laboratory) (TEMP)	4500H+B	1	C	22.492	22.325	22.308	22.608				N/A
Thallium (Tl)	X200.8	1	ug/L	ND	ND	ND	ND	2			2
Threshold Odor Number (Median) (ODOR)	2150B	0	TON	ND	ND	ND	ND		3		3
Title 22 Cation-Anion Balance (T22CAB)	UNKWQAN		meq/L	-10.848	-5.913	-2.41	-4.405				N/A
Title 22 Total Anions (T22ANI)	UNKWQAN		meq/L	1.001	0.975	1.008	1.044				N/A
Title 22 Total Cations (T22CAT)	CALC / UNKWQAN		meq/L	0.957	1.001	1.074	1.079				N/A
Total Alkalinity (as CaCO3) (TOTALK)	2320B	1 - 5	mg/L	38.4	39.883	43.108	42.6				N/A
Total Anions (TOTANI)	UNKWQAN		meq/L	1.004	0.978	1.016	1.048				N/A
Total Cations (TOTCAT)	UNKWQAN		meq/L	0.898	0.919	0.984	0.999				N/A
Total Chlorine (TOTCL2)	4500CLF	0.1	mg/L	0.6	1.9	0.7	1				N/A
Total Dissolved Solids (TDS)	2540C	2.5	mg/L	48.592	51.792	54.808	55.583		500		500[16]
INORGANIC (Continued)											
Total Hardness (as CaCO3) (TOTHRD)	X200.7	1	mg/L	34.2	34.767	33.733	36				240[17]
Total Kjeldahl Nitrogen (TKN)	X1-351.2	0.2	mg/L	0.045	0.147	0.372	0.254				N/A

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1])
AVERAGES FOR ALL AVAILABLE DATA FOR 2022[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2022 Quarter 1	2022 Quarter 2	2022 Quarter 3	2022 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
Total Nitrogen (TOT-N)	X1-351.2	0.3	mg/L	0.917	1.048	1.297	1.079				5 / 10[18]
Total Organic Carbon (Unfiltered) (TOC)	5310C	0.05	mg/L	0.081	0.082	0.084	0.082				0.5[19]
Trivalent Chromium (CrIII)	X200.8	1	ug/L	ND	ND	ND	ND				N/A
Ultraviolet (absorbance) (UVAB)	5910B	0.005	1/cm	0.007	0.01	0.008	0.012				N/A
Uranium (U) (U)	X200.8	1	ug/L	ND	ND	ND	ND	30			N/A
UV Absorbance/TOC (unfiltered) ratio (UV/TOC)	5910B	0.0001	L/mg-cm	0.136	0.126	0.148	0.164				N/A
Vanadium (V)	X200.8	1	ug/L	ND	ND	ND	ND			50	N/A
Zinc (Zn)	X200.8	1	ug/L	ND	ND	ND	ND		5,000		5,000
ORGANIC											
1,1,1,2-Tetrachloroethane (1112PC)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
1,1,1-Trichloro-2-propanone (TCPONE)	551.1	0.5	ug/L	ND	ND	ND	ND				N/A
1,1,1-Trichloroethane (111TCA)	524.2	0.5	ug/L	ND	ND	ND	ND	200			200
1,1,2,2-Tetrachloroethane (1122PC)	524.2	0.5	ug/L	ND	ND	ND	ND	1			1
1,1,2-Trichloroethane (112TCA)	524.2	0.5	ug/L	ND	ND	ND	ND	5			5
1,1-Dichloro-2-propanone (11DC2P)	551.1	0.5	ug/L	ND	ND	ND	ND				N/A
1,1-Dichloroethane (11DCA)	524.2	0.5	ug/L	ND	ND	ND	ND	5			5
1,1-Dichloroethene (11DCE)[20]	524.2	0.5	ug/L	ND	ND	ND	ND	6			6
1,1-Dichloropropene (11DCP)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
1,2,3-Trichlorobenzene (123TCB)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
1,2,3-Trichloropropane (123TCP)	14DIOX / 504.1 / 524.2 / 524M-TCP	0.005 - 0.5	ug/L	ND	ND	ND	ND	0.005			N/A
1,2,4-Trichlorobenzene (124TCB)	524.2 / 625.1 / 8270C	0.5 - 9.7	ug/L	ND	ND	ND	ND	5			5
1,2,4-Trimethylbenzene (124TMB)	524.2	0.5	ug/L	ND	ND	ND	ND			330	N/A
1,2-Dibromo-3-chloropropane (DBCP)[21]	14DIOX / 504.1 / 524.2 / 524M-TCP	0.01 - 0.5	ug/L	ND	ND	ND	ND	0.2			0.2
1,2-Dibromoethane (EDB)[22]	14DIOX / 504.1 / 524.2 / 524M-TCP	0.005 - 0.5	ug/L	ND	ND	ND	ND	0.05			0.05
1,2-Dichlorobenzene (12DCB)	524.2 / 625.1 / 8270C	0.5 - 9.7	ug/L	ND	ND	ND	ND	600			600
1,2-Dichloroethane (12DCA)	524.2	0.5	ug/L	ND	ND	ND	ND	0.5			0.5
1,2-Dichloropropane (12DCP)	524.2	0.5	ug/L	ND	ND	ND	ND	5			5
1,2-Diphenylhydrazine (12DPH)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
1,3,5-Trimethylbenzene (135TMB)	524.2	0.5	ug/L	ND	ND	ND	ND			330	N/A
1,3-Dichlorobenzene (13DCB)	524.2 / 625.1 / 8270C	0.5 - 9.7	ug/L	ND	ND	ND	ND			600	N/A
1,3-Dichloropropane (13DCP)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
1,4-Dichlorobenzene (14DCB)	524.2 / 625.1 / 8270C	0.5 - 9.7	ug/L	ND	ND	ND	ND	5			5
1,4-Dioxane (14DIOX)	14DIOX	0.5	ug/L	ND	ND	ND	ND			1	1
11-chloroeicosafluoro-3-oxaundecane-1sulfonic acid (11CLPF)	537.1	2	ng/L	ND	ND	ND	ND				N/A
17a-Estradiol (aESTRA)	CEC	1	ng/L	ND	ND	ND	ND				N/A
17a-Ethynylestradiol (aETEST)[23]	CEC	2	ng/L	ND	ND	ND	ND				N/A
17b-Estradiol (bESTRA)	CEC	2	ng/L	ND	ND	ND	ND				N/A
ORGANIC (Continued)											
2,2-Dichloropropane (22DCP)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1613B	4.8 - 4.9	pg/L	ND	ND	ND	ND	30			30
2,4,5-Trichlorophenol (245TCP)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1]) AVERAGES FOR ALL AVAILABLE DATA FOR 2022[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2022 Quarter 1	2022 Quarter 2	2022 Quarter 3	2022 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
2,4,6-Trichlorophenol (246TCP)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
2,4-Dichlorophenol (24DCPH)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
2,4-Dimethylphenol (24DMP)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND			100	N/A
2,4-Dinitrophenol (24DNP)	625.1 / 8270C	10 - 49	ug/L	ND	ND	ND	ND				N/A
2,4-Dinitrotoluene (24DNT)	525.2 / 625.1 / 8270C	0.1 - 9.7	ug/L	ND	ND	ND	ND				N/A
2,6-Dinitrotoluene (26DNT)	525.2 / 625.1 / 8270C	0.1 - 9.7	ug/L	ND	ND	ND	ND				N/A
2-Chloroethylvinyl ether (2ClEVE)	14DIOX	1	ug/L	ND	ND	ND	ND				N/A
2-Chloronapthalene (2ClNAP)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
2-Chlorophenol (2ClPNL)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
2-Chlorotoluene (2CLTOL)	524.2	0.5	ug/L	ND	ND	ND	ND			140	N/A
2-Methyl naphthalene (2MNAP)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
2-Methyl-4,6-Dinitrophenol (2MDNP)	625.1 / 8270C	5 - 49	ug/L	ND	ND	ND	ND				N/A
2-Methylphenol (oCRESL)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
2-Nitroaniline (oNTANL)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
2-Nitrophenol (2NPNL)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
3- & 4-Methylphenol (mpCRESL)	8270C	1	ug/L	ND	ND	ND	ND				N/A
3,3'-Dichlorobenzidine (DCBZDE)	625.1 / 8270C	5 - 24	ug/L	ND	ND	ND	ND				N/A
3-Nitroaniline (mNTANL)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
4:2 Fluorotelomer sulfonate (4:2FTS)	533	2	ng/L	ND	ND	ND	ND				N/A
4-Androstene-3,17-dione (ANDROS)	CEC	2	ng/L	ND	ND	ND	ND				N/A
4-Bromophenyl phenyl ether (4BrPPE)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
4-Chloro-3-methylphenol (43CMP)[24]	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
4-Chloroaniline (pClANL)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
4-Chlorophenyl phenyl ether (4ClPPE)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
4-Chlorotoluene (4CLTOL)	524.2	0.5	ug/L	ND	ND	ND	ND			140	N/A
4-Isopropyltoluene (4IPTOL)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
4-Nitroaniline (pNTANL)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
4-Nitrophenol (4NPNL)	625.1 / 8270C	5 - 9.7	ug/L	ND	ND	ND	ND				N/A
4-n-Octylphenol (4nOCPH)	CEC	0.2	ug/L	ND	ND	ND	ND				N/A
4-tert-Octylphenol (4tOCPH)	CEC	0.2	ug/L	ND	ND	ND	ND				N/A
6:2 Fluorotelomer sulfonate (6:2FTS)	533	2	ng/L	ND	ND	ND	ND				N/A
8:2 Fluorotelomer sulfonate (8:2FTS)	533	2	ng/L	ND	ND	ND	ND				N/A
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9CLPF3)	537.1	2	ng/L	ND	ND	ND	ND				N/A
Acetaldehyde (ACEALD)	556	2	ug/L	ND	ND	ND	ND				N/A
Acetone (ACETNE)	524.2	10	ug/L	ND	ND	ND	ND				N/A
Acrolein (ACROLN)	524.2	5	ug/L	ND	ND	ND	ND				N/A
ORGANIC (Continued)											
Acrylonitrile (ACRYLO)	524.2	2	ug/L	ND	ND	ND	ND				N/A
Aniline (ANLN)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
Aspartame (ASPATM)	CEC	100	ng/L	ND	ND	ND	ND				N/A
Atenolol (ATENOL)	CEC	5	ng/L	ND	ND	ND	ND				N/A
Benzaldehyde (BENALD)	556	2	ug/L	ND	ND	ND	ND				N/A

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1])
AVERAGES FOR ALL AVAILABLE DATA FOR 2022[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2022 Quarter 1	2022 Quarter 2	2022 Quarter 3	2022 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
Benzene (BENZ)	524.2	0.5	ug/L	ND	ND	ND	ND	1			1
Benzidine (BNZDE)	625.1 / 8270C	10 - 49	ug/L	ND	ND	ND	ND				N/A
Benzoic Acid (BNZACD)	625.1 / 8270C	48 - 100	ug/L	ND	ND	ND	ND				N/A
Benzyl Alcohol (BNZALC)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
bis (2-chloroethoxy) methane (B2CEM)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
bis (2-chloroethyl) ether (B2CLEE)	524.2 / 625.1 / 8270C	1 - 24	ug/L	ND	ND	ND	ND				N/A
bis (2-chloroisopropyl) ether (B2CIPE)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
Bisphenol A (BisPHA)	CEC	0.2	ug/L	ND	ND	ND	ND				N/A
Bromobenzene (BRBENZ)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
Bromochloroacetic Acid (BCAA)	552.2	1	ug/L	ND	ND	ND	ND				N/A
Bromochloroacetonitrile (BCAN)	551.1	0.5	ug/L	ND	ND	ND	ND				N/A
Bromochloromethane (CH2BrC)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
Bromodichloroacetic Acid (BDCAA)	552.2	1	ug/L	ND	ND	ND	ND				N/A
Bromodichloromethane (CHBrCl)[25]	524.2	0.5	ug/L	0.6	0.527	0.26	0.275				N/A
Bromoform (CHBr3)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
Bromomethane (CH3Br)[26]	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
Carbazole (CARBZL)	8270C	1	ug/L	ND	ND	ND	ND				N/A
Carbon Disulfide (CS2)	524.2	0.5	ug/L	ND	ND	ND	ND			160	N/A
Carbon tetrachloride (CCl4)	524.2	0.5	ug/L	ND	ND	ND	ND	0.5			0.5 ug/L
Chlorobenzene (CLBENZ)[27]	524.2	0.5	ug/L	ND	ND	ND	ND	70			70 ug/L
Chlorodibromoacetic Acid (CDBAA)	552.2	1	ug/L	ND	ND	ND	ND				N/A
Chlorodifluoromethane (FREN22)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
Chloroethane (ClETHA)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
Chloroform (CHCl3)	524.2	0.5	ug/L	1.823	1.846	1.493	1.25				N/A
Chloromethane (CH3Cl)[28]	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
Chloropicrin (ClPICR)	551.1	0.5	ug/L	ND	ND	ND	ND			50	N/A
cis-1,2-Dichloroethene (c12DCE)[29]	524.2	0.5	ug/L	ND	ND	ND	ND	6			6
cis-1,3-Dichloropropene (c13DCP)	524.2	0.5	ug/L	ND	ND	ND	ND	0.50			0.5
Crotonaldehyde (CRTALD)	556	2	ug/L	ND	ND	ND	ND				N/A
Cyclohexanone (CYCHXN)	556	2	ug/L	ND	ND	ND	ND				N/A
Decanal (DECNAL)	556	2	ug/L	ND	ND	ND	ND				N/A
Dibenzofuran (DBFUR)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
Dibromoacetic Acid (DBAA)[30]	552.2	1	ug/L	ND	ND	ND	ND				60, total HAA5
Dibromoacetonitrile (DBAN)	551.1	0.5	ug/L	ND	ND	ND	ND				N/A
Dibromochloromethane (CHBr2C)[31]	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
Dibromomethane (CH2Br2)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
ORGANIC (Continued)											
Dichloroacetic Acid (DCAA)[30]	552.2	1	ug/L	ND	ND	ND	ND				60, total HAA5
Dichloroacetonitrile (DCAN)	551.1	0.5	ug/L	0.56	0.65	0.52	0.63				N/A
Dichlorodifluoromethane (CCl2F2)	524.2	0.5	ug/L	ND	ND	ND	ND			1,000	N/A
Diclofenac (DICLFN)	CEC	5	ng/L	ND	ND	ND	ND				N/A
Diethylstilbestrol (DESTBL)	CEC	2	ng/L	ND	ND	ND	ND				N/A
Diisopropyl ether (DIPE)	524.2	1	ug/L	ND	ND	ND	ND				N/A

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1])
AVERAGES FOR ALL AVAILABLE DATA FOR 2022[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2022 Quarter 1	2022 Quarter 2	2022 Quarter 3	2022 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
Dilantin (DILANT)	CEC	10	ng/L	ND	ND	ND	ND				N/A
Dissolved Organic Carbon (DOC)	5310C	0.05	mg/L	0.1	0.1	0.09	0.1				N/A
Endosulfan II (ENDOII)[32]	508.1 / 525.2 / 8081A / 8081A_LL	0.0096 - 0.1	ug/L	ND	ND	ND	ND				N/A
Epitestosterone (cis-Testosterone) (EPITES)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Equilin (EQUILN)	CEC	5	ng/L	ND	ND	ND	ND				N/A
Estriol (ESTRIO)	CEC	2	ng/L	ND	ND	ND	ND				N/A
Estrone (ESTRON)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Ethyl tert-butyl ether (ETBE)	524.2	1	ug/L	ND	ND	ND	ND				N/A
Ethylbenzene (EtBENZ)	524.2	0.5	ug/L	ND	ND	ND	ND	300			300
Fluoxetine (FLUXET)	CEC	5	ng/L	ND	ND	ND	ND				N/A
Formaldehyde (FORALD)	556	2	ug/L	9.7	7.9	7.9	8.7			100	N/A
Freon 123a (FR123A)	524.2	0.5 - 2	ug/L	ND	ND	ND	ND				N/A
Glyoxal (GLYOXL)	556	2	ug/L	ND	ND	ND	ND				N/A
HCH-alpha (Alpha-BHC) (BHCa)	508.1 / 525.2 / 8081A / 8081A_LL	0.0019 - 0.1	ug/L	ND	ND	ND	ND			0.015	N/A
HCH-beta (Beta-BHC) (BHCb)	508.1 / 525.2 / 8081A / 8081A_LL	0.0039 - 0.1	ug/L	ND	ND	ND	ND			0.025	N/A
HCH-delta (Delta-BHC) (BHCd)	508.1 / 525.2 / 8081A / 8081A_LL	0.0039 - 0.1	ug/L	ND	ND	ND	ND				N/A
Heptanal (HEPNAL)	556	2	ug/L	ND	ND	ND	ND				N/A
Hexachlorobutadiene (HClBut)	524.2 / 625.1 / 8270C	0.5 - 9.7	ug/L	ND	ND	ND	ND				N/A
Hexachloroethane (HCE)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
Hexafluoropropylene oxide dimer acid (GenX) (HFPODA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
Hexanal (HEXNAL)	556	2	ug/L	ND	ND	ND	ND				N/A
Iohexol (IOHEXL)	CEC	20	ng/L	ND	ND	ND	ND				N/A
Iopromide (IOPRMD)	CEC	10	ng/L	ND	ND	ND	ND				N/A
Isophorone (IPHOR)	525.2 / 625.1 / 8270C	0.1 - 9.7	ug/L	ND	ND	ND	ND				N/A
Isopropylbenzene (ISPBNZ)	524.2	0.5	ug/L	ND	ND	ND	ND			770	N/A
Linuron (LINURN)	CEC	0.005	ug/L	ND	ND	ND	ND				N/A
m,p-Xylene (mp-XYL)[37]	524.2	0.5	ug/L	ND	ND	ND	ND	1,750			1750[37]
Meprobamate (MEPROB)	CEC	5	ng/L	ND	ND	ND	ND				N/A
Methyl Ethyl Ketone (MEK) (MEK)	524.2	2.5	ug/L	ND	ND	ND	ND				N/A
Methyl Isobutyl Ketone (MIBK) (MIBK)	524.2	2.5	ug/L	ND	ND	ND	ND			120	N/A
Methyl tert-butyl ether (MTBE)[33]	524.2	0.2	ug/L	ND	ND	ND	ND	13	5		5[33]
Methylene Chloride (CH2Cl2)[34]	524.2	0.5	ug/L	0.165	ND	ND	ND	5			5
ORGANIC (Continued)											
Methylglyoxal (MGLYOX)	556	2	ug/L	ND	ND	ND	ND				N/A
Methylisothiocyanate (MITC)	14DIOX	0.05	ug/L	ND	ND	ND	ND			190	N/A
Metolachlor (METOCL)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Monobromoacetic Acid (MBAA)[30]	552.2	1	ug/L	ND	ND	ND	ND				60, total HAA5
Monochloroacetic Acid (MCAA)[30]	552.2	1	ug/L	ND	ND	ND	ND				60, total HAA5
Naphthalene (NAP)	524.2/525.2/625.1/8270C	0.1 - 9.7	ug/L	ND	ND	ND	ND			17	N/A
Naproxen (NAPRXN)	CEC	5	ng/L	ND	ND	ND	ND				N/A
n-Butylbenzene (nBBENZ)	524.2	0.5	ug/L	ND	ND	ND	ND			260	N/A

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1])
AVERAGES FOR ALL AVAILABLE DATA FOR 2022[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2022 Quarter 1	2022 Quarter 2	2022 Quarter 3	2022 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
Neotame (NEOTAM)	CEC	10	ng/L	ND	ND	ND	ND				N/A
N-ethyl perfluorooctanesulfonamidoacetic acid (EtFOSA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
Nitrobenzene (NBENZ)	625.1 / 8270C	1 - 24	ug/L	ND	ND	ND	ND				N/A
N-methyl perfluorooctanesulfonamidoacetic acid (MeFOSA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
N-Nitrosodiethylamine (NDEA)	NDMA-LOW	2	ng/L	ND	ND	ND	ND			10	N/A
n-Nitrosodimethylamine (NDMA)	NDMA-LOW	2	ng/L	0.508	1.9	0.807	0.729			10	10
n-Nitroso-di-n-propylamine (NDPA)	625.1 / 8270C / NDMA-LOW	2 - 9700	ng/L	ND	ND	ND	ND			10	N/A
n-Nitrosodiphenylamine (NDPhA)	625.1 / 8270C	1000 - 9700	ng/L	ND	ND	ND	ND				N/A
N-Nitrosomorpholine (NMOR)	NDMA-LOW	2	ng/L	ND	ND	ND	ND				12
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	533	2	ng/L	ND	ND	ND	ND				N/A
Nonanal (NONNAL)	556	2	ug/L	ND	ND	ND	ND				N/A
Nonylphenol (NONYPH)	CEC	0.2	ug/L	ND	ND	ND	ND				N/A
o-Xylene (o-XYL)[37]	524.2	0.5	ug/L	ND	ND	ND	ND	1,750			1750[37]
para-Chlorobenzene sulfonic acid (pCBSA)	CEC	200	ng/L	ND	ND	ND	ND				N/A
PCB-1016 (PCB16)[35]	508.1	0.1	ug/L	ND	ND	ND	ND	0.5[35]			0.5[35]
PCB-1221 (PCB21)[35]	508.1	0.1	ug/L	ND	ND	ND	ND	0.5[35]			0.5[35]
PCB-1232 (PCB32)[35]	508.1	0.1	ug/L	ND	ND	ND	ND	0.5[35]			0.5[35]
PCB-1242 (PCB42)[35]	508.1	0.1	ug/L	ND	ND	ND	ND	0.5[35]			0.5[35]
PCB-1248 (PCB48)[35]	508.1	0.1	ug/L	ND	ND	ND	ND	0.5[35]			0.5[35]
PCB-1254 (PCB54)[35]	508.1	0.1	ug/L	ND	ND	ND	ND	0.5[35]			0.5[35]
PCB-1260 (PCB60)[35]	508.1	0.1	ug/L	ND	ND	ND	ND	0.5[35]			0.5[35]
PCBs, Total (TOTPCB)[35]	508.1	0.5	ug/L	ND	ND	ND	ND	0.5[35]			0.5[35]
Perfluoro butane sulfonic acid (PFBS)	537.1	2	ng/L	ND	ND	ND	ND			500	N/A
Perfluoro heptanoic acid (PFHpA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
Perfluoro hexane sulfonic acid (PFHxS)	537.1	2	ng/L	ND	ND	ND	ND			3	N/A
Perfluoro nonanoic acid (PFNA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
Perfluoro octane sulfonic acid (PFOS)	537.1	2	ng/L	ND	ND	ND	ND			6.5	13
Perfluoro octanoic acid (PFOA)	537.1	2	ng/L	ND	ND	ND	ND			5.1	14
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	533	2	ng/L	ND	ND	ND	ND				N/A
Perfluoro-3-methoxypropanoic acid (PFMPA)	533	2	ng/L	ND	ND	ND	ND				N/A
Perfluoro-4-methoxybutanoic acid (PFMBA)	533	2	ng/L	ND	ND	ND	ND				N/A
Perfluorobutanoic acid (PFBA)	533	2	ng/L	ND	ND	ND	ND				N/A
Perfluorodecanoic acid (PFDA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
ORGANIC (Continued)											
Perfluorododecanoic acid (PFDoA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
Perfluoroheptanesulfonic Acid (PFHpS)	533	2	ng/L	ND	ND	ND	ND				N/A
Perfluorohexanoic acid (PFHxA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
Perfluoropentanesulfonic acid (PFPeS)	533	2	ng/L	ND	ND	ND	ND				N/A
Perfluoropentanoic acid (PFPeA)	533	2	ng/L	ND	ND	ND	ND				N/A
Perfluorotetradecanoic acid (PFTA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
Perfluorotridecanoic acid (PFTrDA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
Perfluoroundecanoic acid (PFUnA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
PFOA + PFOS (PFOAOS)	UNKWQAN	2	ng/L	ND	ND	NR	NR				N/A
Phenol (PHENOL)	625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND			4,200	N/A

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1])
AVERAGES FOR ALL AVAILABLE DATA FOR 2022[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2022 Quarter 1	2022 Quarter 2	2022 Quarter 3	2022 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
PhenylPhenol (PHNYPH)	CEC	0.2	ug/L	ND	ND	ND	ND				N/A
Progesterone (PRGSTR)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Propylbenzene (PRPBNZ)	524.2	0.5	ug/L	ND	ND	ND	ND			260	N/A
Pyridine (PYRDN)	8270c	5	ug/L	ND	ND	ND	ND				N/A
sec-Butylbenzene (sBBENZ)	524.2	0.5	ug/L	ND	ND	ND	ND			260	N/A
Styrene (STYR)	524.2	0.5	ug/L	ND	ND	ND	ND	100			100
Sucralose (SUCRAL)	CEC	100	ng/L	ND	ND	ND	ND				N/A
Sum of five Haloacetic Acids (HAA5)	UNKWQAN	1	ug/L	ND	ND	ND	ND	60			60
Sum of nine Haloacetic Acids (HAA9)	UNKWQAN	1	ug/L	ND	ND	ND	ND				N/A
Sum of Six Brominated Haloacetic Acids (HAA6Br)	UNKWQAN	1	ug/L	ND	ND	ND	ND				N/A
Terbufos Sulfone (TERSUL)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Tert-amyl methyl ether (TAME)	524.2	1	ug/L	ND	ND	ND	ND				N/A
tert-butyl alcohol (TBA)	524.2	2	ug/L	ND	ND	ND	ND			12	N/A
tert-Butylbenzene (tBBENZ)	524.2	0.5	ug/L	ND	ND	ND	ND			260	N/A
Testosterone (trans-Testosterone) (TESTOR)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Tetrabromobisphenol A (TBBISA)	CEC	0.2	ug/L	ND	ND	ND	ND				N/A
Tetrachloroethene (PCE)[36]	524.2	0.5	ug/L	ND	ND	ND	ND	5			5
Toluene (TOLU)	524.2	0.5	ug/L	ND	ND	ND	ND	150			150
Total 1,3-Dichloropropene (x13DCP)	524.2	0.5	ug/L	ND	ND	ND	ND	0.5			0.5
Total Trihalomethanes (TTHMs)	524.2	0.5	ug/L	2.331	2.315	1.573	1.421	80			80
Total Xylenes (m,p,&o) (TOTALX)[35]	524.2	0.5	ug/L	ND	ND	ND	ND	1,750			1750[35]
trans-1,2 Dichloroethene (t12DCE)[38]	524.2	0.5	ug/L	ND	ND	ND	ND	10			10
trans-1,3-Dichloropropene (t13DCP)	524.2	0.5	ug/L	ND	ND	ND	ND	0.50			0.5
Tribromoacetic Acid (TBAA)	552.2	1	ug/L	ND	ND	ND	ND				N/A
Trichloroacetic Acid (TCAA)[30]	552.2	1	ug/L	ND	ND	ND	ND				60, total HAA5
Trichloroacetonitrile (TCAN)	551.1	0.5	ug/L	ND	ND	ND	ND				N/A
Trichloroethene (TCE)[39]	524.2	0.5	ug/L	ND	ND	ND	ND	5			5
Trichlorofluoromethane (Freon 11) (CCl3F)	524.2	0.5	ug/L	ND	ND	ND	ND	150			150
Trichlorotrifluoroethane (Freon 113) (Cl3F3E)[40]	524.2	0.5	ug/L	ND	ND	ND	ND	1,200			1,200
Trimethoprim (TRIMTP)	CEC	5	ng/L	ND	ND	ND	ND				N/A
Tris-2-chloroethyl phosphate (TCEP)	CEC	5	ng/L	ND	ND	ND	ND				N/A
Vinyl chloride (VNYLCL)	524.2	0.5	ug/L	ND	ND	ND	ND	0.5			0.5

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1]) AVERAGES FOR ALL AVAILABLE DATA FOR 2022[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2022 Quarter 1	2022 Quarter 2	2022 Quarter 3	2022 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
RADIOLOGICALS											
Gross Alpha Excluding Uranium (TOTa-U)	UNKWQAN	DLR[42] 3, 1.1 - 2.61	pCi/L	2.24	2.38	2.05	1.94	15			15
Natural Uranium (NTUr)	X200.8	DLR[42] 1, 0.67	pCi/L	ND	ND	ND	ND	20			20
Radium 226 + Radium 228 (Ra6Ra8)	UNKWQAN	DLR[42] 1, 0.624 - 0.737	pCi/L	1.128	0.274	0.468	ND	5			5
Radium 226 + Radium 228 Counting Error (Ra68CE)	UNKWQAN	0.624 - 0.737	pCi/L	0.997	0.18	0.954	ND				N/A
Total Alpha (TOTa)	7110C	1.1 - 2.61	pCi/L	2.24	2.38	2.05	1.94				N/A
Total Alpha Counting Error (TOTaCE)	7110C	1.1 - 2.61	pCi/L	1.39	1.56	2.1	1.39				N/A
Total Beta (TOTb)	900.0	DLR[42] 4, 1.07-1.66	pCi/L	3.38	3.13	0.24	1.05	50			50
Total Beta Counting Error (TOTbCE)	900.0	1.07 - 1.66	pCi/L	1.16	1.11	0.746	1.13				N/A
Total Radium 226 (TRa226)	903.0	0.41 - 0.737	pCi/L	0.609	0.274	0.052	ND	5			N/A
Total Radium 226 Counting Error (TRa6CE)	903.0	0.41 - 0.737	pCi/L	0.311	0.18	0.177	ND				N/A
Total Radium 228 (TRa228)	RA-05	0.624	pCi/L	0.519	ND	0.416	ND	5			N/A
Total Radium 228 Counting Error (TRa8CE)	RA-05	0.624	pCi/L	0.686	ND	0.777	ND				N/A
Total Strontium-90 (TS90)	905.0 / 905.0MOD	DLR[42] 2, 0.26-0.65	pCi/L	0.86	0.24	0.41	0.187	8			8
Total Strontium-90 Counting Error (TS90CE)	905.0 / 905.0MOD	0.26 - 0.65	pCi/L	0.12	0.14	0.11	0.315				N/A
Total Tritium (TTr)	906.0	DLR[42] 1000, 434	pCi/L	271.2	212.75	779.583	332.9	20,000			20,000
Total Tritium Counting Error (TTrCE)	906.0	434	pCi/L	273.2	272.5	285.083	275.5				N/A
SEMI-ORGANIC											
1-Naphthol (NPTHOL)	531.2	5	ug/L	ND	ND	ND	ND				N/A
2,4,5-T (245T)	515.4	0.2	ug/L	ND	ND	ND	ND				N/A
2,4,5-TP (Silvex) (245TP)	515.4	0.2	ug/L	ND	ND	ND	ND	50			50
2,4,6-Trinitrotoluene (246TNT)	8330A	0.11 - 0.12	ug/L	ND	ND	ND	ND			1	N/A
2,4-DB (24DB)	515.4	2	ug/L	ND	ND	ND	ND				N/A
2,4-Dichlorophenoxyacetic Acid (24D)	515.4	0.4	ug/L	ND	ND	ND	ND	70			70
3,5-Dichlorobenzoic Acid (35DBA)	515.4	1	ug/L	ND	ND	ND	ND				N/A
3-Hydroxycarbofuran (HYDCFR)	531.2	2	ug/L	ND	ND	ND	ND				N/A
4,4'-DDD (DDD)	508.1 / 525.2 / 8081A / 8081A_LL	0.0096 - 0.1	ug/L	ND	ND	ND	ND				N/A
4,4'-DDE (DDE)	508.1 / 525.2 / 8081A / 8081A_LL	0.0039 - 0.1	ug/L	ND	ND	ND	ND				N/A
4,4'-DDT (DDT)	508.1 / 525.2 / 8081A / 8081A_LL	0.0048 - 0.1	ug/L	ND	ND	ND	ND				N/A
Acenaphthene (ACNAPE)	525.2 / 625.1 / 8270C	0.1 - 9.7	ug/L	ND	ND	ND	ND				N/A
Acenaphthylene (ACENAP)	525.2 / 625.1 / 8270C	0.1 - 9.7	ug/L	ND	ND	ND	ND				N/A
Acetaminophen (ACTMNP)	CEC	5	ng/L	ND	ND	ND	ND				N/A
Acetochlor (ACETOC)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Acifluorfen (ACIFEN)	515.4	0.4	ug/L	ND	ND	ND	ND				N/A
Alachlor (ALACHL)	525.2	0.1	ug/L	ND	ND	ND	ND	2			2
Aldicarb (ALDI)	531.2	1	ug/L	ND	ND	ND	ND			7	N/A
Aldicarb sulfone (ALDISN)	531.2	2	ug/L	ND	ND	ND	ND				N/A
Aldicarb sulfoxide (ALDISX)	531.2	2	ug/L	ND	ND	ND	ND				N/A
SEMI-ORGANIC (Continued)											

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1])
AVERAGES FOR ALL AVAILABLE DATA FOR 2022[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2022 Quarter 1	2022 Quarter 2	2022 Quarter 3	2022 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
Aldrin (ALDRIN)	508.1 / 525.2 / 8081A / 8081A_LL	0.0048 - 0.1	ug/L	ND	ND	ND	ND			0.002	N/A
Ametryn (AMERYN)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Anthracene (ANTHRA)	525.2 / 625.1 / 8270C	0.1 - 9.7	ug/L	ND	ND	ND	ND				N/A
Atrazine (ATRAZ)	525.2 / CEC	0.001 - 0.1	ug/L	ND	ND	ND	ND	1			1
Azithromycin (AZTMCN)	CEC	10 - 50	ng/L	NR[46]	ND	ND	ND				N/A
Baygon (BAYGON)	531.2	1	ug/L	ND	ND	ND	ND			30	N/A
Bentazon (BENTAZ)	515.4	2	ug/L	ND	ND	ND	ND	18			18
Benzo(a)anthracene (BaANTH)	525.2 / 625.1 / 8270C	0.1 - 9.7	ug/L	ND	ND	ND	ND				N/A
Benzo(a)pyrene (BaPYRE)	525.2 / 625.1 / 8270C	0.1 - 9.7	ug/L	ND	ND	ND	ND	0.2			0.2
Benzo(b)fluoranthene (BbFLUR)	525.2 / 625.1 / 8270C	0.1 - 9.7	ug/L	ND	ND	ND	ND				N/A
Benzo(g,h,i)perylene (BghiPR)	525.2 / 625.1 / 8270C	0.1 - 9.7	ug/L	ND	ND	ND	ND				N/A
Benzo[k]fluoranthene (BkFLUR)	525.2 / 625.1 / 8270C	0.1 - 9.7	ug/L	ND	ND	ND	ND				N/A
bis (2-ethylhexyl) adipate (DEHA)[43]	525.2	2	ug/L	ND	ND	ND	ND	400			400
bis (2-ethylhexyl) phthalate (DEHP)[44]	525.2 / 625.1 / 8270C	2 - 9.7	ug/L	ND	ND	ND	ND	4			4
Bromacil (BROMAC)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Butachlor (BUTACL)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Butanal (BUTAN)	556	2	ug/L	ND	ND	ND	ND				N/A
Butylate (BTYATE)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Butylbenzyl phthalate (BBP)	525.2 / 625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
Caffeine (CAFFEI)	525.2 / CEC	3 - 100	ng/L	ND	ND	ND	ND				N/A
Captan (CAPTAN)	525.2	0.1	ug/L	ND	ND	ND	ND			15	N/A
Carbamazepine (CBMAZP)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Carbaryl (CARBAR)	531.2	2	ug/L	ND	ND	ND	ND			700	N/A
Carbofuran (CARBOF)	531.2	1	ug/L	ND	ND	ND	ND	18			18
Chlordane (ClDANE)	508.1 / 8081A / 8081A_LL	0.02 - 0.1	ug/L	ND	ND	ND	ND	0.1			0.1
Chlordane-alpha (CLDA)	525.2 / 8081A / 8081A_LL	0.0039 - 0.1	ug/L	ND	ND	ND	ND				N/A
Chlordane-gamma (CLDG)	525.2 / 8081A / 8081A_LL	0.0098 - 0.1	ug/L	ND	ND	ND	ND				N/A
Chlorobenzilate (CLBZLA)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Chloroneb (CLNEB)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Chlorothalonil (CLTNIL)	508.1 / 525.2	0.05 - 0.1	ug/L	ND	ND	ND	ND				N/A
Chlorpropham (CPRPHM)	525.2	0.1	ug/L	ND	ND	ND	ND			1,200	N/A
Chlorpyrifos (ClPYRI)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Chrysene (CHRYS)	525.2 / 625.1 / 8270C	0.1 - 9.7	ug/L	ND	ND	ND	ND				N/A
Dalapon (DALAPN)	515.4 / 552.2	0.4 - 1	ug/L	ND	ND	ND	ND	200			200
DCPA-Dacthal (DCPA)	515.4 / 525.2	0.1	ug/L	ND	ND	ND	ND			1.2	N/A
Diazinon (DIAZI)	525.2	0.1	ug/L	ND	ND	ND	ND			1.2	N/A
Dibenzo(a,h)anthracene (DBahAN)	525.2 / 625.1 / 8270C	0.1 - 9.7	ug/L	ND	ND	ND	ND				N/A
Dicamba (DICAMB)	515.4	0.6	ug/L	ND	ND	ND	ND				N/A
Dichlorprop (24DP)	515.4	0.3	ug/L	ND	ND	ND	ND				N/A
Dichlorvos (DCLVOS)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
SEMI-ORGANIC (Continued)											
Dieldrin (DIELDR)	508.1 / 525.2 / 8081A / 8081A_LL	0.0048 - 0.1	ug/L	ND	ND	ND	ND			0.002	N/A

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1])
AVERAGES FOR ALL AVAILABLE DATA FOR 2022[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2022 Quarter 1	2022 Quarter 2	2022 Quarter 3	2022 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
Diethyl phthalate (DEP)	525.2 / 625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
Dimethoate (DMTH)	525.2	1	ug/L	ND	ND	ND	ND			1	N/A
Dimethyl phthalate (DMP)	525.2 / 625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
Di-n-butylphthalate (DnBP)	525.2 / 625.1 / 8270C	1 - 9.7	ug/L	ND	ND	ND	ND				N/A
Di-n-octyl phthalate (DnOP)	525.2 / 625.1 / 8270C	1 - 24	ug/L	ND	ND	ND	ND				N/A
Dinoseb (DINOSB)	515.4	0.4	ug/L	ND	ND	ND	ND	7			7
Diphenamid (DPHNMD)	525.2	0.1	ug/L	ND	ND	ND	ND			200	N/A
Diquat (DIQUAT)	549.2	4	ug/L	ND	ND	ND	ND	20			20
Diuron (DIURON)	CEC	0.005	ug/L	ND	ND	ND	ND				N/A
Endosulfan I (ENDOI)[45]	508.1 / 525.2 / 8081A / 8081A_LL	0.0019 - 0.1	ug/L	ND	ND	ND	ND				N/A
Endosulfan sulfate (ENDOSL)	508.1 / 525.2 / 8081A / 8081A_LL	0.0048 - 0.1	ug/L	ND	ND	ND	ND				N/A
Endothall (ENDOTL)	548.1	45	ug/L	ND	ND	ND	ND	100			100
Endrin (ENDRIN)	508.1 / 525.2 / 8081A / 8081A_LL	0.0039 - 0.1	ug/L	ND	ND	ND	ND	2			2
Endrin Aldehyde (ENDR-A)	508.1 / 525.2 / 8081A / 8081A_LL	0.01 - 0.1	ug/L	ND	ND	ND	ND				N/A
Endrin Ketone (ENDR-K)	8081A / 8081A_LL	0.0048 - 0.0098	ug/L	ND	ND	ND	ND				N/A
EPTC (EPTC)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Erythromycin (ERYTHN)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Ethion (ETHION)	525.2	0.1	ug/L	ND	ND	ND	ND			4	N/A
Ethoprop (ETHPRP)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Ethylene Glycol (GLYCOL)	8015B / 8015D	10,000	ug/L	ND	ND	ND	ND			14,000	N/A
Etridiazole (ETRDZL)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Fluoranthene (FLANTH)	525.2 / 625.1 / 8270C	0.1 - 9.7	ug/L	ND	ND	ND	ND				N/A
Fluorene (FLUOR)	525.2 / 625.1 / 8270C	0.1 - 9.7	ug/L	ND	ND	ND	ND				N/A
Gemfibrozil (GMFIBZ)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Glyphosate (GLYPHO)	547	25	ug/L	ND	ND	ND	ND	700			700
HCH-gamma (Lindane) (LINDNE)	508.1 / 525.2 / 8081A / 8081A_LL	0.0019 - 0.1	ug/L	ND	ND	ND	ND	0.2			0.2
Heptachlor (HEPTA)	508.1 / 525.2 / 8081A / 8081A_LL	0.0019 - 0.1	ug/L	ND	ND	ND	ND	0.01			0.01
Heptachlor epoxide (HEPEPX)	508.1 / 525.2 / 8081A / 8081A_LL	0.0039 - 0.1	ug/L	ND	ND	ND	ND	0.01			0.01
Hexachlorobenzene (HEXCLB)	508.1 / 525.2 / 625.1 / 8270C	0.05 - 9.7	ug/L	ND	ND	ND	ND	1			1
Hexachlorocyclopentadiene (HClCPD)	508.1 / 525.2 / 625.1 / 8270C	0.05 - 24	ug/L	ND	ND	ND	ND	50			50
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	8330A	0.21 - 0.22	ug/L	ND	ND	ND	ND			0.3	N/A
Hexazinone (HEXZON)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Ibuprofen (IBPRFN)	CEC	1	ng/L	ND	ND	ND	ND				N/A
SEMI-ORGANIC (Continued)											
Indeno(1,2,3-cd)pyrene (INDPYR)	525.2 / 625.1 / 8270C	0.1 - 9.7	ug/L	ND	ND	ND	ND			160	N/A
Malathion (MALATH)	525.2	2	ug/L	ND	ND	ND	ND				N/A
Methiocarb (MTHCRB)	531.2	4	ug/L	ND	ND	ND	ND				N/A

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1]) AVERAGES FOR ALL AVAILABLE DATA FOR 2022[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2022 Quarter 1	2022 Quarter 2	2022 Quarter 3	2022 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
Methomyl (MTHOMY)	531.2	1	ug/L	ND	ND	ND	ND				N/A
Methoxychlor (METHOX)	508.1 / 525.2 / 8081A / 8081A_LL	0.0096 - 0.1	ug/L	ND	ND	ND	ND	30			30
methyl-Parathion (MPARA)	525.2	0.5	ug/L	ND	ND	ND	ND			2	N/A
Metribuzin (MTRBZN)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Molinate (MOLINT)	525.2	0.1	ug/L	ND	ND	ND	ND	20			20
N,N-diethyl-m-toluamide (DEET)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Norflurazon (NORFLR)	525.2	1	ug/L	ND	ND	ND	ND				N/A
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	8330A	0.21 - 0.22	ug/L	ND	ND	ND	ND			350	N/A
Oxamyl (OXAMYL)	531.2	2	ug/L	ND	ND	ND	ND	50			50
Paraquat (PARAQT)	549.2	4	ug/L	ND	ND	ND	ND				N/A
Parathion (PARA)	525.2	0.5	ug/L	ND	ND	ND	ND			40	N/A
Pentachlorophenol (PCP)	515.4/525.2/625.1/8270C/CEC	0.2 - 24	ug/L	ND	ND	ND	ND	1			1
Pentanal (PENTNL)	556	2	ug/L	ND	ND	ND	ND				N/A
Permethrin-(total of cis/trans) (PMTHRN)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Phenanthrene (PHENAN)	525.2 / 625.1 / 8270C	0.1 - 9.7	ug/L	ND	ND	ND	ND				N/A
Picloram (PICLOR)	515.4	0.6	ug/L	ND	ND	ND	ND	500			500
Primidone (PRIMDN)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Prometryn (PROMET)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Pronamide (PROAMD)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Propachlor (PROPCL)	508.1 / 525.2	0.05 - 0.1	ug/L	ND	ND	ND	ND			90	N/A
Propanal (PROPNL)	556	2	ug/L	ND	ND	ND	ND				N/A
Propazine (PROPAZ)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Pyrene (PYRENE)	525.2 / 625.1 / 8270C	0.1 - 9.7	ug/L	ND	ND	ND	ND				N/A
Simazine (SIMAZ)	525.2 / CEC	0.005 - 0.1	ug/L	ND	ND	ND	ND	4			4
Sulfamethoxazole (SULTHZ)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Tebuthiuron (TBTURN)	525.2	2	ug/L	ND	ND	ND	ND				N/A
Terbacil (TRBACL)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Thiobencarb (THIO)[41]	525.2	0.1	ug/L	ND	ND	ND	ND	70	1		1[41]
Toxaphene Mixture (TOXA)	508.1 / 8081A / 8081A_LL	0.059 - 1	ug/L	ND	ND	ND	ND	3			3
Triclosan (TRICLN)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Trifluralin (TRFLRN)	508.1 / 525.2	0.01 - 0.1	ug/L	ND	ND	ND	ND				N/A
Trithion (TRTION)	525.2	0.1	ug/L	ND	ND	ND	ND			7	N/A

APPENDIX A
Orange County Water District
GWRS WATER QUALITY REQUIREMENTS

Purified Recycled Water Monitoring

Footnotes:

[1] Purified Recycled Water (also called Finished Product Water (FPW) or Final Product Water) is the final recycled water flow stream.

[2] For purposes of calculating quarterly averages, 10% of corresponding Reportable Detection Limits (RDL) was used for all non-detect (ND) values. If all data for the quarter were ND, then the average is shown as ND.

[3] Permit and monitoring and reporting requirements per RWQCB Order Nos. R8-2004-0002 amended by R8-2008-0058, R8-2014-0054, R8-2016-0051 and R8-2021-0003 (through December 1, 2022) that were replaced by RWQCB Order No. R8-2022-0050 (beginning December 2, 2022.

[4] California Drinking Water Standards are shown as applicable. Abbreviations are: Action Level = AL; Primary MCL = 1MCL; Secondary MCL = 2MCL(recommended value (more stringent value) is considered); Notification Level = NL (includes notification levels and archived advisory levels); Unregulated Chemicals Requiring Monitoring = UR; California Unregulated Chemical Monitoring Regulation = CA UCMR; N/A = not applicable. While not drinking water standards, the RWQCB Basin Plan requirements for the permit are noted as BP in this column with Talbert Barrier area water quality objectives shown.

[5] Purified Recycled Water Flow limit was ≤ 100 mgd through December 1, 2022, and ≤ 130 mgd beginnig December 2, 2022.

[6] ROP is the RO Permeate or RO Product flow stream. Permit requirements for UV%T and turbidity are applicable to the ROP flow stream.

[7] ROP turbidity shall not exceed: 0.2 Nephelometric Turbidity Units (NTU) more than 5 percent of the time in any 24-hour period; and 0.5 NTU at any time.

[8] Aluminum has a Primary MCL of 1 mg/L and a Secondary MCL of 0.2 mg/L. The permit limit is the lower of these two values.

[9] Chloride has a Secondary MCL of 250 mg/L and a RWQCB Basin Plan Water Quality Objective of 55 mg/L.

[10] Copper has a Secondary MCL of 1 mg/L and an Action Level of 1.3 mg/L.

[11] Lead has an Action Level of 0.015 mg/L.

[12] Manganese has a Secondary MCL of 50 ug/L and a Notification Level of 500 ug/L.

[13] Nitrate-nitrogen has a Primary MCL of 10 mg/L (as nitrogen) and a RWQCB Basin Plan Water Quality Objective of 3 mg/L. The sum of nitrate-nitrogen plus nitrite-nitrogen has a primary MCL of 10 mg/L (as nitrogen).

[14] Sodium has a RWQCB Basin Plan Water Quality Objective of 45 mg/L.

[15] Sulfate has a Secondary MCL of 250 mg/L and a RWQCB Basin Plan Water Quality Objective of 100 mg/L.

[16] Total Dissolved Solids has a Secondary MCL of 500 mg/L and a RWQCB Basin Plan Water Quality Objective of 500 mg/L.

[17] Total Hardness (as CaCO3) has a RWQCB Basin Plan Water Quality Objective of 240 mg/L.

[18] Total Nitrogen limit was 5 mg/L through December 1, 2022, and 10 mg/L beginning December 2, 2022.

[19] TOC limit of 0.5 mg/L is based on the maximum allowable Recycled Water Contribution (RWC) of 100% at Talbert Barrier. The TOC limit is calculated by dividing 0.5 mg/L by the approved maximum RWC specified by CDPH for each recharge site. On November 25, 2009, CDPH approved the 100% RWC at Talbert Barrier, making the TOC requirement calculated by dividing 0.5 mg/L by 100%, or equal to 0.5 mg/L thereafter, at that site. The TOC permit requirement for Kraemer-Miller Basins remains 0.7 mg/L based on the approved RWC of 75% at that location. However, because the same FPW is supplied to both sites, the maximum TOC concentration is effectively 0.5 mg/L.

[20] Alternate name for 1,1-Dichloroethene is 1,1-Dichloroethylene.

[21] Alternate name for 1,2-Dibromo-3-chloropropane is Dibromochloropropane (DBCP).

[22] Alternate name for Dibromoethane is Ethylene Dibromide (EDB).

[23] Alternate name for 17a-Ethynyl Estradiol is Ethinyl Estradiol.

[24] Alternate name for 4-Chloro-3-methylphenol is 3-Methyl-4-Chlorophenol.

[25] Alternate name for Bromodichloromethane is Dichlorobromomethane.

[26] Alternate name for Bromomethane is Methyl Bromide.

[27] Alternate name for Chlorobenzene is Monochlorobenzene .

[28] Alternate name for Chloromethane is Methyl Chloride.

[29] Alternate name for cis-1,2-Dichloroethene is cis-1,2-Dichloroethylene.

[30] Total Haloacetic acids (five) (HAA5) are listed separately as Monochloroacetic Acid, Dichloroacetic Acid, Trichloroacetic Acid, Monobromoacetic Acid, and Dibromoacetic Acid.

[31] Alternate name for Dibromochloromethane is Chlorodibromomethane.

[32] Alternate name for Endosulfan II is Beta Endosulfan.

[33] MTBE has a Primary MCL of 13 ug/L and a Secondary MCL of 5 ug/L. The permit limit is the lower of these two values.

[34] Alternate name for Methylene chloride is Dichloromethane.

[35] Polychlorinated Biphenyls are listed separately as PCB-1016, PCB-1221, PCB-1232, PCB-1242, PCB-1248, PCB-1254, and PCB-1260; however the PMCL is for the total mixture of PCB congeners (TOTPCB) and not individual PCB's.

[36] Alternate name for Tetrachloroethene is Tetrachloroethylene.

[37] Primary MCL for Total Xylenes and not isomers (o-, m-, p-xylene).

[38] Alternate name for trans-1,2-Dichloroethene is trans-1,2-Dichloroethylene.

[39] Alternate name for Trichloroethene is Trichloroethylene.

[40] Alternate name for Trichlorotrifluoroethane (Freon 113) is 1,1,2-Trichloro-1,2,2-Trifluoroethane.

[41] Thiobencarb has a Primary MCL of 70 ug/L and a Secondary MCL of 1 ug/L. The permit limit is the lower of these two values.

[42] California Detection Level for purposes of Reporting (DLR).
[43] Alternate name for bis (2-ethylhexyl) adipate is Di(2-ethylhexyl)adipate.
[44] Alternate name for bis (2-ethylhexyl) phthalate is Di(2-ethylhexyl)phthalate (DEHP).
[45] Alternate name for Endosulfan I is Alpha Endosulfan.
[46] NR: Not Reported or reported as NA

GWRS 2022 Quarterly Sampling Dates

OCWD Water Quality Department

GWRS FINAL PRODUCT WATER (FPW)

Station Name	Qtr 1	Qtr 2*	Qtr 3**	Qtr 4***
GWRS-FPW	01/05/2022	04/13/2022	07/06/2022	10/19/2022

* Additional samples collected on 4/26/2022, 5/4/2022, 5/31/2022, 6/13/2022 & 6/21/2022.

** Additional samples collected on 7/19/2022, 8/10/2022 & 9/14/2022.

*** Additional sample collected on 11/15/2022.

Notes for Appendix A Tables:

► Listed dates (above) are the quarterly compliance monitoring dates; other samples may have been collected during the year. Detections of organic chemicals are reported for all samples collected in 2021 and are not limited to the quarterly compliance samples.

► Appendices B and C contain a list of all methods and reportable detection limits (RDL).

► Detailed data reports are available upon request.

► The more stringent value in the range of secondary MCLs is used in the tables (e.g., <MCL) for TDS, electrical conductivity (EC), chloride and sulfate.

► Analysis for priority pollutants is performed by multiple inorganic and organic methods

► MCL: Maximum Contaminant Level

► N/A: Not applicable

► ND: Not detected at reportable detection limit (RDL)

► NL: SWRCB DDW (formerly CDPH) Notification Level

► NS: Not sampled

► SMCL: Secondary Maximum Contaminant Level

► TR: Trace

Category	Lab	Permit Limit	GWRS-FPW Qtr 1	GWRS-FPW Qtr 2	GWRS-FPW Qtr 3	GWRS-FPW Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	200	1.5	1.1	ND	ND
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND	ND	ND	ND
Asbestos (ASBESTOS), MFL	Eurofins/Eurofins CEI	7	ND	ND	ND	ND
Barium (Ba), ug/L	OCWD	1,000	ND	ND	ND	ND
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND	ND	ND
Cyanide (CN), ug/L	OCWD	150	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	ND	ND	ND	ND
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND	ND	ND	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND	ND	ND	ND
Nitrate Nitrogen (NO3-N), mg/L	OCWD	3	0.67 - 0.88	0.64 - 0.92	0.38 - 1.01	0.58 - 0.98
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	0.032 - 0.066	0.035 -	0.068 - 0.155	0.038 - 0.092
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND	ND	ND	ND
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD), pg/L	EuroTSac	30	ND	ND	ND	ND
Primary Drinking Water Standards - Radioactivity						
Gross Alpha Excluding Uranium (TOTa-U), pCi/L	FGL	15	2.24	2.38	2.05	1.94
Other Radionuclides	FGL /Davi /Eber	Varies	ND < PMCL	ND < PMCL	ND < PMCL	ND < PMCL
Primary Drinking Water Standards - Disinfection By-Products						
Sum of five Haloacetic Acids (HAA5), ug/L	OCWD	60***	ND	ND	ND	ND
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	1.4 - 3.7	1.2 - 3.2	1.2 - 2.6	0.7 - 2.4
Primary Drinking Water Standards - Biological						
Total Coliform (Colilert - MPN/100mL) (TCOLIQ), MPN	OCWD	2.2	ND	ND	ND - 2	ND
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	N/A	84 - 106	90 - 112	89 - 123	88 - 142
Iron (Fe), ug/L	OCWD	300	ND	ND	ND	ND
Manganese (Mn), ug/L	OCWD	50	ND	ND	ND	ND
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND	ND	ND	ND
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	28 - 59	36 - 56	41 - 63	42 - 72
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1000	ND	ND	ND	ND
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.2	0.24	0.27	0.29
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	ND	ND	ND	ND
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD/EurfC/Wec	N/A	ND	ND	ND	ND
2,6-Dinitrotoluene (26DNT), ug/L	OCWD/EurfC/Wec	N/A	ND	ND	ND	ND
4,4'-DDE (DDE), ug/L	OCWD/EurfC/Wec	N/A	ND	ND	ND	ND
Acetochlor (ACETOC), ug/L	OCWD	N/A	ND	ND	ND	ND
DCPA-Dacthal (DCPA), ug/L	OCWD / Weck	N/A	ND	ND	ND	ND
EPTC (EPTC), ug/L	OCWD	N/A	ND	ND	ND	ND
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	ND	ND	ND	ND
Nitrobenzene (NBENZ), ug/L	EurfCalt/Cllc/Weck	N/A	ND	ND	ND	ND
Terbacil (TRBACL), ug/L	OCWD	N/A	ND	ND	ND	ND

* MCL based on total (not dissolved); ** CA Secondary MCL; *** CA Primary MCL

Method	Description	Lab	GWRS-FPW Qtr 1	GWRS-FPW Qtr 2	GWRS-FPW Qtr 3	GWRS-FPW Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND	ND	ND	ND
1613B	2,3,7,8-Tetrachlorodibenzo-p-dioxin	EuroTSac	ND	ND	ND	ND
504.1	EDB, DBCP & 123TCP	OCWD	ND	ND	ND	ND
508.1	Chlorinated Pesticides	Weck	ND	ND	ND	ND
515.4	Chlorinated Acids	Weck	ND	ND	ND	ND
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
524M-TCP	123TCP & EDB	OCWD	ND	ND	ND	ND
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	ND	ND	ND	ND
531.2	Carbamates	OCWD	ND	ND	ND	ND
533	PFAS Compounds	OCWD	ND	ND	ND	ND
537.1	PFAS Compounds	OCWD	ND	ND	ND	ND
547	Glyphosate	OCWD	ND	ND	ND	ND
548.1	Endothall	Weck	ND	ND	ND	ND
549.2	Diquat and Paraquat	OCWD	ND	ND	ND	ND
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	Weck	ND - Detections	ND - Detections	ND - Detections	ND - Detections
552.2	Disinfection Byproducts (DBPs) - Haloacetic Acids	OCWD	ND	ND	ND	ND
556	Determination of Carbonyl Compounds	Weck	ND < NL	ND < NL	ND < NL	ND < NL
625.1	Semi-Volatile Organic Compounds, including Priority Pollutants	Eurf CalT/CLLC	ND	ND	ND	ND
8015B/ 8015D	Nonhalogenated Organics	EurofBuf / Weck	ND	ND	ND	ND
8081A / 8081A_LL	Chlorine Containing Pesticides	Eurf CalT/CLLC	ND	ND	ND	ND
8270C	Semivolatile Organics	Weck	ND	ND	ND	ND
8330A	Nitroaromatics and Nitramines	EurDenvr	ND	ND	ND	ND
CEC	Chemicals of Emerging Concern	OCWD	ND	ND	ND	ND
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND < NL	ND < NL	ND < NL	ND < NL

GWRS-FPW
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
1/5/2022	9:30	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
1/5/2022	9:30	Chloroform (CHCl3)	1.6	ug/L	0.5
1/5/2022	9:30	Total Trihalomethanes (TTHMs)	1.6	ug/L	0.5
1/7/2022	9:45	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
1/7/2022	9:45	Chloroform (CHCl3)	1.4	ug/L	0.5
1/7/2022	9:45	Total Trihalomethanes (TTHMs)	1.4	ug/L	0.5
1/14/2022	9:00	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
1/14/2022	9:00	Chloroform (CHCl3)	1.7	ug/L	0.5
1/14/2022	9:00	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5
1/14/2022	9:00	Total Trihalomethanes (TTHMs)	2.3	ug/L	0.5
1/21/2022	8:45	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
1/21/2022	8:45	Chloroform (CHCl3)	2	ug/L	0.5
1/21/2022	8:45	Total Trihalomethanes (TTHMs)	2.7	ug/L	0.5
1/28/2022	8:20	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
1/28/2022	8:20	Chloroform (CHCl3)	1.9	ug/L	0.5
1/28/2022	8:20	Total Trihalomethanes (TTHMs)	2.5	ug/L	0.5
2/4/2022	8:20	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
2/4/2022	8:20	Chloroform (CHCl3)	1.6	ug/L	0.5
2/4/2022	8:20	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5
2/4/2022	8:20	Total Trihalomethanes (TTHMs)	1.6	ug/L	0.5
2/11/2022	8:00	Bromodichloromethane (CHBrCl)	1.2	ug/L	0.5
2/11/2022	8:00	Chloroform (CHCl3)	2.5	ug/L	0.5
2/11/2022	8:00	Methylene Chloride (CH2Cl2)	0.7	ug/L	0.5
2/11/2022	8:00	Total Trihalomethanes (TTHMs)	3.7	ug/L	0.5
2/18/2022	8:15	Bromodichloromethane (CHBrCl)	0.5	ug/L	0.5
2/18/2022	8:15	Chloroform (CHCl3)	1.5	ug/L	0.5
2/18/2022	8:15	Total Trihalomethanes (TTHMs)	2	ug/L	0.5
2/25/2022	8:15	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
2/25/2022	8:15	Chloroform (CHCl3)	1.9	ug/L	0.5
2/25/2022	8:15	Total Trihalomethanes (TTHMs)	2.6	ug/L	0.5
3/4/2022	9:10	Bromodichloromethane (CHBrCl)	0.9	ug/L	0.5
3/4/2022	9:10	Chloroform (CHCl3)	2	ug/L	0.5
3/4/2022	9:10	Methylene Chloride (CH2Cl2)	0.5	ug/L	0.5
3/4/2022	9:10	Total Trihalomethanes (TTHMs)	2.9	ug/L	0.5
3/11/2022	8:15	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
3/11/2022	8:15	Chloroform (CHCl3)	1.6	ug/L	0.5
3/11/2022	8:15	Total Trihalomethanes (TTHMs)	1.6	ug/L	0.5
3/18/2022	8:15	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
3/18/2022	8:15	Chloroform (CHCl3)	1.9	ug/L	0.5

GWRS-FPW
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
3/18/2022	8:15	Total Trihalomethanes (TTHMs)	2.5	ug/L	0.5
3/25/2022	8:10	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
3/25/2022	8:10	Chloroform (CHCl3)	2.1	ug/L	0.5
3/25/2022	8:10	Total Trihalomethanes (TTHMs)	2.9	ug/L	0.5

METHOD: 551.1

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
1/5/2022	9:30	Dichloroacetonitrile (DCAN)	0.56	ug/L	0.5

METHOD: 556

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
1/5/2022	9:30	Formaldehyde (FORALD)	9.7	ug/L	2

METHOD: NDMA-LOW

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
3/11/2022	8:15	n-Nitrosodimethylamine (NDMA)	2.4	ng/L	2
3/18/2022	8:15	n-Nitrosodimethylamine (NDMA)	2	ng/L	2

Year 2022, Quarter 2

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
4/1/2022	8:25	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
4/1/2022	8:25	Chloroform (CHCl3)	1.9	ug/L	0.5
4/1/2022	8:25	Total Trihalomethanes (TTHMs)	2.5	ug/L	0.5
4/8/2022	8:50	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
4/8/2022	8:50	Chloroform (CHCl3)	1.4	ug/L	0.5
4/8/2022	8:50	Total Trihalomethanes (TTHMs)	1.4	ug/L	0.5
4/13/2022	9:05	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
4/13/2022	9:05	Chloroform (CHCl3)	1.2	ug/L	0.5
4/13/2022	9:05	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5
4/15/2022	8:30	Chloroform (CHCl3)	1.2	ug/L	0.5
4/15/2022	8:30	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5

GWRS-FPW
Organic Detections by Method

Year 2022, Quarter 2

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
4/29/2022	8:00	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
4/29/2022	8:00	Chloroform (CHCl3)	1.7	ug/L	0.5
4/29/2022	8:00	Total Trihalomethanes (TTHMs)	2.3	ug/L	0.5
5/6/2022	8:10	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
5/6/2022	8:10	Chloroform (CHCl3)	2.3	ug/L	0.5
5/6/2022	8:10	Total Trihalomethanes (TTHMs)	3.1	ug/L	0.5
5/13/2022	8:10	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
5/13/2022	8:10	Chloroform (CHCl3)	2.1	ug/L	0.5
5/13/2022	8:10	Total Trihalomethanes (TTHMs)	2.7	ug/L	0.5
5/20/2022	8:40	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
5/20/2022	8:40	Chloroform (CHCl3)	2.3	ug/L	0.5
5/20/2022	8:40	Total Trihalomethanes (TTHMs)	3	ug/L	0.5
5/27/2022	8:40	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
5/27/2022	8:40	Chloroform (CHCl3)	2	ug/L	0.5
5/27/2022	8:40	Total Trihalomethanes (TTHMs)	2.6	ug/L	0.5
6/3/2022	8:20	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
6/3/2022	8:20	Chloroform (CHCl3)	1.7	ug/L	0.5
6/3/2022	8:20	Total Trihalomethanes (TTHMs)	1.7	ug/L	0.5
6/10/2022	8:25	Bromodichloromethane (CHBrCl)	0.9	ug/L	0.5
6/10/2022	8:25	Chloroform (CHCl3)	2.3	ug/L	0.5
6/10/2022	8:25	Total Trihalomethanes (TTHMs)	3.2	ug/L	0.5
6/17/2022	8:10	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
6/17/2022	8:10	Chloroform (CHCl3)	2.1	ug/L	0.5
6/17/2022	8:10	Total Trihalomethanes (TTHMs)	2.9	ug/L	0.5
6/24/2022	8:30	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
6/24/2022	8:30	Chloroform (CHCl3)	1.8	ug/L	0.5
6/24/2022	8:30	Total Trihalomethanes (TTHMs)	2.3	ug/L	0.5

METHOD: 551.1

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
5/4/2022	8:35	Dichloroacetonitrile (DCAN)	0.65	ug/L	0.5

METHOD: 556

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
4/13/2022	9:05	Formaldehyde (FORALD)	7.9	ug/L	2

GWRS-FPW
Organic Detections by Method

Year 2022, Quarter 2

METHOD: NDMA-LOW

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
4/8/2022	8:50	n-Nitrosodimethylamine (NDMA)	2.2	ng/L	2
4/15/2022	8:30	n-Nitrosodimethylamine (NDMA)	3.3	ng/L	2
4/29/2022	8:00	n-Nitrosodimethylamine (NDMA)	5.2	ng/L	2
5/13/2022	8:10	n-Nitrosodimethylamine (NDMA)	2.2	ng/L	2
5/27/2022	8:40	n-Nitrosodimethylamine (NDMA)	2.8	ng/L	2
6/3/2022	8:20	n-Nitrosodimethylamine (NDMA)	2	ng/L	2
6/17/2022	8:10	n-Nitrosodimethylamine (NDMA)	2.5	ng/L	2
6/24/2022	8:30	n-Nitrosodimethylamine (NDMA)	3.5	ng/L	2

Year 2022, Quarter 3

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
7/1/2022	8:00	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
7/1/2022	8:00	Chloroform (CHCl3)	1.2	ug/L	0.5
7/1/2022	8:00	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5
7/6/2022	9:30	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
7/6/2022	9:30	Chloroform (CHCl3)	1.4	ug/L	0.5
7/6/2022	9:30	Total Trihalomethanes (TTHMs)	1.4	ug/L	0.5
7/8/2022	9:00	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
7/8/2022	9:00	Chloroform (CHCl3)	1.7	ug/L	0.5
7/8/2022	9:00	Total Trihalomethanes (TTHMs)	1.7	ug/L	0.5
7/15/2022	8:01	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
7/15/2022	8:01	Chloroform (CHCl3)	1.6	ug/L	0.5
7/15/2022	8:01	Total Trihalomethanes (TTHMs)	1.9	ug/L	0.5
7/22/2022	7:50	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
7/22/2022	7:50	Chloroform (CHCl3)	1.4	ug/L	0.5
7/22/2022	7:50	Total Trihalomethanes (TTHMs)	1.7	ug/L	0.5
7/29/2022	8:05	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
7/29/2022	8:05	Chloroform (CHCl3)	1.4	ug/L	0.5
7/29/2022	8:05	Total Trihalomethanes (TTHMs)	1.4	ug/L	0.5
8/5/2022	8:30	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
8/5/2022	8:30	Chloroform (CHCl3)	2	ug/L	0.5
8/5/2022	8:30	Total Trihalomethanes (TTHMs)	2.6	ug/L	0.5
8/12/2022	8:30	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
8/12/2022	8:30	Chloroform (CHCl3)	1.7	ug/L	0.5
8/12/2022	8:30	Total Trihalomethanes (TTHMs)	1.7	ug/L	0.5

GWRS-FPW
Organic Detections by Method

Year 2022, Quarter 3

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
8/19/2022	8:45	Chloroform (CHCl3)	1.2	ug/L	0.5
8/19/2022	8:45	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5
8/26/2022	9:00	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
8/26/2022	9:00	Chloroform (CHCl3)	1.3	ug/L	0.5
8/26/2022	9:00	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5
9/2/2022	8:01	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
9/2/2022	8:01	Chloroform (CHCl3)	1.6	ug/L	0.5
9/2/2022	8:01	Total Trihalomethanes (TTHMs)	1.6	ug/L	0.5
9/9/2022	8:20	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
9/9/2022	8:20	Chloroform (CHCl3)	1.6	ug/L	0.5
9/9/2022	8:20	Total Trihalomethanes (TTHMs)	1.6	ug/L	0.5
9/16/2022	8:00	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
9/16/2022	8:00	Chloroform (CHCl3)	1.3	ug/L	0.5
9/16/2022	8:00	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5
9/23/2022	8:10	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
9/23/2022	8:10	Chloroform (CHCl3)	1.3	ug/L	0.5
9/23/2022	8:10	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5
9/30/2022	7:55	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
9/30/2022	7:55	Chloroform (CHCl3)	1.7	ug/L	0.5
9/30/2022	7:55	Total Trihalomethanes (TTHMs)	1.7	ug/L	0.5

METHOD: 551.1

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
7/6/2022	9:30	Dichloroacetonitrile (DCAN)	0.52	ug/L	0.5

METHOD: 556

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
7/6/2022	9:30	Formaldehyde (FORALD)	7.9	ug/L	2

METHOD: NDMA-LOW

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
7/15/2022	8:01	n-Nitrosodimethylamine (NDMA)	2.4	ng/L	2
7/22/2022	7:50	n-Nitrosodimethylamine (NDMA)	2.9	ng/L	2
7/29/2022	8:05	n-Nitrosodimethylamine (NDMA)	2.4	ng/L	2
9/2/2022	8:01	n-Nitrosodimethylamine (NDMA)	2.2	ng/L	2

GWRS-FPW
Organic Detections by Method

Year 2022, Quarter 4

METHOD: 524.2

Sample Date &	*Time*	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
10/7/2022	8:15	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
10/7/2022	8:15	Chloroform (CHCl3)	1.9	ug/L	0.5
10/7/2022	8:15	Total Trihalomethanes (TTHMs)	2.4	ug/L	0.5
10/14/2022	8:25	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
10/14/2022	8:25	Chloroform (CHCl3)	1.4	ug/L	0.5
10/14/2022	8:25	Total Trihalomethanes (TTHMs)	1.4	ug/L	0.5
10/19/2022	11:15	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
10/19/2022	11:15	Chloroform (CHCl3)	1.5	ug/L	0.5
10/19/2022	11:15	Total Trihalomethanes (TTHMs)	1.5	ug/L	0.5
10/21/2022	7:45	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
10/21/2022	7:45	Chloroform (CHCl3)	1.6	ug/L	0.5
10/21/2022	7:45	Total Trihalomethanes (TTHMs)	1.6	ug/L	0.5
10/28/2022	8:08	Chloroform (CHCl3)	1.2	ug/L	0.5
10/28/2022	8:08	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5
11/4/2022	8:05	Chloroform (CHCl3)	0.8	ug/L	0.5
11/4/2022	8:05	Total Trihalomethanes (TTHMs)	0.8	ug/L	0.5
11/11/2022	8:55	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
11/11/2022	8:55	Chloroform (CHCl3)	1.1	ug/L	0.5
11/11/2022	8:55	Total Trihalomethanes (TTHMs)	1.4	ug/L	0.5
11/18/2022	7:55	Chloroform (CHCl3)	1.3	ug/L	0.5
11/18/2022	7:55	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5
11/25/2022	8:30	Bromodichloromethane (CHBrCl)	0.5	ug/L	0.5
11/25/2022	8:30	Chloroform (CHCl3)	1.6	ug/L	0.5
11/25/2022	8:30	Total Trihalomethanes (TTHMs)	2.1	ug/L	0.5
12/2/2022	8:35	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
12/2/2022	8:35	Chloroform (CHCl3)	1.3	ug/L	0.5
12/2/2022	8:35	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5
12/9/2022	9:15	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
12/9/2022	9:15	Chloroform (CHCl3)	1.6	ug/L	0.5
12/9/2022	9:15	Total Trihalomethanes (TTHMs)	2.1	ug/L	0.5
12/16/2022	8:00	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
12/16/2022	8:00	Chloroform (CHCl3)	0.8	ug/L	0.5
12/16/2022	8:00	Total Trihalomethanes (TTHMs)	1.4	ug/L	0.5
12/23/2022	11:14	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
12/23/2022	11:14	Chloroform (CHCl3)	0.7	ug/L	0.5
12/23/2022	11:14	Total Trihalomethanes (TTHMs)	0.7	ug/L	0.5
12/30/2022	7:25	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
12/30/2022	7:25	Chloroform (CHCl3)	0.7	ug/L	0.5
12/30/2022	7:25	Total Trihalomethanes (TTHMs)	0.7	ug/L	0.5

GWRS-FPW
Organic Detections by Method

Year 2022, Quarter 4

METHOD: 551.1

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/19/2022	11:15	Dichloroacetonitrile (DCAN)	0.63	ug/L	0.5

METHOD: 556

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/19/2022	11:15	Formaldehyde (FORALD)	8.7	ug/L	2

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/28/2022	8:08	n-Nitrosodimethylamine (NDMA)	2.4	ng/L	2
11/4/2022	8:05	n-Nitrosodimethylamine (NDMA)	2.9	ng/L	2
12/23/2022	11:14	n-Nitrosodimethylamine (NDMA)	2.7	ng/L	2

Appendix B

Laboratory Methods of Analysis

Orange County Water District
Groundwater Replenishment System
2022 Annual Report

Laboratory Method: 100.2

Laboratory: EUROFINS CEI, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Asbestos (ASBESTOS)	0.18	MFL

Laboratory: EUROFINS EATON ANALYTICAL

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Asbestos (ASBESTOS)	0.18 - 0.2	MFL

Laboratory Method: 14DIOX

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
1,2,3-Trichloropropane (123TCP)	0.005	ug/L
1,2-Dibromo-3-chloropropane (DBCP)	0.01	ug/L
1,2-Dibromoethane (EDB)	0.005	ug/L
1,4-Dioxane (14DIOX)	0.5	ug/L
2-Chloroethylvinyl ether (2ClEVE)	1	ug/L
Methylisothiocyanate (MITC)	0.05	ug/L

Laboratory Method: 1600

Laboratory: O.C. HEALTH CARE AGENCY

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Enterococcus(Membrane Filtration-CFU/100ml) (ENTRCC)	1	CFU/100

Laboratory Method: 1601

Laboratory: O.C. HEALTH CARE AGENCY

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Bacteriophage, Male Specific (BACTMLSP)	1	P/A PERL
Bacteriophage, Somatic (BACTSOMT)	1	P/A PERL

Laboratory Method: 1602

Laboratory: O.C. HEALTH CARE AGENCY

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Male Specific Phage (MALSPHAG)	1	pfu/100

Laboratory Method: 1613B

Laboratory: EUROFINS SACRAMENTO

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	4.8 - 5.1	pg/L

Laboratory Method: 1623

Laboratory: EUROFINS EATON SOUTH BEND

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Cryptosporidium (CRYPTO)	0.0909 - 0.1	oocyst/L
Giardia (GIARDIA)	0.0909 - 0.1	cysts/L

Laboratory Method: 1623.1

Laboratory: CEL ANALYTICAL INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Cryptosporidium (CRYPTO)	0.093 - 0.1	oocyst/L
Giardia (GIARDIA)	0.093 - 0.1	cysts/L

Laboratory Method: 1694MESI

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
N,N-diethyl-m-toluamide (DEET)	4	ng/L
Oxybenzone (BP3)	4	ng/L

Laboratory Method: 2120B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Apparent Color (unfiltered) (APCOLR)	3 - 15	UNITS
True Color (filtered) (TRCOLR)	3 - 15	UNITS

Laboratory Method: 2130B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Turbidity (TURB)	0.1	NTU

Laboratory Method: 2150B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Threshold Odor Number (Median) (ODOR)	0	TON

Laboratory Method: 2320B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Alkalinity-Phenolphthalein (ALKPHE)	1	mg/L
Bicarbonate (as CaCO3) (HCO3Ca)	1	mg/L
Bicarbonate (as HCO3) (HCO3)	1	mg/L
Carbonate (as CaCO3) (CO3Ca)	1	mg/L
Carbonate (as CO3) (CO3)	0.6	mg/L
Hydroxide (as CaCO3) (OHCa)	1	mg/L
Hydroxide (as OH) (OH)	0.3	mg/L
Total Alkalinity (as CaCO3) (TOTALK)	1 - 5	mg/L

Laboratory Method: 2330B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Corrosivity (CORROS)	-100	S.I.

Laboratory Method: 2510B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Electrical Conductivity (EC)	1	uS/cm

Laboratory Method: 2540C

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Dissolved Solids (TDS)	2.5	mg/L

Laboratory Method: 2540D

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Suspended Solids (SUSSOL)	2.5	mg/L

Laboratory Method: 300.1B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Bromate (BrO3)	5	ug/L
Bromide (Br)	0.01	mg/L
Chlorate (CLO3)	10	ug/L
Chlorite (CLO2)	10	ug/L

Laboratory Method: 332.0

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Perchlorate (CLO4)	2	ug/L

Laboratory Method: 350.1

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Ammonia Nitrogen (NH3-N)	0.1 - 0.5	mg/L

Laboratory Method: 365.1

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Phosphate Phosphorus (orthophosphate) (PO4-P)	0.01 - 0.05	mg/L

Laboratory Method: 4500CLF

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Free Chlorine (FRCL2)	0.1 - 0.2	mg/L
Total Chlorine (TOTCL2)	0.1 - 0.2	mg/L

Laboratory Method: 4500H+B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
pH (pH)	1	UNITS
Temperature (Laboratory) (TEMP)	1	C

Laboratory Method: 4500H2O2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Hydrogen Peroxide (H2O2)	0.1	mg/L

Laboratory Method: 4500NO3F

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Nitrate (NO3)	0.4	mg/L
Nitrate + Nitrite Nitrogen (NO3NO2-N)	0.1 - 0.2	mg/L
Nitrate Nitrogen (NO3-N)	0.1 - 0.2	mg/L
Nitrite Nitrogen (NO2-N)	0.002 - 0.01	mg/L

Laboratory Method: 4500SIOC

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Silica (SIO2)	1	mg/L

Laboratory Method: 504.1

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
1,2,3-Trichloropropane (123TCP)	0.05	ug/L
1,2-Dibromo-3-chloropropane (DBCP)	0.01	ug/L
1,2-Dibromoethane (EDB)	0.01	ug/L

Laboratory Method: 508.1

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
4,4'-DDD (DDD)	0.01	ug/L
4,4'-DDE (DDE)	0.01	ug/L
4,4'-DDT (DDT)	0.01	ug/L
Aldrin (ALDRIN)	0.01	ug/L
Chlordane (ClDANE)	0.1	ug/L
Chlorothalonil (CLTNIL)	0.05	ug/L
Dieldrin (DIELDR)	0.01	ug/L
Endosulfan I (ENDOI)	0.01	ug/L
Endosulfan II (ENDOII)	0.01	ug/L
Endosulfan sulfate (ENDOSL)	0.01	ug/L
Endrin (ENDRIN)	0.01	ug/L
Endrin Aldehyde (ENDR-A)	0.01	ug/L
HCH-alpha (Alpha-BHC) (BHCa)	0.01	ug/L
HCH-beta (Beta-BHC) (BHCb)	0.01	ug/L
HCH-delta (Delta-BHC) (BHCd)	0.01	ug/L
HCH-gamma (Lindane) (LINDNE)	0.01	ug/L
Heptachlor (HEPTA)	0.01	ug/L
Heptachlor epoxide (HEPEPX)	0.01	ug/L
Hexachlorobenzene (HEXCLB)	0.05	ug/L
Hexachlorocyclopentadiene (HClCPD)	0.05	ug/L
Methoxychlor (METHOX)	0.01	ug/L
PCB-1016 (PCB16)	0.1 - 0.5	ug/L
PCB-1221 (PCB21)	0.1 - 0.5	ug/L
PCB-1232 (PCB32)	0.1 - 0.5	ug/L
PCB-1242 (PCB42)	0.1 - 0.5	ug/L
PCB-1248 (PCB48)	0.1 - 0.5	ug/L
PCB-1254 (PCB54)	0.1 - 0.5	ug/L
PCB-1260 (PCB60)	0.1 - 0.5	ug/L
PCBs, Total (TOTPCB)	0.5	ug/L
Propachlor (PROPCL)	0.05	ug/L
Toxaphene Mixture (TOXA)	1	ug/L
Trifluralin (TRFLRN)	0.01	ug/L

Laboratory Method: 515.4

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
2,4,5-T (245T)	0.2	ug/L
2,4,5-TP (Silvex) (245TP)	0.2	ug/L
2,4-DB (24DB)	2	ug/L
2,4-Dichlorophenoxyacetic Acid (24D)	0.4	ug/L
3,5-Dichlorobenzoic Acid (35DBA)	1	ug/L
Acifluorfen (ACIFEN)	0.4	ug/L
Bentazon (BENTAZ)	2	ug/L
Dalapon (DALAPN)	0.4	ug/L
DCPA-Dacthal (DCPA)	0.1	ug/L
Dicamba (DICAMB)	0.6	ug/L
Dichlorprop (24DP)	0.3	ug/L
Dinoseb (DINOSB)	0.4	ug/L
Pentachlorophenol (PCP) (PCP)	0.2	ug/L
Picloram (PICLOR)	0.6	ug/L

Laboratory Method: 5210B

Laboratory: EUROFINS CALSCIENCE TUSTIN

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Biochemical Oxygen Demand (BOD)	2 - 3	mg/L

Laboratory Method: 524.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
1,1,1,2-Tetrachloroethane (1112PC)	0.5	ug/L
1,1,1-Trichloroethane (111TCA)	0.5	ug/L
1,1,2,2-Tetrachloroethane (1122PC)	0.5	ug/L
1,1,2-Trichloroethane (112TCA)	0.5	ug/L
1,1-Dichloroethane (11DCA)	0.5	ug/L
1,1-Dichloroethene (11DCE)	0.5	ug/L

ORANGE COUNTY WATER DISTRICT
LABORATORY METHODS OF ANALYSES

Laboratory Method: 524.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
1,1-Dichloropropene (11DCP)	0.5	ug/L
1,2,3-Trichlorobenzene (123TCB)	0.5	ug/L
1,2,3-Trichloropropane (123TCP)	0.5	ug/L
1,2,4-Trichlorobenzene (124TCB)	0.5	ug/L
1,2,4-Trimethylbenzene (124TMB)	0.5	ug/L
1,2-Dibromo-3-chloropropane (DBCP)	0.5	ug/L
1,2-Dibromoethane (EDB)	0.5	ug/L
1,2-Dichlorobenzene (12DCB)	0.5	ug/L
1,2-Dichloroethane (12DCA)	0.5	ug/L
1,2-Dichloropropane (12DCP)	0.5	ug/L
1,3,5-Trimethylbenzene (135TMB)	0.5	ug/L
1,3-Dichlorobenzene (13DCB)	0.5	ug/L
1,3-Dichloropropane (13DCP)	0.5	ug/L
1,4-Dichlorobenzene (14DCB)	0.5	ug/L
2,2-Dichloropropane (22DCP)	0.5	ug/L
2-Chlorotoluene (2CLTOL)	0.5	ug/L
4-Chlorotoluene (4CLTOL)	0.5	ug/L
4-Isopropyltoluene (4IPTOL)	0.5	ug/L
Acetone (ACETNE)	10	ug/L
Acrolein (ACROLN)	5	ug/L
Acrylonitrile (ACRYLO)	2	ug/L
Benzene (BENZ)	0.5	ug/L
bis (2-chloroethyl) ether (B2CLEE)	2.5	ug/L
Bromobenzene (BRBENZ)	0.5	ug/L
Bromochloromethane (CH2BrC)	0.5	ug/L
Bromodichloromethane (CHBrCl)	0.5	ug/L
Bromoform (CHBr3)	0.5	ug/L
Bromomethane (CH3Br)	0.5	ug/L
Carbon Disulfide (CS2)	0.5	ug/L
Carbon tetrachloride (CCl4)	0.5	ug/L
Chlorobenzene (CLBENZ)	0.5	ug/L
Chlorodifluoromethane (FREN22)	0.5	ug/L
Chloroethane (ClETHA)	0.5 - 5	ug/L
Chloroform (CHCl3)	0.5	ug/L

Laboratory Method: 524.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Chloromethane (CH3Cl)	0.5	ug/L
cis-1,2-Dichloroethene (c12DCE)	0.5	ug/L
cis-1,3-Dichloropropene (c13DCP)	0.5	ug/L
Dibromochloromethane (CHBr2C)	0.5	ug/L
Dibromomethane (CH2Br2)	0.5	ug/L
Dichlorodifluoromethane (CCl2F2)	0.5	ug/L
Diisopropyl ether (DIPE)	1	ug/L
Ethyl tert-butyl ether (ETBE)	1	ug/L
Ethylbenzene (EtBENZ)	0.5	ug/L
Freon 123a (FR123A)	0.5 - 2	ug/L
Hexachlorobutadiene (HClBut)	0.5	ug/L
Isopropylbenzene (ISPBNZ)	0.5	ug/L
m,p-Xylene (mp-XYL)	0.5	ug/L
Methyl Ethyl Ketone (MEK) (MEK)	2.5	ug/L
Methyl Isobutyl Ketone (MIBK) (MIBK)	2.5	ug/L
Methyl tert-butyl ether (MTBE)	0.2	ug/L
Methylene Chloride (CH2Cl2)	0.5	ug/L
Naphthalene (NAP)	0.5	ug/L
n-Butylbenzene (nBBENZ)	0.5	ug/L
o-Xylene (o-XYL)	0.5	ug/L
Propylbenzene (PRPBNZ)	0.5	ug/L
sec-Butylbenzene (sBBENZ)	0.5	ug/L
Styrene (STYR)	0.5	ug/L
Tert-amyl methyl ether (TAME)	1	ug/L
tert-butyl alcohol (TBA)	2	ug/L
tert-Butylbenzene (tBBENZ)	0.5	ug/L
Tetrachloroethene (PCE)	0.5	ug/L
Toluene (TOLU)	0.5	ug/L
Total 1,3-Dichloropropene (x13DCP)	0.5	ug/L
Total Trihalomethanes (TTHMs)	0.5	ug/L
Total Xylenes (m,p,&o) (TOTALX)	0.5	ug/L
trans-1,2 Dichloroethene (t12DCE)	0.5	ug/L
trans-1,3-Dichloropropene (t13DCP)	0.5	ug/L
Trichloroethene (TCE)	0.5	ug/L

Laboratory Method: 524.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Trichlorofluoromethane (Freon 11) (CCl3F)	0.5	ug/L
Trichlorotrifluoroethane (Freon 113) (Cl3F3E)	0.5	ug/L
Vinyl chloride (VNYLCL)	0.5	ug/L

Laboratory Method: 524M-TCP

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
1,2,3-Trichloropropane (123TCP)	0.005	ug/L
1,2-Dibromo-3-chloropropane (DBCP)	0.01	ug/L
1,2-Dibromoethane (EDB)	0.005	ug/L

Laboratory Method: 525.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
2,4-Dinitrotoluene (24DNT)	0.1	ug/L
2,6-Dinitrotoluene (26DNT)	0.1	ug/L
4,4'-DDD (DDD)	0.1	ug/L
4,4'-DDE (DDE)	0.1	ug/L
4,4'-DDT (DDT)	0.1	ug/L
Acenaphthene (ACNAPE)	0.1	ug/L
Acenaphthylene (ACENAP)	0.1	ug/L
Acetochlor (ACETOC)	0.1	ug/L
Alachlor (ALACHL)	0.1	ug/L
Aldrin (ALDRIN)	0.1	ug/L
Ametryn (AMERYN)	0.1	ug/L
Anthracene (ANTHRA)	0.1	ug/L
Atrazine (ATRAZ)	0.1	ug/L
Benzo(a)anthracene (BaANTH)	0.1	ug/L
Benzo(a)pyrene (BaPYRE)	0.1	ug/L

Laboratory Method: 525.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Benzo(b)fluoranthene (BbFLUR)	0.1	ug/L
Benzo(g,h,i)perylene (BghiPR)	0.1	ug/L
Benzo[k]fluoranthene (BkFLUR)	0.1	ug/L
bis (2-ethylhexyl) adipate (DEHA)	2	ug/L
bis (2-ethylhexyl) phthalate (DEHP)	2	ug/L
Bromacil (BROMAC)	0.1	ug/L
Butachlor (BUTACL)	0.1	ug/L
Butylate (BTYATE)	0.1	ug/L
Butylbenzyl phthalate (BBP)	2	ug/L
Caffeine (CAFFEI)	100	ng/L
Captan (CAPTAN)	0.1	ug/L
Chlordane-alpha (CLDA)	0.1	ug/L
Chlordane-gamma (CLDG)	0.1	ug/L
Chlorobenzilate (CLBZLA)	0.1	ug/L
Chloroneb (CLNEB)	0.1	ug/L
Chlorothalonil (CLTNIL)	0.1	ug/L
Chlorpropham (CPRPHM)	0.1	ug/L
Chlorpyrifos (ClPYRI)	0.1	ug/L
Chrysene (CHRYS)	0.1	ug/L
DCPA-Dacthal (DCPA)	0.1	ug/L
Diazinon (DIAZI)	0.1	ug/L
Dibenzo(a,h)anthracene (DBahAN)	0.1	ug/L
Dichlorvos (DCLVOS)	0.1	ug/L
Dieldrin (DIELDR)	0.1	ug/L
Diethyl phthalate (DEP)	2	ug/L
Dimethoate (DMTH)	1	ug/L
Dimethyl phthalate (DMP)	2	ug/L
Di-n-butylphthalate (DnBP)	2	ug/L
Di-n-octyl phthalate (DnOP)	2	ug/L
Diphenamid (DPHNMD)	0.1	ug/L
Endosulfan I (ENDOI)	0.1	ug/L
Endosulfan II (ENDOII)	0.1	ug/L
Endosulfan sulfate (ENDOSL)	0.1	ug/L
Endrin (ENDRIN)	0.1	ug/L

Laboratory Method: 525.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Endrin Aldehyde (ENDR-A)	0.1	ug/L
EPTC (EPTC)	0.1	ug/L
Ethion (ETHION)	0.1	ug/L
Ethoprop (ETHPRP)	0.1	ug/L
Etridiazole (ETRDZL)	0.1	ug/L
Fluoranthene (FLANTH)	0.1	ug/L
Fluorene (FLUOR)	0.1	ug/L
HCH-alpha (Alpha-BHC) (BHCa)	0.1	ug/L
HCH-beta (Beta-BHC) (BHCb)	0.1	ug/L
HCH-delta (Delta-BHC) (BHCd)	0.1	ug/L
HCH-gamma (Lindane) (LINDNE)	0.1	ug/L
Heptachlor (HEPTA)	0.1	ug/L
Heptachlor epoxide (HEPEPX)	0.1	ug/L
Hexachlorobenzene (HEXCLB)	0.1	ug/L
Hexachlorocyclopentadiene (HClCPD)	0.1	ug/L
Hexazinone (HEXZON)	0.1	ug/L
Indeno(1,2,3-cd)pyrene (INDPYR)	0.1	ug/L
Isophorone (IPHOR)	0.1	ug/L
Malathion (MALATH)	2	ug/L
Methoxychlor (METHOX)	0.1	ug/L
methyl-Parathion (MPARA)	0.5	ug/L
Metolachlor (METOCL)	0.1	ug/L
Metribuzin (MTRBZN)	0.1	ug/L
Molinate (MOLINT)	0.1	ug/L
Naphthalene (NAP)	0.1	ug/L
Norflurazon (NORFLR)	0.1 - 1.0	ug/L
Parathion (PARA)	0.5	ug/L
Pentachlorophenol (PCP) (PCP)	1	ug/L
Permethrin-(total of cis/trans) (PMTHRN)	0.1	ug/L
Phenanthrene (PHENAN)	0.1	ug/L
Prometryn (PROMET)	0.1	ug/L
Pronamide (PROAMD)	0.1	ug/L
Propachlor (PROPCL)	0.1	ug/L
Propazine (PROPAZ)	0.1	ug/L

Laboratory Method: 525.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Pyrene (PYRENE)	0.1	ug/L
Simazine (SIMAZ)	0.1	ug/L
Tebuthiuron (TBTURN)	2	ug/L
Terbacil (TRBACL)	0.1	ug/L
Terbufos Sulfone (TERSUL)	0.1	ug/L
Thiobencarb (THIO)	0.1	ug/L
Trifluralin (TRFLRN)	0.1	ug/L
Trithion (TRTION)	0.1	ug/L

Laboratory Method: 531.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
1-Naphthol (NPTHOL)	5	ug/L
3-Hydroxycarbofuran (HYDCFR)	2	ug/L
Aldicarb (ALDI)	1	ug/L
Aldicarb sulfone (ALDISN)	2	ug/L
Aldicarb sulfoxide (ALDISX)	2	ug/L
Baygon (BAYGON)	1	ug/L
Carbaryl (CARBAR)	2	ug/L
Carbofuran (CARBOF)	1	ug/L
Methiocarb (MTHCRB)	4	ug/L
Methomyl (MTHOMY)	1	ug/L
Oxamyl (OXAMYL)	2	ug/L

Laboratory Method: 5310C

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Dissolved Organic Carbon (DOC)	0.05	mg/L
Total Organic Carbon (Unfiltered) (TOC)	0.05	mg/L

Laboratory Method: 533

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
11-chloroeicosafluoro-3-oxaundecane-1sulfonic acid (11CLPF)	2	ng/L
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	2	ng/L
4:2 Fluorotelomer sulfonate (4:2FTS)	2	ng/L
6:2 Fluorotelomer sulfonate (6:2FTS)	2	ng/L
8:2 Fluorotelomer sulfonate (8:2FTS)	2	ng/L
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9CLPF3)	2	ng/L
Hexafluoropropylene oxide dimer acid (GenX) (HFPODA)	2	ng/L
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2	ng/L
Perfluoro butane sulfonic acid (PFBS)	2	ng/L
Perfluoro heptanoic acid (PFHpA)	2	ng/L
Perfluoro hexane sulfonic acid (PFHxS)	2	ng/L
Perfluoro nonanoic acid (PFNA)	2	ng/L
Perfluoro octane sulfonic acid (PFOS)	2	ng/L
Perfluoro octanoic acid (PFOA)	2	ng/L
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	2	ng/L
Perfluoro-3-methoxypropanoic acid (PFMPA)	2	ng/L
Perfluoro-4-methoxybutanoic acid (PFMBA)	2	ng/L
Perfluorobutanoic acid (PFBA)	2	ng/L
Perfluorodecanoic acid (PFDA)	2	ng/L
Perfluorododecanoic acid (PFDoA)	2	ng/L
Perfluoroheptanesulfonic Acid (PFHpS)	2	ng/L
Perfluorohexanoic acid (PFHxA)	2	ng/L
Perfluoropentanesulfonic acid (PFPeS)	2	ng/L
Perfluoropentanoic acid (PFPeA)	2	ng/L
Perfluoroundecanoic acid (PFUnA)	2	ng/L

Laboratory Method: 537.1

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
11-chloroeicosafluoro-3-oxaundecane-1sulfonic acid (11CLPF)	2	ng/L
11-chloroeicosafluoro3oxaundecane1sulfonicacid-DUP (D-11CLPF)	2	ng/L

ORANGE COUNTY WATER DISTRICT
LABORATORY METHODS OF ANALYSES

Laboratory Method: 537.1

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
11-chloroeicosafluoro3oxaundecane1sulfonicacid-FRB (B-11CLPF)	2	ng/L
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	2	ng/L
4,8-dioxa-3H-perfluorononanoic acid (DUP) (D-ADONA)	2	ng/L
4,8-dioxa-3H-perfluorononanoic acid (FRB) (B-ADONA)	2	ng/L
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9CLPF3)	2	ng/L
9-chlorohexadecafluoro-3-oxanone1sulfonic acid-DUP (D-9CLPF3)	2	ng/L
9-chlorohexadecafluoro-3-oxanone1sulfonic acid-FRB (B-9CLPF3)	2	ng/L
Hexafluoropropylene oxide dimer acid (GenX) (HFPODA)	2	ng/L
Hexafluoropropylene oxide dimer acid (GenX) (DUP) (D-HFPODA)	2	ng/L
Hexafluoropropylene oxide dimer acid (GenX) (FRB) (B-HFPODA)	2	ng/L
N-ethyl perfluorooctanesulfonamidoacetic acid (EtFOSA)	2	ng/L
N-ethyl perfluorooctanesulfonamidoacetic acid(DUP) (D-EtFOSA)	2	ng/L
N-ethyl perfluorooctanesulfonamidoacetic acid(FRB) (B-EtFOSA)	2	ng/L
N-methyl perfluorooctanesulfonamidoacetic acid (MeFOSA)	2	ng/L
N-methyl perfluorooctanesulfonamidoacetic acid-DUP (D-MeFOSA)	2	ng/L
N-methyl perfluorooctanesulfonamidoacetic acid-FRB (B-MeFOSA)	2	ng/L
Perfluoro butane sulfonic acid (PFBS)	2	ng/L
Perfluoro butane sulfonic acid (DUP) (D-PFBS)	2	ng/L
Perfluoro butane sulfonic acid (FRB) (B-PFBS)	2	ng/L
Perfluoro heptanoic acid (PFHpA)	2	ng/L
Perfluoro heptanoic acid (DUP) (D-PFHpA)	2	ng/L
Perfluoro heptanoic acid (FRB) (B-PFHpA)	2	ng/L
Perfluoro hexane sulfonic acid (PFHxS)	2	ng/L
Perfluoro hexane sulfonic acid (DUP) (D-PFHxS)	2	ng/L
Perfluoro hexane sulfonic acid (FRB) (B-PFHxS)	2	ng/L
Perfluoro nonanoic acid (PFNA)	2	ng/L
Perfluoro nonanoic acid (DUP) (D-PFNA)	2	ng/L
Perfluoro nonanoic acid (FRB) (B-PFNA)	2	ng/L
Perfluoro octane sulfonic acid (PFOS)	2	ng/L
Perfluoro octane sulfonic acid (DUP) (D-PFOS)	2	ng/L
Perfluoro octane sulfonic acid (FRB) (B-PFOS)	2	ng/L
Perfluoro octanoic acid (PFOA)	2	ng/L
Perfluoro octanoic acid (DUP) (D-PFOA)	2	ng/L
Perfluoro octanoic acid (FRB) (B-PFOA)	2	ng/L

Laboratory Method: 537.1

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Perfluorodecanoic acid (PFDA)	2	ng/L
Perfluorodecanoic acid (DUP) (D-PFDA)	2	ng/L
Perfluorodecanoic acid (FRB) (B-PFDA)	2	ng/L
Perfluorododecanoic acid (PFDoA)	2	ng/L
Perfluorododecanoic acid (DUP) (D-PFDoA)	2	ng/L
Perfluorododecanoic acid (FRB) (B-PFDoA)	2	ng/L
Perfluorohexanoic acid (PFHxA)	2	ng/L
Perfluorohexanoic acid (DUP) (D-PFHxA)	2	ng/L
Perfluorohexanoic acid (FRB) (B-PFHxA)	2	ng/L
Perfluorotetradecanoic acid (PFTA)	2	ng/L
Perfluorotetradecanoic acid (DUP) (D-PFTA)	2	ng/L
Perfluorotetradecanoic acid (FRB) (B-PFTA)	2	ng/L
Perfluorotridecanoic acid (PFTrDA)	2	ng/L
Perfluorotridecanoic acid (DUP) (D-PFTrDA)	2	ng/L
Perfluorotridecanoic acid (FRB) (B-PFTrDA)	2	ng/L
Perfluoroundecanoic acid (PFUnA)	2	ng/L
Perfluoroundecanoic acid (DUP) (D-PFUnA)	2	ng/L
Perfluoroundecanoic acid (FRB) (B-PFUnA)	2	ng/L

Laboratory Method: 544

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Microcystin-LA (MCSLA)	0.008	ug/L
Microcystin-LF (MCSLF)	0.006	ug/L
Microcystin-LR (MCSLR)	0.02	ug/L
Microcystin-LY (MCSLY)	0.009	ug/L
Microcystin-RR (MCSRR)	0.006	ug/L
Microcystin-YR (MCSYR)	0.02	ug/L
Nodularin (NODULRN)	0.005	ug/L

Laboratory Method: 545

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Anatoxin-a (ANATXNA)	0.03	ug/L
Cylindrospermopsin (CYN)	0.09	ug/L

Laboratory Method: 546

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Microcystins (TMCSs)	0.3	ug/L

Laboratory Method: 547

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Glyphosate (GLYPHO)	25	ug/L

Laboratory Method: 548.1

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Endothall (ENDOTL)	45	ug/L

Laboratory Method: 549.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Diquat (DIQUAT)	4	ug/L
Paraquat (PARAQT)	4	ug/L

Laboratory Method: 551.1

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
1,1,1-Trichloropropanone (111TCP)	0.1	ug/L
1,1-Dichloro-2-propanone (11DC2P)	0.1	ug/L
Bromochloroacetonitrile (BCAN)	0.1	ug/L
Chloropicrin (ClPICR)	0.1	ug/L
Dibromoacetonitrile (DBAN)	0.1	ug/L
Dichloroacetonitrile (DCAN)	0.1	ug/L
Trichloroacetonitrile (TCAN)	0.1	ug/L

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
1,1,1-Trichloro-2-propanone (TCPONE)	0.5	ug/L
1,1-Dichloro-2-propanone (11DC2P)	0.5	ug/L
Bromochloroacetonitrile (BCAN)	0.5	ug/L
Chloropicrin (ClPICR)	0.5	ug/L
Dibromoacetonitrile (DBAN)	0.5	ug/L
Dichloroacetonitrile (DCAN)	0.5	ug/L
Trichloroacetonitrile (TCAN)	0.5	ug/L

Laboratory Method: 552.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Bromochloroacetic Acid (BCAA)	1	ug/L
Bromodichloroacetic Acid (BDCAA)	1	ug/L
Chlorodibromoacetic Acid (CDBAA)	1	ug/L
Dalapon (DALAPN)	1	ug/L
Dibromoacetic Acid (DBAA)	1	ug/L
Dichloroacetic Acid (DCAA)	1	ug/L
Monobromoacetic Acid (MBAA)	1	ug/L
Monochloroacetic Acid (MCAA)	1	ug/L
Tribromoacetic Acid (TBAA)	1	ug/L

Laboratory Method: 552.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Trichloroacetic Acid (TCAA)	1	ug/L

Laboratory Method: 5540C

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Surfactants (MBAS)	0.02 - 0.04	mg/L

Laboratory Method: 556

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Acetaldehyde (ACEALD)	2	ug/L
Benzaldehyde (BENALD)	2	ug/L
Butanal (BUTAN)	2	ug/L
Crotonaldehyde (CRTALD)	2	ug/L
Cyclohexanone (CYCHXN)	2	ug/L
Decanal (DECNAL)	2	ug/L
Formaldehyde (FORALD)	2	ug/L
Glyoxal (GLYOXL)	2	ug/L
Heptanal (HEPNAL)	2	ug/L
Hexanal (HEXNAL)	2	ug/L
Methylglyoxal (MGLYOX)	2	ug/L
Nonanal (NONNAL)	2	ug/L
Pentanal (PENTNL)	2	ug/L
Propanal (PROPNL)	2	ug/L

Laboratory Method: 5910B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Ultraviolet (absorbance) (UVAB)	0.005	1/cm
Ultraviolet percent transmittance @254nm (UV%T-254)	0.1	%
UV Absorbance/TOC (unfiltered) ratio (UV/TOC)	0.0001	L/mg-cm

Laboratory Method: 625.1

Laboratory: EUROFINS CALSCIENCE LINCOLN

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
1,2,4-Trichlorobenzene (124TCB)	9.6 - 10	ug/L
1,2-Dichlorobenzene (12DCB)	9.6 - 10	ug/L
1,2-Diphenylhydrazine (12DPH)	9.6 - 10	ug/L
1,3-Dichlorobenzene (13DCB)	9.6 - 10	ug/L
1,4-Dichlorobenzene (14DCB)	9.6 - 10	ug/L
2,4,5-Trichlorophenol (245TCP)	9.6 - 10	ug/L
2,4,6-Trichlorophenol (246TCP)	9.6 - 10	ug/L
2,4-Dichlorophenol (24DCPH)	9.6 - 10	ug/L
2,4-Dimethylphenol (24DMP)	9.6 - 10	ug/L
2,4-Dinitrophenol (24DNP)	48 - 52	ug/L
2,4-Dinitrotoluene (24DNT)	9.6 - 10	ug/L
2,6-Dinitrotoluene (26DNT)	9.6 - 10	ug/L
2-Chloronaphthalene (2ClNAP)	9.6 - 10	ug/L
2-Chlorophenol (2ClPNL)	9.6 - 10	ug/L
2-Methyl naphthalene (2MNAP)	9.6 - 10	ug/L
2-Methyl-4,6-Dinitrophenol (2MDNP)	48 - 52	ug/L
2-Methylphenol (oCRESL)	9.6 - 10	ug/L
2-Nitroaniline (oNTANL)	9.6 - 10	ug/L
2-Nitrophenol (2NPNL)	9.6 - 10	ug/L
3,3'-Dichlorobenzidine (DCBZDE)	24 - 26	ug/L
3-Nitroaniline (mNTANL)	9.6 - 10	ug/L
4-Bromophenyl phenyl ether (4BrPPE)	9.6 - 10	ug/L
4-Chloro-3-methylphenol (43CMP)	9.6 - 10	ug/L
4-Chloroaniline (pClANL)	9.6 - 10	ug/L

Laboratory Method: 625.1

Laboratory: EUROFINS CALSCIENCE LINCOLN

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
4-Chlorophenyl phenyl ether (4ClPPE)	9.6 - 10	ug/L
4-Nitroaniline (pNTANL)	9.6 - 10	ug/L
4-Nitrophenol (4NPNL)	9.6 - 10	ug/L
Acenaphthene (ACNAPE)	9.6 - 10	ug/L
Acenaphthylene (ACENAP)	9.6 - 10	ug/L
Aniline (ANLN)	9.6 - 10	ug/L
Anthracene (ANTHRA)	9.6 - 10	ug/L
Benzidine (BNZDE)	48 - 52	ug/L
Benzo(a)anthracene (BaANTH)	9.6 - 10	ug/L
Benzo(a)pyrene (BaPYRE)	9.6 - 10	ug/L
Benzo(b)fluoranthene (BbFLUR)	9.6 - 10	ug/L
Benzo(g,h,i)perylene (BghiPR)	9.6 - 10	ug/L
Benzo[k]fluoranthene (BkFLUR)	9.6 - 10	ug/L
Benzoic Acid (BNZACD)	48 - 52	ug/L
Benzyl Alcohol (BNZALC)	9.6 - 10	ug/L
bis (2-chloroethoxy) methane (B2CEM)	9.6 - 10	ug/L
bis (2-chloroethyl) ether (B2CLEE)	24 - 26	ug/L
bis (2-chloroisopropyl) ether (B2CIPE)	9.6 - 10	ug/L
bis (2-ethylhexyl) phthalate (DEHP)	9.6 - 10	ug/L
Butylbenzyl phthalate (BBP)	9.6 - 10	ug/L
Chrysene (CHRYS)	9.6 - 10	ug/L
Dibenzo(a,h)anthracene (DBahAN)	9.6 - 10	ug/L
Dibenzofuran (DBFUR)	9.6 - 10	ug/L
Diethyl phthalate (DEP)	9.6 - 10	ug/L
Dimethyl phthalate (DMP)	9.6 - 10	ug/L
Di-n-butylphthalate (DnBP)	9.6 - 10	ug/L
Di-n-octyl phthalate (DnOP)	9.7 - 24	ug/L
Fluoranthene (FLANTH)	9.6 - 10	ug/L
Fluorene (FLUOR)	9.6 - 10	ug/L
Hexachlorobenzene (HEXCLB)	9.6 - 10	ug/L
Hexachlorobutadiene (HClBut)	9.6 - 10	ug/L
Hexachlorocyclopentadiene (HClCPD)	24 - 26	ug/L
Hexachloroethane (HCE)	9.6 - 10	ug/L
Indeno(1,2,3-cd)pyrene (INDPYR)	9.6 - 10	ug/L

Laboratory Method: 625.1

Laboratory: EUROFINS CALSCIENCE LINCOLN

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Isophorone (IPHOR)	9.6 - 10	ug/L
Naphthalene (NAP)	9.6 - 10	ug/L
Nitrobenzene (NBENZ)	24 - 26	ug/L
n-Nitroso-di-n-propylamine (NDPA)	9,600 - 10,000	ng/L
n-Nitrosodiphenylamine (NDPhA)	9,600 - 10,000	ng/L
Pentachlorophenol (PCP) (PCP)	9.7 - 24	ug/L
Phenanthrene (PHENAN)	9.6 - 10	ug/L
Phenol (PHENOL)	9.6 - 10	ug/L
Pyrene (PYRENE)	9.6 - 10	ug/L

Laboratory: EUROFINS CALSCIENCE TUSTIN

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
1,2,4-Trichlorobenzene (124TCB)	9.5 - 10	ug/L
1,2-Dichlorobenzene (12DCB)	9.5 - 10	ug/L
1,2-Diphenylhydrazine (12DPH)	9.5 - 10	ug/L
1,3-Dichlorobenzene (13DCB)	9.5 - 10	ug/L
1,4-Dichlorobenzene (14DCB)	9.5 - 10	ug/L
2,4,5-Trichlorophenol (245TCP)	9.5 - 10	ug/L
2,4,6-Trichlorophenol (246TCP)	9.5 - 10	ug/L
2,4-Dichlorophenol (24DCPH)	9.5 - 10	ug/L
2,4-Dimethylphenol (24DMP)	9.5 - 10	ug/L
2,4-Dinitrophenol (24DNP)	48 - 50	ug/L
2,4-Dinitrotoluene (24DNT)	9.5 - 10	ug/L
2,6-Dinitrotoluene (26DNT)	9.5 - 10	ug/L
2-Chloronaphthalene (2ClNAP)	9.5 - 10	ug/L
2-Chlorophenol (2ClPNL)	9.5 - 10	ug/L
2-Methyl naphthalene (2MNAP)	9.5 - 10	ug/L
2-Methyl-4,6-Dinitrophenol (2MDNP)	48 - 50	ug/L
2-Methylphenol (oCRESL)	9.5 - 10	ug/L
2-Nitroaniline (oNTANL)	9.5 - 10	ug/L
2-Nitrophenol (2NPNL)	9.5 - 10	ug/L
3,3'-Dichlorobenzidine (DCBZDE)	9.5 - 10	ug/L
3-Nitroaniline (mNTANL)	9.5 - 10	ug/L

Laboratory Method: 625.1

Laboratory: EUROFINS CALSCIENCE TUSTIN

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
4-Bromophenyl phenyl ether (4BrPPE)	9.5 - 10	ug/L
4-Chloro-3-methylphenol (43CMP)	9.5 - 10	ug/L
4-Chloroaniline (pClANL)	9.5 - 10	ug/L
4-Chlorophenyl phenyl ether (4ClPPE)	9.5 - 10	ug/L
4-Nitroaniline (pNTANL)	9.5 - 10	ug/L
4-Nitrophenol (4NPNL)	9.5 - 10	ug/L
Acenaphthene (ACNAPE)	9.5 - 10	ug/L
Acenaphthylene (ACENAP)	9.5 - 10	ug/L
Aniline (ANLN)	9.5 - 10	ug/L
Anthracene (ANTHRA)	9.5 - 10	ug/L
Benzidine (BNZDE)	48 - 50	ug/L
Benzo(a)anthracene (BaANTH)	9.5 - 10	ug/L
Benzo(a)pyrene (BaPYRE)	9.5 - 10	ug/L
Benzo(b)fluoranthene (BbFLUR)	9.5 - 10	ug/L
Benzo(g,h,i)perylene (BghiPR)	9.5 - 10	ug/L
Benzo[k]fluoranthene (BkFLUR)	9.5 - 10	ug/L
Benzoic Acid (BNZACD)	48 - 50	ug/L
Benzyl Alcohol (BNZALC)	9.5 - 10	ug/L
bis (2-chloroethoxy) methane (B2CEM)	9.5 - 10	ug/L
bis (2-chloroethyl) ether (B2CLEE)	24 - 25	ug/L
bis (2-chloroisopropyl) ether (B2CIPE)	9.5 - 10	ug/L
bis (2-ethylhexyl) phthalate (DEHP)	9.5 - 10	ug/L
Butylbenzyl phthalate (BBP)	9.5 - 10	ug/L
Chrysene (CHRYS)	9.5 - 10	ug/L
Dibenzo(a,h)anthracene (DBahAN)	9.5 - 10	ug/L
Dibenzofuran (DBFUR)	9.5 - 10	ug/L
Diethyl phthalate (DEP)	9.5 - 10	ug/L
Dimethyl phthalate (DMP)	9.5 - 10	ug/L
Di-n-butylphthalate (DnBP)	9.5 - 10	ug/L
Di-n-octyl phthalate (DnOP)	9.5 - 10	ug/L
Fluoranthene (FLANTH)	9.5 - 10	ug/L
Fluorene (FLUOR)	9.5 - 10	ug/L
Hexachlorobenzene (HEXCLB)	9.5 - 10	ug/L
Hexachlorobutadiene (HClBut)	9.5 - 10	ug/L

Laboratory Method: 625.1

Laboratory: EUROFINS CALSCIENCE TUSTIN

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
Hexachlorocyclopentadiene (HClCPD)	24 - 25	ug/L
Hexachloroethane (HCE)	9.5 - 10	ug/L
Indeno(1,2,3-cd)pyrene (INDPYR)	9.5 - 10	ug/L
Isophorone (IPHOR)	9.5 - 10	ug/L
Naphthalene (NAP)	9.5 - 10	ug/L
Nitrobenzene (NBENZ)	24 - 25	ug/L
n-Nitroso-di-n-propylamine (NDPA)	9,500 - 10,000	ng/L
n-Nitrosodiphenylamine (NDPhA)	9,500 - 10,000	ng/L
Pentachlorophenol (PCP) (PCP)	9.5 - 10	ug/L
Phenanthrene (PHENAN)	9.5 - 10	ug/L
Phenol (PHENOL)	9.5 - 10	ug/L
Pyrene (PYRENE)	9.5 - 10	ug/L

Laboratory Method: 7110C

Laboratory: FRUIT GROWERS LABORATORY, INC.

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
Total Alpha (TOTa)	1.1 - 2.61	pCi/L
Total Alpha Counting Error (TOTaCE)	1.1 - 2.61	pCi/L

Laboratory Method: 8015B

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
Ethylene Glycol (GLYCOL)	10,000	ug/L

Laboratory Method: 8015D

Laboratory: EUROFINS BUFFALO

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
Diethylene Glycol (DEGLYCOL)	10,000	ug/L
Ethylene Glycol (GLYCOL)	10,000	ug/L
Propylene Glycol (PRGLYCOL)	10,000	ug/L

Laboratory Method: 8081A

Laboratory: EUROFINS CALSCIENCE LINCOLN

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
4,4'-DDD (DDD)	0.0098	ug/L
4,4'-DDE (DDE)	0.0039	ug/L
4,4'-DDT (DDT)	0.0098	ug/L
Aldrin (ALDRIN)	0.0098	ug/L
Chlordane (ClDANE)	0.02	ug/L
Chlordane-alpha (CLDA)	0.0039	ug/L
Chlordane-gamma (CLDG)	0.0098	ug/L
Dieldrin (DIELDR)	0.0098	ug/L
Endosulfan I (ENDOI)	0.0098	ug/L
Endosulfan II (ENDOII)	0.0098	ug/L
Endosulfan sulfate (ENDOSL)	0.0098	ug/L
Endrin (ENDRIN)	0.0039	ug/L
Endrin Aldehyde (ENDR-A)	0.02	ug/L
Endrin Ketone (ENDR-K)	0.0098	ug/L
HCH-alpha (Alpha-BHC) (BHCa)	0.0039	ug/L
HCH-beta (Beta-BHC) (BHCb)	0.0039	ug/L
HCH-delta (Delta-BHC) (BHCd)	0.0039	ug/L
HCH-gamma (Lindane) (LINDNE)	0.0039	ug/L
Heptachlor (HEPTA)	0.0039	ug/L
Heptachlor epoxide (HEPEPX)	0.0039	ug/L
Methoxychlor (METHOX)	0.0098	ug/L
Toxaphene Mixture (TOXA)	0.059	ug/L

Laboratory Method: 8081A

Laboratory: EUROFINS CALSCIENCE TUSTIN

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
4,4'-DDD (DDD)	0.0097	ug/L
4,4'-DDE (DDE)	0.0049	ug/L
4,4'-DDT (DDT)	0.0049	ug/L
Aldrin (ALDRIN)	0.0049	ug/L
Chlordane (ClDANE)	0.049	ug/L
Chlordane-alpha (CLDA)	0.0049	ug/L
Chlordane-gamma (CLDG)	0.015	ug/L
Dieldrin (DIELDR)	0.0049	ug/L
Endosulfan I (ENDOI)	0.0019	ug/L
Endosulfan II (ENDOII)	0.0097	ug/L
Endosulfan sulfate (ENDOSL)	0.0049	ug/L
Endrin (ENDRIN)	0.0049	ug/L
Endrin Aldehyde (ENDR-A)	0.049	ug/L
Endrin Ketone (ENDR-K)	0.0049	ug/L
HCH-alpha (Alpha-BHC) (BHCa)	0.0019	ug/L
HCH-beta (Beta-BHC) (BHCb)	0.0073	ug/L
HCH-delta (Delta-BHC) (BHCd)	0.0049	ug/L
HCH-gamma (Lindane) (LINDNE)	0.0019	ug/L
Heptachlor (HEPTA)	0.0019	ug/L
Heptachlor epoxide (HEPEPX)	0.0097	ug/L
Methoxychlor (METHOX)	0.0097	ug/L
Toxaphene Mixture (TOXA)	0.097	ug/L

Laboratory Method: 8081A_LL

Laboratory: EUROFINS CALSCIENCE TUSTIN

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
4,4'-DDD (DDD)	0.0096	ug/L
4,4'-DDE (DDE)	0.0048	ug/L
4,4'-DDT (DDT)	0.0048	ug/L
Aldrin (ALDRIN)	0.0048	ug/L
Chlordane (ClDANE)	0.048	ug/L

Laboratory Method: 8081A_LL

Laboratory: EUROFINS CALSCIENCE TUSTIN

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
Chlordane-alpha (CLDA)	0.0048	ug/L
Chlordane-gamma (CLDG)	0.014	ug/L
Dieldrin (DIELDR)	0.0048	ug/L
Endosulfan I (ENDOI)	0.0019	ug/L
Endosulfan II (ENDOII)	0.0096	ug/L
Endosulfan sulfate (ENDOSL)	0.0048	ug/L
Endrin (ENDRIN)	0.0048	ug/L
Endrin Aldehyde (ENDR-A)	0.048	ug/L
Endrin Ketone (ENDR-K)	0.0048	ug/L
HCH-alpha (Alpha-BHC) (BHCa)	0.0019	ug/L
HCH-beta (Beta-BHC) (BHCb)	0.0072	ug/L
HCH-delta (Delta-BHC) (BHCd)	0.0048	ug/L
HCH-gamma (Lindane) (LINDNE)	0.0019	ug/L
Heptachlor (HEPTA)	0.0019	ug/L
Heptachlor epoxide (HEPEPX)	0.0096	ug/L
Methoxychlor (METHOX)	0.0096	ug/L
Toxaphene Mixture (TOXA)	0.096	ug/L

Laboratory Method: 8270C

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
1,2,4-Trichlorobenzene (124TCB)	1	ug/L
1,2-Dichlorobenzene (12DCB)	1	ug/L
1,2-Diphenylhydrazine (12DPH)	1	ug/L
1,3-Dichlorobenzene (13DCB)	1	ug/L
1,4-Dichlorobenzene (14DCB)	1	ug/L
2,4,5-Trichlorophenol (245TCP)	1	ug/L
2,4,6-Trichlorophenol (246TCP)	1	ug/L
2,4-Dichlorophenol (24DCPH)	1	ug/L
2,4-Dimethylphenol (24DMP)	1	ug/L
2,4-Dinitrophenol (24DNP)	10	ug/L

Laboratory Method: 8270C

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
2,4-Dinitrotoluene (24DNT)	1	ug/L
2,6-Dinitrotoluene (26DNT)	1	ug/L
2-Chloronaphthalene (2ClNAP)	1	ug/L
2-Chlorophenol (2ClPNL)	1	ug/L
2-Methyl naphthalene (2MNAP)	1	ug/L
2-Methyl-4,6-Dinitrophenol (2MDNP)	5	ug/L
2-Methylphenol (oCRESL)	1	ug/L
2-Nitroaniline (oNTANL)	1	ug/L
2-Nitrophenol (2NPNL)	1	ug/L
3- & 4-Methylphenol (mpCRESL)	1	ug/L
3,3'-Dichlorobenzidine (DCBZDE)	5	ug/L
3-Nitroaniline (mNTANL)	1	ug/L
4-Bromophenyl phenyl ether (4BrPPE)	1	ug/L
4-Chloro-3-methylphenol (43CMP)	1	ug/L
4-Chloroaniline (pClANL)	1	ug/L
4-Chlorophenyl phenyl ether (4ClPPE)	1	ug/L
4-Nitroaniline (pNTANL)	1	ug/L
4-Nitrophenol (4NPNL)	5	ug/L
Acenaphthene (ACNAPE)	1	ug/L
Acenaphthylene (ACENAP)	1	ug/L
Aniline (ANLN)	1	ug/L
Anthracene (ANTHRA)	1	ug/L
Benzidine (BNZDE)	10	ug/L
Benzo(a)anthracene (BaANTH)	1	ug/L
Benzo(a)pyrene (BaPYRE)	1	ug/L
Benzo(b)fluoranthene (BbFLUR)	1	ug/L
Benzo(g,h,i)perylene (BghiPR)	2	ug/L
Benzo[k]fluoranthene (BkFLUR)	1	ug/L
Benzoic Acid (BNZACD)	100	ug/L
Benzyl Alcohol (BNZALC)	1	ug/L
bis (2-chloroethoxy) methane (B2CEM)	1	ug/L
bis (2-chloroethyl) ether (B2CLEE)	1	ug/L
bis (2-chloroisopropyl) ether (B2CIPE)	1	ug/L
bis (2-ethylhexyl) phthalate (DEHP)	5	ug/L

Laboratory Method: 8270C

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
Butylbenzyl phthalate (BBP)	1	ug/L
Carbazole (CARBZL)	1	ug/L
Chrysene (CHRYS)	1	ug/L
Dibenzo(a,h)anthracene (DBahAN)	2	ug/L
Dibenzofuran (DBFUR)	1	ug/L
Diethyl phthalate (DEP)	1	ug/L
Dimethyl phthalate (DMP)	1	ug/L
Di-n-butylphthalate (DnBP)	1	ug/L
Di-n-octyl phthalate (DnOP)	1	ug/L
Fluoranthene (FLANTH)	1	ug/L
Fluorene (FLUOR)	1	ug/L
Hexachlorobenzene (HEXCLB)	1	ug/L
Hexachlorobutadiene (HClBut)	1	ug/L
Hexachlorocyclopentadiene (HClCPD)	5	ug/L
Hexachloroethane (HCE)	1	ug/L
Indeno(1,2,3-cd)pyrene (INDPYR)	2	ug/L
Isophorone (IPHOR)	1	ug/L
Naphthalene (NAP)	1	ug/L
Nitrobenzene (NBENZ)	1	ug/L
n-Nitrosodimethylamine (NDMA)	1000	ng/L
n-Nitroso-di-n-propylamine (NDPA)	1,000	ng/L
n-Nitrosodiphenylamine (NDPhA)	1,000	ng/L
Pentachlorophenol (PCP) (PCP)	1	ug/L
Phenanthrene (PHENAN)	1	ug/L
Phenol (PHENOL)	1	ug/L
Pyrene (PYRENE)	1	ug/L
Pyridine (PYRDN)	5	ug/L

Laboratory Method: 8330A

Laboratory: EUROFINS TESTAMERICA, DENVER

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
2,4,6-Trinitrotoluene (246TNT)	0.11 - 0.12	ug/L
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.21 - 0.22	ug/L
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	0.21 - 0.22	ug/L

Laboratory Method: 900.0

Laboratory: FRUIT GROWERS LABORATORY, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Alpha (TOTa)	1.51	pCi/L
Total Alpha Counting Error (TOTaCE)	1.51	pCi/L
Total Beta (TOTb)	1.04 - 4.99	pCi/L
Total Beta Counting Error (TOTbCE)	1.04 - 4.99	pCi/L

Laboratory Method: 903.0

Laboratory: FRUIT GROWERS LABORATORY, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Radium 226 (TRa226)	0.41 - 0.737	pCi/L
Total Radium 226 Counting Error (TRa6CE)	0.41 - 0.737	pCi/L

Laboratory Method: 905.0

Laboratory: DAVI LABORATORY

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Strontium-90 (TS90)	0.08 - 0.36	pCi/L
Total Strontium-90 Counting Error (TS90CE)	0.08 - 0.36	pCi/L

Laboratory Method: 905.0

Laboratory: FRUIT GROWERS LABORATORY, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Strontium-90 (TS90)	0.546	pCi/L
Total Strontium-90 Counting Error (TS90CE)	0.546	pCi/L

Laboratory Method: 905.0MOD

Laboratory: EBERLINE ANALYTICAL

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Strontium-90 (TS90)	0.529 - 1.454	pCi/L
Total Strontium-90 Counting Error (TS90CE)	0.529 - 1.454	pCi/L

Laboratory Method: 906.0

Laboratory: FRUIT GROWERS LABORATORY, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Tritium (TTr)	434	pCi/L
Total Tritium Counting Error (TTrCE)	434	pCi/L

Laboratory Method: 9221B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Coliform (Mult. Tube Fermentation) (TCOLIM)	1.1	MPN

Laboratory Method: 9221E

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Fecal Coliform (Mult. Tube Fermentation) (FCOLIM)	1.1	MPN

Laboratory Method: 9222B

Laboratory: O.C. HEALTH CARE AGENCY

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Coliform (Membrane Filtration-CFU/100ml) (TCOLIF)	1	CFU/100

Laboratory Method: 9223B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
E. Coli (Colilert - MPN/100mL) (ECOLIQ)	1 - 3,400	MPN
Total Coliform (Colilert - MPN/100mL) (TCOLIQ)	1 - 3,400	MPN

Laboratory Method: AI

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Aggressive Index (AI)	0	A.I.

Laboratory Method: BIOASCEC

Laboratory: TRUSSELL TECHNOLOGIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Estrogen Receptor alpha as 17-beta Estradiol (ERa17bES)	0.5	ng/L

Laboratory Method: CALC

Laboratory: FRUIT GROWERS LABORATORY, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Gross Alpha Excluding Uranium (TOTa-U)	1.21	pCi/L
Radium 226 + Radium 228 (Ra6Ra8)	0.732	pCi/L
Radium 226 + Radium 228 Counting Error (Ra68CE)	0.732	pCi/L

Laboratory Method: CALC

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
Aggressive Index (AI)		A.I.
Bicarbonate (as HCO3) (HCO3)	1.2	mg/L
Nitrate (NO3)	0.4 - 0.9	mg/L
Nitrate + Nitrite Nitrogen (NO3NO2-N)	0.1	mg/L
Nitrite (NO2)	0.007 - 0.033	mg/L
Title 22 Cation-Anion Balance (T22CAB)		meq/L
Title 22 Total Anions (T22ANI)		meq/L
Title 22 Total Cations (T22CAT)		meq/L
Total Cations (TOTCAT)		meq/L
Total Nitrogen (TOT-N)	0.4 - 0.6	mg/L

Laboratory Method: CEC

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
17a-Estradiol (aESTRA)	1	ng/L
17a-Ethynylestradiol (aETEST)	2	ng/L
17b-Estradiol (bESTRA)	2	ng/L
4-Androstene-3,17-dione (ANDROS)	2	ng/L
4-n-Octylphenol (4nOCPH)	0.2	ug/L
4-tert-Octylphenol (4tOCPH)	0.2	ug/L
Acetaminophen (ACTMNP)	5 - 100	ng/L
Aspartame (ASPATM)	100	ng/L
Atenolol (ATENOL)	5	ng/L
Atrazine (ATRAZ)	0.001	ug/L
Azithromycin (AZTMCN)	10 - 50	ng/L
Bisphenol A (BisPHA)	0.2	ug/L
Caffeine (CAFFEI)	3 - 30	ng/L
Carbamazepine (CBMAZP)	1	ng/L
Diclofenac (DICLFN)	5 - 50	ng/L
Diethylstilbestrol (DESTBL)	2	ng/L
Dilantin (DILANT)	10	ng/L

Laboratory Method: CEC

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
Diuron (DIURON)	0.005	ug/L
Epitestosterone (cis-Testosterone) (EPITES)	1	ng/L
Equilin (EQUILN)	5	ng/L
Erythromycin (ERYTHN)	1	ng/L
Estriol (ESTRIO)	2	ng/L
Estrone (ESTRON)	1	ng/L
Fluoxetine (FLUXET)	5	ng/L
Gemfibrozil (GMFIBZ)	1	ng/L
Ibuprofen (IBPRFN)	1	ng/L
Iohexol (IOHEXL)	20 - 1,000	ng/L
Iopromide (IOPRMD)	10	ng/L
Linuron (LINURN)	0.005	ug/L
Meprobamate (MEPROB)	5	ng/L
N,N-diethyl-m-toluamide (DEET)	1 - 10	ng/L
Naproxen (NAPRXN)	5 - 50	ng/L
Neotame (NEOTAM)	10	ng/L
Nonylphenol (NONYPH)	0.2	ug/L
Oxybenzone (BP3)	1	ng/L
para-Chlorobenzene sulfonic acid (pCBSA)	200	ng/L
Pentachlorophenol (PCP) (PCP)	0.2	ug/L
PhenylPhenol (PHNYPH)	0.2	ug/L
Primidone (PRIMDN)	1	ng/L
Progesterone (PRGSTR)	1	ng/L
Simazine (SIMAZ)	0.005	ug/L
Sucralose (SUCRAL)	100 - 5,000	ng/L
Sulfamethoxazole (SULTHZ)	1 - 10	ng/L
Testosterone (trans-Testosterone) (TESTOR)	1	ng/L
Tetrabromobisphenol A (TBBISA)	0.2	ug/L
Triclosan (TRICLN)	1	ng/L
Trimethoprim (TRIMTP)	5	ng/L
Tris-2-chloroethyl phosphate (TCEP)	5	ng/L

Laboratory Method: H2O2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Hydrogen Peroxide (H2O2)	0.1	mg/L

Laboratory Method: LC-MS-MS

Laboratory: EUROFINS EATON ANALYTICAL

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
N,N-diethyl-m-toluamide (DEET)	10	ng/L
Oxybenzone (BP3)	30	ng/L

Laboratory Method: M-TEC

Laboratory: O.C. HEALTH CARE AGENCY

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
E. Coli (Membrane Filtration - CFU/100ml) (ECOLI)	1	CFU/100

Laboratory Method: NDMA-LOW

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
N-Nitrosodiethylamine (NDEA)	2 - 10	ng/L
n-Nitrosodimethylamine (NDMA)	2 - 10	ng/L
n-Nitroso-di-n-propylamine (NDPA)	2 - 10	ng/L
N-Nitrosomorpholine (NMOR)	2 - 10	ng/L

Laboratory Method: RA-05

Laboratory: FRUIT GROWERS LABORATORY, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Radium 228 (TRa228)	0.624 - 0.643	pCi/L
Total Radium 228 Counting Error (TRa8CE)	0.624 - 0.643	pCi/L

Laboratory Method: UNKWQAN

Laboratory: FRUIT GROWERS LABORATORY, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Gross Alpha Excluding Uranium (TOTa-U)	1.1 - 2.61	pCi/L
Radium 226 + Radium 228 (Ra6Ra8)	0.624 - 0.737	pCi/L
Radium 226 + Radium 228 Counting Error (Ra68CE)	0.624 - 0.737	pCi/L

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Aggressive Index (AI)		A.I.
Bicarbonate (as CaCO3) (HCO3Ca)	5	mg/L
Bicarbonate (as HCO3) (HCO3)	1.2 - 6.1	mg/L
Carbonate (as CaCO3) (CO3Ca)	5	mg/L
Cation-Anion meq balance (CATANI)		RATIO
Hydroxide (as CaCO3) (OHCa)	1 - 5	mg/L
Nitrate (NO3)	0.4 - 0.9	mg/L
Nitrate + Nitrite Nitrogen (NO3NO2-N)	0.1	mg/L
Nitrite (NO2)	0.007 - 0.033	mg/L
PFOA + PFOS (PFOAOS)	2	ng/L
PFOA + PFOS (FRB) (B-PFOAOS)	2	ng/L
Sum of five Haloacetic Acids (HAA5)	1	ug/L
Sum of nine Haloacetic Acids (HAA9)	1	ug/L
Sum of Six Brominated Haloacetic Acids (HAA6Br)	1	ug/L
Title 22 Cation-Anion Balance (T22CAB)		meq/L
Title 22 Total Anions (T22ANI)		meq/L
Title 22 Total Cations (T22CAT)		meq/L
Total Anions (TOTANI)		meq/L

Laboratory Method: UNKWQAN

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Cations (TOTCAT)		meq/L
Total Nitrogen (TOT-N)	0.2 - 0.8	mg/L

Laboratory Method: X1-218.6

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Hexavalent Chromium (CrVI)	0.2	ug/L

Laboratory Method: X1-218.7

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Hexavalent Chromium (CrVI)	0.2 - 0.4	ug/L

Laboratory Method: X1-300.0

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Bromide (Br)	0.1	mg/L
Chloride (Cl)	0.5 - 5	mg/L
Fluoride (F)	0.1	mg/L
Nitrate (NO3)	0.4	mg/L
Nitrate Nitrogen (NO3-N)	0.1	mg/L
Sulfate (SO4)	0.5 - 2.5	mg/L

Laboratory Method: X1-335.4

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Cyanide (CN)	5	ug/L

Laboratory Method: X1-351.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Organic Nitrogen (ORG-N)	0.1 - 0.2	mg/L
Total Kjeldahl Nitrogen (TKN)	0.2 - 0.8	mg/L
Total Nitrogen (TOT-N)	0.3	mg/L

Laboratory Method: X200.7

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Boron (B)	0.1	mg/L
Boron (dissolved) (B-DIS)	0.1	mg/L
Calcium (Ca)	0.5	mg/L
Calcium (dissolved) (Ca-DIS)	0.5	mg/L
Calcium Hardness (CaHRD)	0.25	mg/L
Iron (Fe)	5 - 50	ug/L
Iron (dissolved) (Fe-DIS)	5	ug/L
Magnesium (Mg)	0.5	mg/L
Magnesium (dissolved) (Mg-DIS)	0.5	mg/L
Potassium (K)	0.5	mg/L
Potassium (dissolved) (K-DIS)	0.5	mg/L
Sodium (Na)	0.5	mg/L
Sodium (dissolved) (Na-DIS)	0.5	mg/L
Total Hardness (as CaCO3) (TOTHRD)	1	mg/L
Total Hardness (as CaCO3) (dissolved) (TOTHRD-D)	1	mg/L

Laboratory Method: X200.8

Laboratory: FRUIT GROWERS LABORATORY, INC.

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
Natural Uranium (NTUr)	0.67	pCi/L

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
Aluminum (Al)	1 - 5	ug/L
Aluminum (dissolved) (Al-DIS)	1	ug/L
Antimony (Sb)	1	ug/L
Antimony (dissolved) (Sb-DIS)	1	ug/L
Arsenic (As)	1	ug/L
Arsenic (dissolved) (As-DIS)	1	ug/L
Barium (Ba)	1	ug/L
Barium (dissolved) (Ba-DIS)	1	ug/L
Beryllium (Be)	1	ug/L
Beryllium (dissolved) (Be-DIS)	1	ug/L
Cadmium (Cd)	1	ug/L
Cadmium (dissolved) (Cd-DIS)	1	ug/L
Chromium (Cr)	1	ug/L
Chromium (dissolved) (Cr-DIS)	1	ug/L
Cobalt (Co)	1	ug/L
Cobalt (dissolved) (Co-DIS)	1	ug/L
Copper (Cu)	1	ug/L
Copper (dissolved) (Cu-DIS)	1	ug/L
Gadolinium (Gd)	10	ng/L
Gadolinium (dissolved) (Gd-DIS)	10	ng/L
Lead (Pb)	1	ug/L
Lead (dissolved) (Pb-DIS)	1	ug/L
Manganese (Mn)	1 - 2	ug/L
Manganese (dissolved) (Mn-DIS)	1	ug/L
Mercury (Hg)	1	ug/L
Mercury (dissolved) (Hg-DIS)	1	ug/L
Nickel (Ni)	1	ug/L
Nickel (dissolved) (Ni-DIS)	1	ug/L
Selenium (Se)	1	ug/L

Laboratory Method: X200.8

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Selenium (dissolved) (Se-DIS)	1	ug/L
Silver (Ag)	1	ug/L
Silver (dissolved) (Ag-DIS)	1	ug/L
Strontium (Sr)	1 - 2	ug/L
Thallium (Tl)	1	ug/L
Thallium (dissolved) (Tl-DIS)	1	ug/L
Trivalent Chromium (CrIII)	1	ug/L
Uranium (dissolved) (U-DIS)	1	ug/L
Uranium (U) (U)	1	ug/L
Vanadium (V)	1	ug/L
Vanadium (dissolved) (V-DIS)	1	ug/L
Zinc (Zn)	1	ug/L
Zinc (dissolved) (Zn-DIS)	1	ug/L

Appendix C

Water Quality Constituents
With Laboratory Methods

Orange County Water District
Groundwater Replenishment System
2022 Annual Report

ORANGE COUNTY WATER DISTRICT
Water Quality Constituents With Laboratory Methods

Constituent Type: BIOLOGICAL

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Bacteriophage, Male Specific (BACTMLSP)	1601	1	P/A PERL	OCHCA
Bacteriophage, Somatic (BACTSOMT)	1601	1	P/A PERL	OCHCA
Cryptosporidium (CRYPTO)	1623	0.0909 - 0.1	oocyst/L	EUROSBIN
Cryptosporidium (CRYPTO)	1623.1	0.093 - 0.1	oocyst/L	CELANASF
E. Coli (Colilert - MPN/100mL) (ECOLIQ)	9223B	1 - 3,400	MPN	OCWD
E. Coli (Membrane Filtration - CFU/100ml) (ECOLI)	M-TEC	1	CFU/100	OCHCA
Enterococcus(Membrane Filtration-CFU/100ml) (ENTRCC)	1600	1	CFU/100	OCHCA
Estrogen Receptor alpha as 17-beta Estradiol (ERa17bES)	BIOASCEC	0.5	ng/L	TRUSSELL
Fecal Coliform (Mult. Tube Fermentation) (FCOLIM)	9221E	1.1	MPN	OCWD
Giardia (GIARDIA)	1623	0.0909 - 0.1	cysts/L	EUROSBIN
Giardia (GIARDIA)	1623.1	0.093 - 0.1	cysts/L	CELANASF
Male Specific Phage (MALSPHAG)	1602	1	pfu/100	OCHCA
Total Coliform (Colilert - MPN/100mL) (TCOLIQ)	9223B	1 - 3,400	MPN	OCWD
Total Coliform (Membrane Filtration-CFU/100ml) (TCOLIF)	9222B	1	CFU/100	OCHCA
Total Coliform (Mult. Tube Fermentation) (TCOLIM)	9221B	1.1	MPN	OCWD

Constituent Type: INORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Aggressive Index (AI)	AI	0	A.I.	OCWD
Aggressive Index (AI)	CALC		A.I.	OCWD
Aggressive Index (AI)	UNKWQAN		A.I.	OCWD
Alkalinity-Phenolphthalein (ALKPHE)	2320B	1	mg/L	OCWD

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Water Quality Constituents With Laboratory Methods

Constituent Type: INORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Aluminum (Al)	X200.8	1 - 5	ug/L	OCWD
Aluminum (dissolved) (Al-DIS)	X200.8	1	ug/L	OCWD
Ammonia Nitrogen (NH3-N)	350.1	0.1 - 0.5	mg/L	OCWD
Antimony (Sb)	X200.8	1	ug/L	OCWD
Antimony (dissolved) (Sb-DIS)	X200.8	1	ug/L	OCWD
Apparent Color (unfiltered) (APCOLR)	2120B	3 - 15	UNITS	OCWD
Arsenic (As)	X200.8	1	ug/L	OCWD
Arsenic (dissolved) (As-DIS)	X200.8	1	ug/L	OCWD
Asbestos (ASBESTOS)	100.2	0.18	MFL	EUROFCEI
Asbestos (ASBESTOS)	100.2	0.18 - 0.2	MFL	EUROFINS
Barium (Ba)	X200.8	1	ug/L	OCWD
Barium (dissolved) (Ba-DIS)	X200.8	1	ug/L	OCWD
Beryllium (Be)	X200.8	1	ug/L	OCWD
Beryllium (dissolved) (Be-DIS)	X200.8	1	ug/L	OCWD
Bicarbonate (as CaCO3) (HCO3Ca)	2320B	1	mg/L	OCWD
Bicarbonate (as CaCO3) (HCO3Ca)	UNKWQAN	5	mg/L	OCWD
Bicarbonate (as HCO3) (HCO3)	2320B	1	mg/L	OCWD
Bicarbonate (as HCO3) (HCO3)	CALC	1.2	mg/L	OCWD
Bicarbonate (as HCO3) (HCO3)	UNKWQAN	1.2 - 6.1	mg/L	OCWD
Biochemical Oxygen Demand (BOD)	5210B	2 - 3	mg/L	EURFCALT
Boron (B)	X200.7	0.1	mg/L	OCWD
Boron (dissolved) (B-DIS)	X200.7	0.1	mg/L	OCWD
Bromate (BrO3)	300.1B	5	ug/L	OCWD

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ORANGE COUNTY WATER DISTRICT
Water Quality Constituents With Laboratory Methods

Constituent Type: INORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Bromide (Br)	300.1B	0.01	mg/L	OCWD
Bromide (Br)	X1-300.0	0.1	mg/L	OCWD
Cadmium (Cd)	X200.8	1	ug/L	OCWD
Cadmium (dissolved) (Cd-DIS)	X200.8	1	ug/L	OCWD
Calcium (Ca)	X200.7	0.5	mg/L	OCWD
Calcium (dissolved) (Ca-DIS)	X200.7	0.5	mg/L	OCWD
Calcium Hardness (CaHRD)	X200.7	0.25	mg/L	OCWD
Carbonate (as CaCO3) (CO3Ca)	2320B	1	mg/L	OCWD
Carbonate (as CaCO3) (CO3Ca)	UNKWQAN	5	mg/L	OCWD
Carbonate (as CO3) (CO3)	2320B	0.6	mg/L	OCWD
Cation-Anion meq balance (CATANI)	UNKWQAN		RATIO	OCWD
Chlorate (CLO3)	300.1B	10	ug/L	OCWD
Chloride (Cl)	X1-300.0	0.5 - 5	mg/L	OCWD
Chlorite (CLO2)	300.1B	10	ug/L	OCWD
Chromium (Cr)	X200.8	1	ug/L	OCWD
Chromium (dissolved) (Cr-DIS)	X200.8	1	ug/L	OCWD
Cobalt (Co)	X200.8	1	ug/L	OCWD
Cobalt (dissolved) (Co-DIS)	X200.8	1	ug/L	OCWD
Copper (Cu)	X200.8	1	ug/L	OCWD
Copper (dissolved) (Cu-DIS)	X200.8	1	ug/L	OCWD
Corrosivity (CORROS)	2330B	-100	S.I.	OCWD
Cyanide (CN)	X1-335.4	5	ug/L	OCWD

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Constituent Type: INORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Electrical Conductivity (EC)	2510B	1	uS/cm	OCWD
Fluoride (F)	X1-300.0	0.1	mg/L	OCWD
Free Chlorine (FRCL2)	4500CLF	0.1 - 0.2	mg/L	OCWD
Gadolinium (Gd)	X200.8	10	ng/L	OCWD
Gadolinium (dissolved) (Gd-DIS)	X200.8	10	ng/L	OCWD
Hexavalent Chromium (CrVI)	X1-218.6	0.2	ug/L	OCWD
Hexavalent Chromium (CrVI)	X1-218.7	0.2 - 0.4	ug/L	OCWD
Hydrogen Peroxide (H2O2)	4500H2O2	0.1	mg/L	OCWD
Hydrogen Peroxide (H2O2)	H2O2	0.1	mg/L	OCWD
Hydroxide (as CaCO3) (OHCa)	2320B	1	mg/L	OCWD
Hydroxide (as CaCO3) (OHCa)	UNKWQAN	1 - 5	mg/L	OCWD
Hydroxide (as OH) (OH)	2320B	0.3	mg/L	OCWD
Iron (Fe)	X200.7	5 - 50	ug/L	OCWD
Iron (dissolved) (Fe-DIS)	X200.7	5	ug/L	OCWD
Lead (Pb)	X200.8	1	ug/L	OCWD
Lead (dissolved) (Pb-DIS)	X200.8	1	ug/L	OCWD
Magnesium (Mg)	X200.7	0.5	mg/L	OCWD
Magnesium (dissolved) (Mg-DIS)	X200.7	0.5	mg/L	OCWD
Manganese (Mn)	X200.8	1 - 2	ug/L	OCWD
Manganese (dissolved) (Mn-DIS)	X200.8	1	ug/L	OCWD
Mercury (Hg)	X200.8	1	ug/L	OCWD
Mercury (dissolved) (Hg-DIS)	X200.8	1	ug/L	OCWD

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Constituent Type: INORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Nickel (Ni)	X200.8	1	ug/L	OCWD
Nickel (dissolved) (Ni-DIS)	X200.8	1	ug/L	OCWD
Nitrate (NO3)	4500NO3F	0.4	mg/L	OCWD
Nitrate (NO3)	CALC	0.4 - 0.9	mg/L	OCWD
Nitrate (NO3)	UNKWQAN	0.4 - 0.9	mg/L	OCWD
Nitrate (NO3)	X1-300.0	0.4	mg/L	OCWD
Nitrate + Nitrite Nitrogen (NO3NO2-N)	4500NO3F	0.1 - 0.2	mg/L	OCWD
Nitrate + Nitrite Nitrogen (NO3NO2-N)	CALC	0.1	mg/L	OCWD
Nitrate + Nitrite Nitrogen (NO3NO2-N)	UNKWQAN	0.1	mg/L	OCWD
Nitrate Nitrogen (NO3-N)	4500NO3F	0.1 - 0.2	mg/L	OCWD
Nitrate Nitrogen (NO3-N)	X1-300.0	0.1	mg/L	OCWD
Nitrite (NO2)	CALC	0.007 - 0.033	mg/L	OCWD
Nitrite (NO2)	UNKWQAN	0.007 - 0.033	mg/L	OCWD
Nitrite Nitrogen (NO2-N)	4500NO3F	0.002 - 0.01	mg/L	OCWD
Organic Nitrogen (ORG-N)	X1-351.2	0.1 - 0.2	mg/L	OCWD
Perchlorate (CLO4)	332.0	2	ug/L	OCWD
pH (pH)	4500H+B	1	UNITS	OCWD
Phosphate Phosphorus (orthophosphate) (PO4-P)	365.1	0.01 - 0.05	mg/L	OCWD
Potassium (K)	X200.7	0.5	mg/L	OCWD
Potassium (dissolved) (K-DIS)	X200.7	0.5	mg/L	OCWD
Selenium (Se)	X200.8	1	ug/L	OCWD
Selenium (dissolved) (Se-DIS)	X200.8	1	ug/L	OCWD
Silica (SIO2)	4500SIOC	1	mg/L	OCWD
Silver (Ag)	X200.8	1	ug/L	OCWD

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Constituent Type: INORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Silver (dissolved) (Ag-DIS)	X200.8	1	ug/L	OCWD
Sodium (Na)	X200.7	0.5	mg/L	OCWD
Sodium (dissolved) (Na-DIS)	X200.7	0.5	mg/L	OCWD
Strontium (Sr)	X200.8	1 - 2	ug/L	OCWD
Sulfate (SO4)	X1-300.0	0.5 - 2.5	mg/L	OCWD
Surfactants (MBAS)	5540C	0.02 - 0.04	mg/L	OCWD
Suspended Solids (SUSSOL)	2540D	2.5	mg/L	OCWD
Temperature (Laboratory) (TEMP)	4500H+B	1	C	OCWD
Thallium (Tl)	X200.8	1	ug/L	OCWD
Thallium (dissolved) (Tl-DIS)	X200.8	1	ug/L	OCWD
Threshold Odor Number (Median) (ODOR)	2150B	0	TON	OCWD
Title 22 Cation-Anion Balance (T22CAB)	CALC		meq/L	OCWD
Title 22 Cation-Anion Balance (T22CAB)	UNKWQAN		meq/L	OCWD
Title 22 Total Anions (T22ANI)	CALC		meq/L	OCWD
Title 22 Total Anions (T22ANI)	UNKWQAN		meq/L	OCWD
Title 22 Total Cations (T22CAT)	CALC		meq/L	OCWD
Title 22 Total Cations (T22CAT)	UNKWQAN		meq/L	OCWD
Total Alkalinity (as CaCO3) (TOTALK)	2320B	1 - 5	mg/L	OCWD
Total Anions (TOTANI)	UNKWQAN		meq/L	OCWD
Total Cations (TOTCAT)	CALC		meq/L	OCWD
Total Cations (TOTCAT)	UNKWQAN		meq/L	OCWD
Total Chlorine (TOTCL2)	4500CLF	0.1 - 0.2	mg/L	OCWD
Total Dissolved Solids (TDS)	2540C	2.5	mg/L	OCWD

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ORANGE COUNTY WATER DISTRICT
Water Quality Constituents With Laboratory Methods

Constituent Type: INORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Total Hardness (as CaCO3) (TOTHRD)	X200.7	1	mg/L	OCWD
Total Hardness (as CaCO3) (dissolved) (TOTHRD-D)	X200.7	1	mg/L	OCWD
Total Kjeldahl Nitrogen (TKN)	X1-351.2	0.2 - 0.8	mg/L	OCWD
Total Nitrogen (TOT-N)	CALC	0.4 - 0.6	mg/L	OCWD
Total Nitrogen (TOT-N)	UNKWQAN	0.2 - 0.8	mg/L	OCWD
Total Nitrogen (TOT-N)	X1-351.2	0.3	mg/L	OCWD
Total Organic Carbon (Unfiltered) (TOC)	5310C	0.05	mg/L	OCWD
Trivalent Chromium (CrIII)	X200.8	1	ug/L	OCWD
True Color (filtered) (TRCOLR)	2120B	3 - 15	UNITS	OCWD
Turbidity (TURB)	2130B	0.1	NTU	OCWD
Ultraviolet (absorbance) (UVAB)	5910B	0.005	1/cm	OCWD
Ultraviolet percent transmittance @254nm (UV%T-254)	5910B	0.1	%	OCWD
Uranium (dissolved) (U-DIS)	X200.8	1	ug/L	OCWD
Uranium (U) (U)	X200.8	1	ug/L	OCWD
UV Absorbance/TOC (unfiltered) ratio (UV/TOC)	5910B	0.0001	L/mg-cm	OCWD
Vanadium (V)	X200.8	1	ug/L	OCWD
Vanadium (dissolved) (V-DIS)	X200.8	1	ug/L	OCWD
Zinc (Zn)	X200.8	1	ug/L	OCWD
Zinc (dissolved) (Zn-DIS)	X200.8	1	ug/L	OCWD

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Constituent Type: ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
1,1,1,2-Tetrachloroethane (1112PC)	524.2	0.5	ug/L	OCWD
1,1,1-Trichloro-2-propanone (TCPONE)	551.1	0.5	ug/L	WECKLAB
1,1,1-Trichloroethane (111TCA)	524.2	0.5	ug/L	OCWD
1,1,1-Trichloropropanone (111TCP)	551.1	0.1	ug/L	OCWD
1,1,2,2-Tetrachloroethane (1122PC)	524.2	0.5	ug/L	OCWD
1,1,2-Trichloroethane (112TCA)	524.2	0.5	ug/L	OCWD
1,1-Dichloro-2-propanone (11DC2P)	551.1	0.1	ug/L	OCWD
1,1-Dichloro-2-propanone (11DC2P)	551.1	0.5	ug/L	WECKLAB
1,1-Dichloroethane (11DCA)	524.2	0.5	ug/L	OCWD
1,1-Dichloroethene (11DCE)	524.2	0.5	ug/L	OCWD
1,1-Dichloropropene (11DCP)	524.2	0.5	ug/L	OCWD
1,2,3-Trichlorobenzene (123TCB)	524.2	0.5	ug/L	OCWD
1,2,3-Trichloropropane (123TCP)	14DIOX	0.005	ug/L	OCWD
1,2,3-Trichloropropane (123TCP)	504.1	0.05	ug/L	OCWD
1,2,3-Trichloropropane (123TCP)	524.2	0.5	ug/L	OCWD
1,2,3-Trichloropropane (123TCP)	524M-TCP	0.005	ug/L	OCWD
1,2,4-Trichlorobenzene (124TCB)	524.2	0.5	ug/L	OCWD
1,2,4-Trichlorobenzene (124TCB)	625.1	9.6 - 10	ug/L	EURFCLLC
1,2,4-Trichlorobenzene (124TCB)	625.1	9.5 - 10	ug/L	EURFCALT
1,2,4-Trichlorobenzene (124TCB)	8270C	1	ug/L	WECKLAB
1,2,4-Trimethylbenzene (124TMB)	524.2	0.5	ug/L	OCWD
1,2-Dibromo-3-chloropropane (DBCP)	14DIOX	0.01	ug/L	OCWD
1,2-Dibromo-3-chloropropane (DBCP)	504.1	0.01	ug/L	OCWD
1,2-Dibromo-3-chloropropane (DBCP)	524.2	0.5	ug/L	OCWD

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Constituent Type: ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
1,2-Dibromo-3-chloropropane (DBCP)	524M-TCP	0.01	ug/L	OCWD
1,2-Dibromoethane (EDB)	14DIOX	0.005	ug/L	OCWD
1,2-Dibromoethane (EDB)	504.1	0.01	ug/L	OCWD
1,2-Dibromoethane (EDB)	524.2	0.5	ug/L	OCWD
1,2-Dibromoethane (EDB)	524M-TCP	0.005	ug/L	OCWD
1,2-Dichlorobenzene (12DCB)	524.2	0.5	ug/L	OCWD
1,2-Dichlorobenzene (12DCB)	625.1	9.6 - 10	ug/L	EURFCLLC
1,2-Dichlorobenzene (12DCB)	625.1	9.5 - 10	ug/L	EURFCALT
1,2-Dichlorobenzene (12DCB)	8270C	1	ug/L	WECKLAB
1,2-Dichloroethane (12DCA)	524.2	0.5	ug/L	OCWD
1,2-Dichloropropane (12DCP)	524.2	0.5	ug/L	OCWD
1,2-Diphenylhydrazine (12DPH)	625.1	9.6 - 10	ug/L	EURFCLLC
1,2-Diphenylhydrazine (12DPH)	625.1	9.5 - 10	ug/L	EURFCALT
1,2-Diphenylhydrazine (12DPH)	8270C	1	ug/L	WECKLAB
1,3,5-Trimethylbenzene (135TMB)	524.2	0.5	ug/L	OCWD
1,3-Dichlorobenzene (13DCB)	524.2	0.5	ug/L	OCWD
1,3-Dichlorobenzene (13DCB)	625.1	9.6 - 10	ug/L	EURFCLLC
1,3-Dichlorobenzene (13DCB)	625.1	9.5 - 10	ug/L	EURFCALT
1,3-Dichlorobenzene (13DCB)	8270C	1	ug/L	WECKLAB
1,3-Dichloropropane (13DCP)	524.2	0.5	ug/L	OCWD
1,4-Dichlorobenzene (14DCB)	524.2	0.5	ug/L	OCWD
1,4-Dichlorobenzene (14DCB)	625.1	9.6 - 10	ug/L	EURFCLLC
1,4-Dichlorobenzene (14DCB)	625.1	9.5 - 10	ug/L	EURFCALT
1,4-Dichlorobenzene (14DCB)	8270C	1	ug/L	WECKLAB
1,4-Dioxane (14DIOX)	14DIOX	0.5	ug/L	OCWD
11-chloroeicosafluoro-3-oxaundecane-1sulfonic acid (11CLPF)	533	2	ng/L	OCWD

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Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
11-chloroeicosafluoro-3-oxaundecane-1sulfonic acid (11CLPF)	537.1	2	ng/L	OCWD
17a-Estradiol (aESTRA)	CEC	1	ng/L	OCWD
17a-Ethynylestradiol (aETEST)	CEC	2	ng/L	OCWD
17b-Estradiol (bESTRA)	CEC	2	ng/L	OCWD
2,2-Dichloropropane (22DCP)	524.2	0.5	ug/L	OCWD
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1613B	4.8 - 5.1	pg/L	EUROTSAC
2,4,5-Trichlorophenol (245TCP)	625.1	9.5 - 10	ug/L	EURFCALT
2,4,5-Trichlorophenol (245TCP)	625.1	9.6 - 10	ug/L	EURFCLLC
2,4,5-Trichlorophenol (245TCP)	8270C	1	ug/L	WECKLAB
2,4,6-Trichlorophenol (246TCP)	625.1	9.6 - 10	ug/L	EURFCLLC
2,4,6-Trichlorophenol (246TCP)	625.1	9.5 - 10	ug/L	EURFCALT
2,4,6-Trichlorophenol (246TCP)	8270C	1	ug/L	WECKLAB
2,4-Dichlorophenol (24DCPH)	625.1	9.6 - 10	ug/L	EURFCLLC
2,4-Dichlorophenol (24DCPH)	625.1	9.5 - 10	ug/L	EURFCALT
2,4-Dichlorophenol (24DCPH)	8270C	1	ug/L	WECKLAB
2,4-Dimethylphenol (24DMP)	625.1	9.6 - 10	ug/L	EURFCLLC
2,4-Dimethylphenol (24DMP)	625.1	9.5 - 10	ug/L	EURFCALT
2,4-Dimethylphenol (24DMP)	8270C	1	ug/L	WECKLAB
2,4-Dinitrophenol (24DNP)	625.1	48 - 52	ug/L	EURFCLLC
2,4-Dinitrophenol (24DNP)	625.1	48 - 50	ug/L	EURFCALT
2,4-Dinitrophenol (24DNP)	8270C	10	ug/L	WECKLAB
2,4-Dinitrotoluene (24DNT)	525.2	0.1	ug/L	OCWD
2,4-Dinitrotoluene (24DNT)	625.1	9.6 - 10	ug/L	EURFCLLC
2,4-Dinitrotoluene (24DNT)	625.1	9.5 - 10	ug/L	EURFCALT
2,4-Dinitrotoluene (24DNT)	8270C	1	ug/L	WECKLAB
2,6-Dinitrotoluene (26DNT)	525.2	0.1	ug/L	OCWD

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Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
2,6-Dinitrotoluene (26DNT)	625.1	9.6 - 10	ug/L	EURFCLLC
2,6-Dinitrotoluene (26DNT)	625.1	9.5 - 10	ug/L	EURFCALT
2,6-Dinitrotoluene (26DNT)	8270C	1	ug/L	WECKLAB
2-Chloroethylvinyl ether (2ClEVE)	14DIOX	1	ug/L	OCWD
2-Chloronaphthalene (2ClNAP)	625.1	9.5 - 10	ug/L	EURFCALT
2-Chloronaphthalene (2ClNAP)	625.1	9.6 - 10	ug/L	EURFCLLC
2-Chloronaphthalene (2ClNAP)	8270C	1	ug/L	WECKLAB
2-Chlorophenol (2ClPNL)	625.1	9.5 - 10	ug/L	EURFCALT
2-Chlorophenol (2ClPNL)	625.1	9.6 - 10	ug/L	EURFCLLC
2-Chlorophenol (2ClPNL)	8270C	1	ug/L	WECKLAB
2-Chlorotoluene (2CLTOL)	524.2	0.5	ug/L	OCWD
2-Methyl naphthalene (2MNAP)	625.1	9.6 - 10	ug/L	EURFCLLC
2-Methyl naphthalene (2MNAP)	625.1	9.5 - 10	ug/L	EURFCALT
2-Methyl naphthalene (2MNAP)	8270C	1	ug/L	WECKLAB
2-Methyl-4,6-Dinitrophenol (2MDNP)	625.1	48 - 52	ug/L	EURFCLLC
2-Methyl-4,6-Dinitrophenol (2MDNP)	625.1	48 - 50	ug/L	EURFCALT
2-Methyl-4,6-Dinitrophenol (2MDNP)	8270C	5	ug/L	WECKLAB
2-Methylphenol (oCRESL)	625.1	9.6 - 10	ug/L	EURFCLLC
2-Methylphenol (oCRESL)	625.1	9.5 - 10	ug/L	EURFCALT
2-Methylphenol (oCRESL)	8270C	1	ug/L	WECKLAB
2-Nitroaniline (oNTANL)	625.1	9.5 - 10	ug/L	EURFCALT
2-Nitroaniline (oNTANL)	625.1	9.6 - 10	ug/L	EURFCLLC
2-Nitroaniline (oNTANL)	8270C	1	ug/L	WECKLAB
2-Nitrophenol (2NPNL)	625.1	9.6 - 10	ug/L	EURFCLLC
2-Nitrophenol (2NPNL)	625.1	9.5 - 10	ug/L	EURFCALT
2-Nitrophenol (2NPNL)	8270C	1	ug/L	WECKLAB

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Constituent Type: ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
3- & 4-Methylphenol (mpCRESL)	8270C	1	ug/L	WECKLAB
3,3'-Dichlorobenzidine (DCBZDE)	625.1	24 - 26	ug/L	EURFCLLC
3,3'-Dichlorobenzidine (DCBZDE)	625.1	9.5 - 10	ug/L	EURFCALT
3,3'-Dichlorobenzidine (DCBZDE)	8270C	5	ug/L	WECKLAB
3-Nitroaniline (mNTANL)	625.1	9.6 - 10	ug/L	EURFCLLC
3-Nitroaniline (mNTANL)	625.1	9.5 - 10	ug/L	EURFCALT
3-Nitroaniline (mNTANL)	8270C	1	ug/L	WECKLAB
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	533	2	ng/L	OCWD
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	537.1	2	ng/L	OCWD
4:2 Fluorotelomer sulfonate (4:2FTS)	533	2	ng/L	OCWD
4-Androstene-3,17-dione (ANDROS)	CEC	2	ng/L	OCWD
4-Bromophenyl phenyl ether (4BrPPE)	625.1	9.6 - 10	ug/L	EURFCLLC
4-Bromophenyl phenyl ether (4BrPPE)	625.1	9.5 - 10	ug/L	EURFCALT
4-Bromophenyl phenyl ether (4BrPPE)	8270C	1	ug/L	WECKLAB
4-Chloro-3-methylphenol (43CMP)	625.1	9.6 - 10	ug/L	EURFCLLC
4-Chloro-3-methylphenol (43CMP)	625.1	9.5 - 10	ug/L	EURFCALT
4-Chloro-3-methylphenol (43CMP)	8270C	1	ug/L	WECKLAB
4-Chloroaniline (pClANL)	625.1	9.6 - 10	ug/L	EURFCLLC
4-Chloroaniline (pClANL)	625.1	9.5 - 10	ug/L	EURFCALT
4-Chloroaniline (pClANL)	8270C	1	ug/L	WECKLAB
4-Chlorophenyl phenyl ether (4ClPPE)	625.1	9.5 - 10	ug/L	EURFCALT
4-Chlorophenyl phenyl ether (4ClPPE)	625.1	9.6 - 10	ug/L	EURFCLLC
4-Chlorophenyl phenyl ether (4ClPPE)	8270C	1	ug/L	WECKLAB
4-Chlorotoluene (4CLTOL)	524.2	0.5	ug/L	OCWD
4-Isopropyltoluene (4IPTOL)	524.2	0.5	ug/L	OCWD

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Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
4-Nitroaniline (pNTANL)	625.1	9.6 - 10	ug/L	EURFCLLC
4-Nitroaniline (pNTANL)	625.1	9.5 - 10	ug/L	EURFCALT
4-Nitroaniline (pNTANL)	8270C	1	ug/L	WECKLAB
4-Nitrophenol (4NPNL)	625.1	9.6 - 10	ug/L	EURFCLLC
4-Nitrophenol (4NPNL)	625.1	9.5 - 10	ug/L	EURFCALT
4-Nitrophenol (4NPNL)	8270C	5	ug/L	WECKLAB
4-n-Octylphenol (4nOCPH)	CEC	0.2	ug/L	OCWD
4-tert-Octylphenol (4tOCPH)	CEC	0.2	ug/L	OCWD
6:2 Fluorotelomer sulfonate (6:2FTS)	533	2	ng/L	OCWD
8:2 Fluorotelomer sulfonate (8:2FTS)	533	2	ng/L	OCWD
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9CLPF3)	533	2	ng/L	OCWD
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9CLPF3)	537.1	2	ng/L	OCWD
Acetaldehyde (ACEALD)	556	2	ug/L	WECKLAB
Acetone (ACETNE)	524.2	10	ug/L	OCWD
Acrolein (ACROLN)	524.2	5	ug/L	OCWD
Acrylonitrile (ACRYLO)	524.2	2	ug/L	OCWD
Anatoxin-a (ANATXNA)	545	0.03	ug/L	WECKLAB
Aniline (ANLN)	625.1	9.6 - 10	ug/L	EURFCLLC
Aniline (ANLN)	625.1	9.5 - 10	ug/L	EURFCALT
Aniline (ANLN)	8270C	1	ug/L	WECKLAB
Aspartame (ASPATM)	CEC	100	ng/L	OCWD
Atenolol (ATENOL)	CEC	5	ng/L	OCWD
Benzaldehyde (BENALD)	556	2	ug/L	WECKLAB
Benzene (BENZ)	524.2	0.5	ug/L	OCWD

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Benzidine (BNZDE)	625.1	48 - 52	ug/L	EURFCLLC
Benzidine (BNZDE)	625.1	48 - 50	ug/L	EURFCALT
Benzidine (BNZDE)	8270C	10	ug/L	WECKLAB
Benzoic Acid (BNZACD)	625.1	48 - 52	ug/L	EURFCLLC
Benzoic Acid (BNZACD)	625.1	48 - 50	ug/L	EURFCALT
Benzoic Acid (BNZACD)	8270C	100	ug/L	WECKLAB
Benzyl Alcohol (BNZALC)	625.1	9.6 - 10	ug/L	EURFCLLC
Benzyl Alcohol (BNZALC)	625.1	9.5 - 10	ug/L	EURFCALT
Benzyl Alcohol (BNZALC)	8270C	1	ug/L	WECKLAB
bis (2-chloroethoxy) methane (B2CEM)	625.1	9.6 - 10	ug/L	EURFCLLC
bis (2-chloroethoxy) methane (B2CEM)	625.1	9.5 - 10	ug/L	EURFCALT
bis (2-chloroethoxy) methane (B2CEM)	8270C	1	ug/L	WECKLAB
bis (2-chloroethyl) ether (B2CLEE)	524.2	2.5	ug/L	OCWD
bis (2-chloroethyl) ether (B2CLEE)	625.1	24 - 25	ug/L	EURFCALT
bis (2-chloroethyl) ether (B2CLEE)	625.1	24 - 26	ug/L	EURFCLLC
bis (2-chloroethyl) ether (B2CLEE)	8270C	1	ug/L	WECKLAB
bis (2-chloroisopropyl) ether (B2CIPE)	625.1	9.5 - 10	ug/L	EURFCALT
bis (2-chloroisopropyl) ether (B2CIPE)	625.1	9.6 - 10	ug/L	EURFCLLC
bis (2-chloroisopropyl) ether (B2CIPE)	8270C	1	ug/L	WECKLAB
Bisphenol A (BisPHA)	CEC	0.2	ug/L	OCWD
Bromobenzene (BRBENZ)	524.2	0.5	ug/L	OCWD
Bromochloroacetic Acid (BCAA)	552.2	1	ug/L	OCWD
Bromochloroacetonitrile (BCAN)	551.1	0.1	ug/L	OCWD
Bromochloroacetonitrile (BCAN)	551.1	0.5	ug/L	WECKLAB
Bromochloromethane (CH2BrC)	524.2	0.5	ug/L	OCWD
Bromodichloroacetic Acid (BDCAA)	552.2	1	ug/L	OCWD

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Constituent Type: ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Bromodichloromethane (CHBrCl)	524.2	0.5	ug/L	OCWD
Bromoform (CHBr3)	524.2	0.5	ug/L	OCWD
Bromomethane (CH3Br)	524.2	0.5	ug/L	OCWD
Carbazole (CARBZL)	8270C	1	ug/L	WECKLAB
Carbon Disulfide (CS2)	524.2	0.5	ug/L	OCWD
Carbon tetrachloride (CCl4)	524.2	0.5	ug/L	OCWD
Chlorobenzene (CLBENZ)	524.2	0.5	ug/L	OCWD
Chlorodibromoacetic Acid (CDBAA)	552.2	1	ug/L	OCWD
Chlorodifluoromethane (FREN22)	524.2	0.5	ug/L	OCWD
Chloroethane (ClETHA)	524.2	0.5 - 5	ug/L	OCWD
Chloroform (CHCl3)	524.2	0.5	ug/L	OCWD
Chloromethane (CH3Cl)	524.2	0.5	ug/L	OCWD
Chloropicrin (ClPICR)	551.1	0.1	ug/L	OCWD
Chloropicrin (ClPICR)	551.1	0.5	ug/L	WECKLAB
cis-1,2-Dichloroethene (c12DCE)	524.2	0.5	ug/L	OCWD
cis-1,3-Dichloropropene (c13DCP)	524.2	0.5	ug/L	OCWD
Crotonaldehyde (CRTALD)	556	2	ug/L	WECKLAB
Cyclohexanone (CYCHXN)	556	2	ug/L	WECKLAB
Cylindrospermopsin (CYN)	545	0.09	ug/L	WECKLAB
Decanal (DECNAL)	556	2	ug/L	WECKLAB
Dibenzofuran (DBFUR)	625.1	9.6 - 10	ug/L	EURFCLLC
Dibenzofuran (DBFUR)	625.1	9.5 - 10	ug/L	EURFCALT

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Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Dibenzofuran (DBFUR)	8270C	1	ug/L	WECKLAB
Dibromoacetic Acid (DBAA)	552.2	1	ug/L	OCWD
Dibromoacetonitrile (DBAN)	551.1	0.1	ug/L	OCWD
Dibromoacetonitrile (DBAN)	551.1	0.5	ug/L	WECKLAB
Dibromochloromethane (CHBr2C)	524.2	0.5	ug/L	OCWD
Dibromomethane (CH2Br2)	524.2	0.5	ug/L	OCWD
Dichloroacetic Acid (DCAA)	552.2	1	ug/L	OCWD
Dichloroacetonitrile (DCAN)	551.1	0.1	ug/L	OCWD
Dichloroacetonitrile (DCAN)	551.1	0.5	ug/L	WECKLAB
Dichlorodifluoromethane (CCl2F2)	524.2	0.5	ug/L	OCWD
Diclofenac (DICLFN)	CEC	5 - 50	ng/L	OCWD
Diethylstilbestrol (DESTBL)	CEC	2	ng/L	OCWD
Diisopropyl ether (DIPE)	524.2	1	ug/L	OCWD
Dilantin (DILANT)	CEC	10	ng/L	OCWD
Dissolved Organic Carbon (DOC)	5310C	0.05	mg/L	OCWD
Endosulfan II (ENDOII)	508.1	0.01	ug/L	WECKLAB
Endosulfan II (ENDOII)	525.2	0.1	ug/L	OCWD
Endosulfan II (ENDOII)	8081A	0.0098	ug/L	EURFCLLC
Endosulfan II (ENDOII)	8081A	0.0097	ug/L	EURFCALT
Endosulfan II (ENDOII)	8081A_LL	0.0096	ug/L	EURFCALT
Epitestosterone (cis-Testosterone) (EPITES)	CEC	1	ng/L	OCWD
Equilin (EQUILN)	CEC	5	ng/L	OCWD
Estriol (ESTRIO)	CEC	2	ng/L	OCWD
Estrone (ESTRON)	CEC	1	ng/L	OCWD

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Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Ethyl tert-butyl ether (ETBE)	524.2	1	ug/L	OCWD
Ethylbenzene (EtBENZ)	524.2	0.5	ug/L	OCWD
Fluoxetine (FLUXET)	CEC	5	ng/L	OCWD
Formaldehyde (FORALD)	556	2	ug/L	WECKLAB
Freon 123a (FR123A)	524.2	0.5 - 2	ug/L	OCWD
Glyoxal (GLYOXL)	556	2	ug/L	WECKLAB
HCH-alpha (Alpha-BHC) (BHCa)	508.1	0.01	ug/L	WECKLAB
HCH-alpha (Alpha-BHC) (BHCa)	525.2	0.1	ug/L	OCWD
HCH-alpha (Alpha-BHC) (BHCa)	8081A	0.0039	ug/L	EURFCLLC
HCH-alpha (Alpha-BHC) (BHCa)	8081A	0.0019	ug/L	EURFCALT
HCH-alpha (Alpha-BHC) (BHCa)	8081A_LL	0.0019	ug/L	EURFCALT
HCH-beta (Beta-BHC) (BHCb)	508.1	0.01	ug/L	WECKLAB
HCH-beta (Beta-BHC) (BHCb)	525.2	0.1	ug/L	OCWD
HCH-beta (Beta-BHC) (BHCb)	8081A	0.0039	ug/L	EURFCLLC
HCH-beta (Beta-BHC) (BHCb)	8081A	0.0073	ug/L	EURFCALT
HCH-beta (Beta-BHC) (BHCb)	8081A_LL	0.0072	ug/L	EURFCALT
HCH-delta (Delta-BHC) (BHCd)	508.1	0.01	ug/L	WECKLAB
HCH-delta (Delta-BHC) (BHCd)	525.2	0.1	ug/L	OCWD
HCH-delta (Delta-BHC) (BHCd)	8081A	0.0039	ug/L	EURFCLLC
HCH-delta (Delta-BHC) (BHCd)	8081A	0.0049	ug/L	EURFCALT
HCH-delta (Delta-BHC) (BHCd)	8081A_LL	0.0048	ug/L	EURFCALT
Heptanal (HEPNAL)	556	2	ug/L	WECKLAB
Hexachlorobutadiene (HClBut)	524.2	0.5	ug/L	OCWD
Hexachlorobutadiene (HClBut)	625.1	9.6 - 10	ug/L	EURFCLLC
Hexachlorobutadiene (HClBut)	625.1	9.5 - 10	ug/L	EURFCALT
Hexachlorobutadiene (HClBut)	8270C	1	ug/L	WECKLAB

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Constituent Type: ORGANIC

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Hexachloroethane (HCE)	625.1	9.6 - 10	ug/L	EURFCLLC
Hexachloroethane (HCE)	625.1	9.5 - 10	ug/L	EURFCALT
Hexachloroethane (HCE)	8270C	1	ug/L	WECKLAB
Hexafluoropropylene oxide dimer acid (GenX) (HFPODA)	533	2	ng/L	OCWD
Hexafluoropropylene oxide dimer acid (GenX) (HFPODA)	537.1	2	ng/L	OCWD
Hexanal (HEXNAL)	556	2	ug/L	WECKLAB
Iohexol (IOHEXL)	CEC	20 - 1,000	ng/L	OCWD
Iopromide (IOPRMD)	CEC	10	ng/L	OCWD
Isophorone (IPHOR)	525.2	0.1	ug/L	OCWD
Isophorone (IPHOR)	625.1	9.6 - 10	ug/L	EURFCLLC
Isophorone (IPHOR)	625.1	9.5 - 10	ug/L	EURFCALT
Isophorone (IPHOR)	8270C	1	ug/L	WECKLAB
Isopropylbenzene (ISPBNZ)	524.2	0.5	ug/L	OCWD
Linuron (LINURN)	CEC	0.005	ug/L	OCWD
m,p-Xylene (mp-XYL)	524.2	0.5	ug/L	OCWD
Meprobamate (MEPROB)	CEC	5	ng/L	OCWD
Methyl Ethyl Ketone (MEK) (MEK)	524.2	2.5	ug/L	OCWD
Methyl Isobutyl Ketone (MIBK) (MIBK)	524.2	2.5	ug/L	OCWD
Methyl tert-butyl ether (MTBE)	524.2	0.2	ug/L	OCWD
Methylene Chloride (CH2Cl2)	524.2	0.5	ug/L	OCWD
Methylglyoxal (MGLYOX)	556	2	ug/L	WECKLAB
Methylisothiocyanate (MITC)	14DIOX	0.05	ug/L	OCWD
Metolachlor (METOCL)	525.2	0.1	ug/L	OCWD

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Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Microcystin-LA (MCSLA)	544	0.008	ug/L	WECKLAB
Microcystin-LF (MCSLF)	544	0.006	ug/L	WECKLAB
Microcystin-LR (MCSLR)	544	0.02	ug/L	WECKLAB
Microcystin-LY (MCSLY)	544	0.009	ug/L	WECKLAB
Microcystin-RR (MCSRR)	544	0.006	ug/L	WECKLAB
Microcystin-YR (MCSYR)	544	0.02	ug/L	WECKLAB
Monobromoacetic Acid (MBAA)	552.2	1	ug/L	OCWD
Monochloroacetic Acid (MCAA)	552.2	1	ug/L	OCWD
Naphthalene (NAP)	524.2	0.5	ug/L	OCWD
Naphthalene (NAP)	525.2	0.1	ug/L	OCWD
Naphthalene (NAP)	625.1	9.6 - 10	ug/L	EURFCLLC
Naphthalene (NAP)	625.1	9.5 - 10	ug/L	EURFCALT
Naphthalene (NAP)	8270C	1	ug/L	WECKLAB
Naproxen (NAPRXN)	CEC	5 - 50	ng/L	OCWD
n-Butylbenzene (nBBENZ)	524.2	0.5	ug/L	OCWD
Neotame (NEOTAM)	CEC	10	ng/L	OCWD
N-ethyl perfluorooctanesulfonamidoacetic acid (EtFOSA)	537.1	2	ng/L	OCWD
Nitrobenzene (NBENZ)	625.1	24 - 26	ug/L	EURFCLLC
Nitrobenzene (NBENZ)	625.1	24 - 25	ug/L	EURFCALT
Nitrobenzene (NBENZ)	8270C	1	ug/L	WECKLAB
N-methyl perfluorooctanesulfonamidoacetic acid (MeFOSA)	537.1	2	ng/L	OCWD
N-Nitrosodiethylamine (NDEA)	NDMA-LOW	2 - 10	ng/L	OCWD
n-Nitrosodimethylamine (NDMA)	8270C	1000	ng/L	WECKLAB
n-Nitrosodimethylamine (NDMA)	NDMA-LOW	2 - 10	ng/L	OCWD

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Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
n-Nitroso-di-n-propylamine (NDPA)	625.1	9,600 - 10,000	ng/L	EURFCLLC
n-Nitroso-di-n-propylamine (NDPA)	625.1	9,500 - 10,000	ng/L	EURFCALT
n-Nitroso-di-n-propylamine (NDPA)	8270C	1,000	ng/L	WECKLAB
n-Nitroso-di-n-propylamine (NDPA)	NDMA-LOW	2 - 10	ng/L	OCWD
n-Nitrosodiphenylamine (NDPhA)	625.1	9,600 - 10,000	ng/L	EURFCLLC
n-Nitrosodiphenylamine (NDPhA)	625.1	9,500 - 10,000	ng/L	EURFCALT
n-Nitrosodiphenylamine (NDPhA)	8270C	1,000	ng/L	WECKLAB
N-Nitrosomorpholine (NMOR)	NDMA-LOW	2 - 10	ng/L	OCWD
Nodularin (NODULRN)	544	0.005	ug/L	WECKLAB
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	533	2	ng/L	OCWD
Nonanal (NONNAL)	556	2	ug/L	WECKLAB
Nonylphenol (NONYPH)	CEC	0.2	ug/L	OCWD
o-Xylene (o-XYL)	524.2	0.5	ug/L	OCWD
para-Chlorobenzene sulfonic acid (pCBSA)	CEC	200	ng/L	OCWD
PCB-1016 (PCB16)	508.1	0.1 - 0.5	ug/L	WECKLAB
PCB-1221 (PCB21)	508.1	0.1 - 0.5	ug/L	WECKLAB
PCB-1232 (PCB32)	508.1	0.1 - 0.5	ug/L	WECKLAB
PCB-1242 (PCB42)	508.1	0.1 - 0.5	ug/L	WECKLAB
PCB-1248 (PCB48)	508.1	0.1 - 0.5	ug/L	WECKLAB
PCB-1254 (PCB54)	508.1	0.1 - 0.5	ug/L	WECKLAB
PCB-1260 (PCB60)	508.1	0.1 - 0.5	ug/L	WECKLAB
PCBs, Total (TOTPCB)	508.1	0.5	ug/L	WECKLAB
Perfluoro butane sulfonic acid (PFBS)	533	2	ng/L	OCWD

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Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Perfluoro butane sulfonic acid (PFBS)	537.1	2	ng/L	OCWD
Perfluoro heptanoic acid (PFHpA)	533	2	ng/L	OCWD
Perfluoro heptanoic acid (PFHpA)	537.1	2	ng/L	OCWD
Perfluoro hexane sulfonic acid (PFHxS)	533	2	ng/L	OCWD
Perfluoro hexane sulfonic acid (PFHxS)	537.1	2	ng/L	OCWD
Perfluoro nonanoic acid (PFNA)	533	2	ng/L	OCWD
Perfluoro nonanoic acid (PFNA)	537.1	2	ng/L	OCWD
Perfluoro octane sulfonic acid (PFOS)	533	2	ng/L	OCWD
Perfluoro octane sulfonic acid (PFOS)	537.1	2	ng/L	OCWD
Perfluoro octanoic acid (PFOA)	533	2	ng/L	OCWD
Perfluoro octanoic acid (PFOA)	537.1	2	ng/L	OCWD
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	533	2	ng/L	OCWD
Perfluoro-3-methoxypropanoic acid (PFMPA)	533	2	ng/L	OCWD
Perfluoro-4-methoxybutanoic acid (PFMBA)	533	2	ng/L	OCWD
Perfluorobutanoic acid (PFBA)	533	2	ng/L	OCWD
Perfluorodecanoic acid (PFDA)	533	2	ng/L	OCWD
Perfluorodecanoic acid (PFDA)	537.1	2	ng/L	OCWD
Perfluorododecanoic acid (PFDoA)	533	2	ng/L	OCWD
Perfluorododecanoic acid (PFDoA)	537.1	2	ng/L	OCWD
Perfluoroheptanesulfonic Acid (PFHpS)	533	2	ng/L	OCWD
Perfluorohexanoic acid (PFHxA)	533	2	ng/L	OCWD
Perfluorohexanoic acid (PFHxA)	537.1	2	ng/L	OCWD
Perfluoropentanesulfonic acid (PFPeS)	533	2	ng/L	OCWD
Perfluoropentanoic acid (PFPeA)	533	2	ng/L	OCWD

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Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Perfluorotetradecanoic acid (PFTA)	537.1	2	ng/L	OCWD
Perfluorotridecanoic acid (PFTrDA)	537.1	2	ng/L	OCWD
Perfluoroundecanoic acid (PFUnA)	533	2	ng/L	OCWD
Perfluoroundecanoic acid (PFUnA)	537.1	2	ng/L	OCWD
PFOA + PFOS (PFOAOS)	UNKWQAN	2	ng/L	OCWD
Phenol (PHENOL)	625.1	9.6 - 10	ug/L	EURFCLLC
Phenol (PHENOL)	625.1	9.5 - 10	ug/L	EURFCALT
Phenol (PHENOL)	8270C	1	ug/L	WECKLAB
PhenylPhenol (PHNYPH)	CEC	0.2	ug/L	OCWD
Progesterone (PRGSTR)	CEC	1	ng/L	OCWD
Propylbenzene (PRPBNZ)	524.2	0.5	ug/L	OCWD
Pyridine (PYRDN)	8270C	5	ug/L	WECKLAB
sec-Butylbenzene (sBBENZ)	524.2	0.5	ug/L	OCWD
Styrene (STYR)	524.2	0.5	ug/L	OCWD
Sucralose (SUCRAL)	CEC	100 - 5,000	ng/L	OCWD
Sum of five Haloacetic Acids (HAA5)	UNKWQAN	1	ug/L	OCWD
Sum of nine Haloacetic Acids (HAA9)	UNKWQAN	1	ug/L	OCWD
Sum of Six Brominated Haloacetic Acids (HAA6Br)	UNKWQAN	1	ug/L	OCWD
Terbufos Sulfone (TERSUL)	525.2	0.1	ug/L	OCWD
Tert-amyl methyl ether (TAME)	524.2	1	ug/L	OCWD
tert-butyl alcohol (TBA)	524.2	2	ug/L	OCWD
tert-Butylbenzene (tBBENZ)	524.2	0.5	ug/L	OCWD

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Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Testosterone (trans-Testosterone) (TESTOR)	CEC	1	ng/L	OCWD
Tetrabromobisphenol A (TBBISA)	CEC	0.2	ug/L	OCWD
Tetrachloroethene (PCE)	524.2	0.5	ug/L	OCWD
Toluene (TOLU)	524.2	0.5	ug/L	OCWD
Total 1,3-Dichloropropene (x13DCP)	524.2	0.5	ug/L	OCWD
Total Microcystins (TMCSs)	546	0.3	ug/L	WECKLAB
Total Trihalomethanes (TTHMs)	524.2	0.5	ug/L	OCWD
Total Xylenes (m,p,&o) (TOTALX)	524.2	0.5	ug/L	OCWD
trans-1,2 Dichloroethene (t12DCE)	524.2	0.5	ug/L	OCWD
trans-1,3-Dichloropropene (t13DCP)	524.2	0.5	ug/L	OCWD
Tribromoacetic Acid (TBAA)	552.2	1	ug/L	OCWD
Trichloroacetic Acid (TCAA)	552.2	1	ug/L	OCWD
Trichloroacetonitrile (TCAN)	551.1	0.1	ug/L	OCWD
Trichloroacetonitrile (TCAN)	551.1	0.5	ug/L	WECKLAB
Trichloroethene (TCE)	524.2	0.5	ug/L	OCWD
Trichlorofluoromethane (Freon 11) (CCl3F)	524.2	0.5	ug/L	OCWD
Trichlorotrifluoroethane (Freon 113) (Cl3F3E)	524.2	0.5	ug/L	OCWD
Trimethoprim (TRIMTP)	CEC	5	ng/L	OCWD
Tris-2-chloroethyl phosphate (TCEP)	CEC	5	ng/L	OCWD
Vinyl chloride (VNYLCL)	524.2	0.5	ug/L	OCWD

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Constituent Type: ORGANIC DUPLICATE

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
11-chloroeicosafluoro3oxaundecane1sulfonicacid-DUP (D-11CLPF)	537.1	2	ng/L	OCWD
4,8-dioxa-3H-perfluorononanoic acid (DUP) (D-ADONA)	537.1	2	ng/L	OCWD
9-chlorohexadecafluoro-3-oxanone1sulfonic acid-DUP (D-9CLPF3)	537.1	2	ng/L	OCWD
Hexafluoropropylene oxide dimer acid (GenX) (DUP) (D-HFPODA)	537.1	2	ng/L	OCWD
N-ethyl perfluorooctanesulfonamidoacetic acid(DUP) (D-EtFOSA)	537.1	2	ng/L	OCWD
N-methyl perfluorooctanesulfonamidoacetic acid-DUP (D-MeFOSA)	537.1	2	ng/L	OCWD
Perfluoro butane sulfonic acid (DUP) (D-PFBS)	537.1	2	ng/L	OCWD
Perfluoro heptanoic acid (DUP) (D-PFHpA)	537.1	2	ng/L	OCWD
Perfluoro hexane sulfonic acid (DUP) (D-PFHxS)	537.1	2	ng/L	OCWD
Perfluoro nonanoic acid (DUP) (D-PFNA)	537.1	2	ng/L	OCWD
Perfluoro octane sulfonic acid (DUP) (D-PFOS)	537.1	2	ng/L	OCWD
Perfluoro octanoic acid (DUP) (D-PFOA)	537.1	2	ng/L	OCWD
Perfluorodecanoic acid (DUP) (D-PFDA)	537.1	2	ng/L	OCWD
Perfluorododecanoic acid (DUP) (D-PFDoA)	537.1	2	ng/L	OCWD
Perfluorohexanoic acid (DUP) (D-PFHxA)	537.1	2	ng/L	OCWD
Perfluorotetradecanoic acid (DUP) (D-PFTA)	537.1	2	ng/L	OCWD
Perfluorotridecanoic acid (DUP) (D-PFTrDA)	537.1	2	ng/L	OCWD
Perfluoroundecanoic acid (DUP) (D-PFUnA)	537.1	2	ng/L	OCWD

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Constituent Type: ORGANIC FRB

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
11-chloroeicosafluoro3oxaundecane1sulfonicacid-FRB (B-11CLPF)	537.1	2	ng/L	OCWD
4,8-dioxa-3H-perfluorononanoic acid (FRB) (B-ADONA)	537.1	2	ng/L	OCWD
9-chlorohexadecafluoro-3-oxanone1sulfonic acid-FRB (B-9CLPF3)	537.1	2	ng/L	OCWD
Hexafluoropropylene oxide dimer acid (GenX) (FRB) (B-HFPODA)	537.1	2	ng/L	OCWD
N-ethyl perfluorooctanesulfonamidoacetic acid(FRB) (B-EtFOSA)	537.1	2	ng/L	OCWD
N-methyl perfluorooctanesulfonamidoacetic acid-FRB (B-MeFOSA)	537.1	2	ng/L	OCWD
Perfluoro butane sulfonic acid (FRB) (B-PFBS)	537.1	2	ng/L	OCWD
Perfluoro heptanoic acid (FRB) (B-PFHpA)	537.1	2	ng/L	OCWD
Perfluoro hexane sulfonic acid (FRB) (B-PFHxS)	537.1	2	ng/L	OCWD
Perfluoro nonanoic acid (FRB) (B-PFNA)	537.1	2	ng/L	OCWD
Perfluoro octane sulfonic acid (FRB) (B-PFOS)	537.1	2	ng/L	OCWD
Perfluoro octanoic acid (FRB) (B-PFOA)	537.1	2	ng/L	OCWD
Perfluorodecanoic acid (FRB) (B-PFDA)	537.1	2	ng/L	OCWD
Perfluorododecanoic acid (FRB) (B-PFDoA)	537.1	2	ng/L	OCWD
Perfluorohexanoic acid (FRB) (B-PFHxA)	537.1	2	ng/L	OCWD
Perfluorotetradecanoic acid (FRB) (B-PFTA)	537.1	2	ng/L	OCWD
Perfluorotridecanoic acid (FRB) (B-PFTrDA)	537.1	2	ng/L	OCWD
Perfluoroundecanoic acid (FRB) (B-PFUnA)	537.1	2	ng/L	OCWD
PFOA + PFOS (FRB) (B-PFOAOS)	UNKWQAN	2	ng/L	OCWD

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Constituent Type: RADIOLOGICALS

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Gross Alpha Excluding Uranium (TOTa-U)	CALC	1.21	pCi/L	FGL
Gross Alpha Excluding Uranium (TOTa-U)	UNKWQAN	1.1 - 2.61	pCi/L	FGL
Natural Uranium (NTUr)	X200.8	0.67	pCi/L	FGL
Radium 226 + Radium 228 (Ra6Ra8)	CALC	0.732	pCi/L	FGL
Radium 226 + Radium 228 (Ra6Ra8)	UNKWQAN	0.624 - 0.737	pCi/L	FGL
Radium 226 + Radium 228 Counting Error (Ra68CE)	CALC	0.732	pCi/L	FGL
Radium 226 + Radium 228 Counting Error (Ra68CE)	UNKWQAN	0.624 - 0.737	pCi/L	FGL
Total Alpha (TOTa)	7110C	1.1 - 2.61	pCi/L	FGL
Total Alpha (TOTa)	900.0	1.51	pCi/L	FGL
Total Alpha Counting Error (TOTaCE)	7110C	1.1 - 2.61	pCi/L	FGL
Total Alpha Counting Error (TOTaCE)	900.0	1.51	pCi/L	FGL
Total Beta (TOTb)	900.0	1.04 - 4.99	pCi/L	FGL
Total Beta Counting Error (TOTbCE)	900.0	1.04 - 4.99	pCi/L	FGL
Total Radium 226 (TRa226)	903.0	0.41 - 0.737	pCi/L	FGL
Total Radium 226 Counting Error (TRa6CE)	903.0	0.41 - 0.737	pCi/L	FGL
Total Radium 228 (TRa228)	RA-05	0.624 - 0.643	pCi/L	FGL
Total Radium 228 Counting Error (TRa8CE)	RA-05	0.624 - 0.643	pCi/L	FGL
Total Strontium-90 (TS90)	905.0	0.546	pCi/L	FGL
Total Strontium-90 (TS90)	905.0	0.08 - 0.36	pCi/L	DAVI
Total Strontium-90 (TS90)	905.0MOD	0.529 - 1.454	pCi/L	EBER
Total Strontium-90 Counting Error (TS90CE)	905.0	0.546	pCi/L	FGL
Total Strontium-90 Counting Error (TS90CE)	905.0	0.08 - 0.36	pCi/L	DAVI
Total Strontium-90 Counting Error (TS90CE)	905.0MOD	0.529 - 1.454	pCi/L	EBER
Total Tritium (TTr)	906.0	434	pCi/L	FGL

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Constituent Type: RADIOLOGICALS

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Total Tritium Counting Error (TTrCE)	906.0	434	pCi/L	FGL

Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
1-Naphthol (NPTHOL)	531.2	5	ug/L	OCWD
2,4,5-T (245T)	515.4	0.2	ug/L	WECKLAB
2,4,5-TP (Silvex) (245TP)	515.4	0.2	ug/L	WECKLAB
2,4,6-Trinitrotoluene (246TNT)	8330A	0.11 - 0.12	ug/L	EURDENVR
2,4-DB (24DB)	515.4	2	ug/L	WECKLAB
2,4-Dichlorophenoxyacetic Acid (24D)	515.4	0.4	ug/L	WECKLAB
3,5-Dichlorobenzoic Acid (35DBA)	515.4	1	ug/L	WECKLAB
3-Hydroxycarbofuran (HYDCFR)	531.2	2	ug/L	OCWD
4,4'-DDD (DDD)	508.1	0.01	ug/L	WECKLAB
4,4'-DDD (DDD)	525.2	0.1	ug/L	OCWD
4,4'-DDD (DDD)	8081A	0.0098	ug/L	EURFCLLC
4,4'-DDD (DDD)	8081A	0.0097	ug/L	EURFCALT
4,4'-DDD (DDD)	8081A_LL	0.0096	ug/L	EURFCALT
4,4'-DDE (DDE)	508.1	0.01	ug/L	WECKLAB
4,4'-DDE (DDE)	525.2	0.1	ug/L	OCWD
4,4'-DDE (DDE)	8081A	0.0039	ug/L	EURFCLLC
4,4'-DDE (DDE)	8081A	0.0049	ug/L	EURFCALT
4,4'-DDE (DDE)	8081A_LL	0.0048	ug/L	EURFCALT
4,4'-DDT (DDT)	508.1	0.01	ug/L	WECKLAB
4,4'-DDT (DDT)	525.2	0.1	ug/L	OCWD

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Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
4,4'-DDT (DDT)	8081A	0.0098	ug/L	EURFCLLC
4,4'-DDT (DDT)	8081A	0.0049	ug/L	EURFCALT
4,4'-DDT (DDT)	8081A_LL	0.0048	ug/L	EURFCALT
Acenaphthene (ACNAPE)	525.2	0.1	ug/L	OCWD
Acenaphthene (ACNAPE)	625.1	9.5 - 10	ug/L	EURFCALT
Acenaphthene (ACNAPE)	625.1	9.6 - 10	ug/L	EURFCLLC
Acenaphthene (ACNAPE)	8270C	1	ug/L	WECKLAB
Acenaphthylene (ACENAP)	525.2	0.1	ug/L	OCWD
Acenaphthylene (ACENAP)	625.1	9.6 - 10	ug/L	EURFCLLC
Acenaphthylene (ACENAP)	625.1	9.5 - 10	ug/L	EURFCALT
Acenaphthylene (ACENAP)	8270C	1	ug/L	WECKLAB
Acetaminophen (ACTMNP)	CEC	5 - 100	ng/L	OCWD
Acetochlor (ACETOC)	525.2	0.1	ug/L	OCWD
Acifluorfen (ACIFEN)	515.4	0.4	ug/L	WECKLAB
Alachlor (ALACHL)	525.2	0.1	ug/L	OCWD
Aldicarb (ALDI)	531.2	1	ug/L	OCWD
Aldicarb sulfone (ALDISN)	531.2	2	ug/L	OCWD
Aldicarb sulfoxide (ALDISX)	531.2	2	ug/L	OCWD
Aldrin (ALDRIN)	508.1	0.01	ug/L	WECKLAB
Aldrin (ALDRIN)	525.2	0.1	ug/L	OCWD
Aldrin (ALDRIN)	8081A	0.0098	ug/L	EURFCLLC
Aldrin (ALDRIN)	8081A	0.0049	ug/L	EURFCALT
Aldrin (ALDRIN)	8081A_LL	0.0048	ug/L	EURFCALT
Ametryn (AMERYN)	525.2	0.1	ug/L	OCWD
Anthracene (ANTHRA)	525.2	0.1	ug/L	OCWD
Anthracene (ANTHRA)	625.1	9.6 - 10	ug/L	EURFCLLC

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Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Anthracene (ANTHRA)	625.1	9.5 - 10	ug/L	EURFCALT
Anthracene (ANTHRA)	8270C	1	ug/L	WECKLAB
Atrazine (ATRAZ)	525.2	0.1	ug/L	OCWD
Atrazine (ATRAZ)	CEC	0.001	ug/L	OCWD
Azithromycin (AZTMCN)	CEC	10 - 50	ng/L	OCWD
Baygon (BAYGON)	531.2	1	ug/L	OCWD
Bentazon (BENTAZ)	515.4	2	ug/L	WECKLAB
Benzo(a)anthracene (BaANTH)	525.2	0.1	ug/L	OCWD
Benzo(a)anthracene (BaANTH)	625.1	9.6 - 10	ug/L	EURFCLLC
Benzo(a)anthracene (BaANTH)	625.1	9.5 - 10	ug/L	EURFCALT
Benzo(a)anthracene (BaANTH)	8270C	1	ug/L	WECKLAB
Benzo(a)pyrene (BaPYRE)	525.2	0.1	ug/L	OCWD
Benzo(a)pyrene (BaPYRE)	625.1	9.6 - 10	ug/L	EURFCLLC
Benzo(a)pyrene (BaPYRE)	625.1	9.5 - 10	ug/L	EURFCALT
Benzo(a)pyrene (BaPYRE)	8270C	1	ug/L	WECKLAB
Benzo(b)fluoranthene (BbFLUR)	525.2	0.1	ug/L	OCWD
Benzo(b)fluoranthene (BbFLUR)	625.1	9.6 - 10	ug/L	EURFCLLC
Benzo(b)fluoranthene (BbFLUR)	625.1	9.5 - 10	ug/L	EURFCALT
Benzo(b)fluoranthene (BbFLUR)	8270C	1	ug/L	WECKLAB
Benzo(g,h,i)perylene (BghiPR)	525.2	0.1	ug/L	OCWD
Benzo(g,h,i)perylene (BghiPR)	625.1	9.6 - 10	ug/L	EURFCLLC
Benzo(g,h,i)perylene (BghiPR)	625.1	9.5 - 10	ug/L	EURFCALT
Benzo(g,h,i)perylene (BghiPR)	8270C	2	ug/L	WECKLAB
Benzo[k]fluoranthene (BkFLUR)	525.2	0.1	ug/L	OCWD
Benzo[k]fluoranthene (BkFLUR)	625.1	9.6 - 10	ug/L	EURFCLLC
Benzo[k]fluoranthene (BkFLUR)	625.1	9.5 - 10	ug/L	EURFCALT
Benzo[k]fluoranthene (BkFLUR)	8270C	1	ug/L	WECKLAB

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ORANGE COUNTY WATER DISTRICT
Water Quality Constituents With Laboratory Methods

Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
bis (2-ethylhexyl) adipate (DEHA)	525.2	2	ug/L	OCWD
bis (2-ethylhexyl) phthalate (DEHP)	525.2	2	ug/L	OCWD
bis (2-ethylhexyl) phthalate (DEHP)	625.1	9.6 - 10	ug/L	EURFCLLC
bis (2-ethylhexyl) phthalate (DEHP)	625.1	9.5 - 10	ug/L	EURFCALT
bis (2-ethylhexyl) phthalate (DEHP)	8270C	5	ug/L	WECKLAB
Bromacil (BROMAC)	525.2	0.1	ug/L	OCWD
Butachlor (BUTACL)	525.2	0.1	ug/L	OCWD
Butanal (BUTAN)	556	2	ug/L	WECKLAB
Butylate (BTYATE)	525.2	0.1	ug/L	OCWD
Butylbenzyl phthalate (BBP)	525.2	2	ug/L	OCWD
Butylbenzyl phthalate (BBP)	625.1	9.6 - 10	ug/L	EURFCLLC
Butylbenzyl phthalate (BBP)	625.1	9.5 - 10	ug/L	EURFCALT
Butylbenzyl phthalate (BBP)	8270C	1	ug/L	WECKLAB
Caffeine (CAFFEI)	525.2	100	ng/L	OCWD
Caffeine (CAFFEI)	CEC	3 - 30	ng/L	OCWD
Captan (CAPTAN)	525.2	0.1	ug/L	OCWD
Carbamazepine (CBMAZP)	CEC	1	ng/L	OCWD
Carbaryl (CARBAR)	531.2	2	ug/L	OCWD
Carbofuran (CARBOF)	531.2	1	ug/L	OCWD
Chlordane (ClDANE)	508.1	0.1	ug/L	WECKLAB
Chlordane (ClDANE)	8081A	0.02	ug/L	EURFCLLC
Chlordane (ClDANE)	8081A	0.049	ug/L	EURFCALT
Chlordane (ClDANE)	8081A_LL	0.048	ug/L	EURFCALT
Chlordane-alpha (CLDA)	525.2	0.1	ug/L	OCWD
Chlordane-alpha (CLDA)	8081A	0.0039	ug/L	EURFCLLC

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Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Chlordane-alpha (CLDA)	8081A	0.0049	ug/L	EURFCALT
Chlordane-alpha (CLDA)	8081A_LL	0.0048	ug/L	EURFCALT
Chlordane-gamma (CLDG)	525.2	0.1	ug/L	OCWD
Chlordane-gamma (CLDG)	8081A	0.0098	ug/L	EURFCLLC
Chlordane-gamma (CLDG)	8081A	0.015	ug/L	EURFCALT
Chlordane-gamma (CLDG)	8081A_LL	0.014	ug/L	EURFCALT
Chlorobenzilate (CLBZLA)	525.2	0.1	ug/L	OCWD
Chloroneb (CLNEB)	525.2	0.1	ug/L	OCWD
Chlorothalonil (CLTNIL)	508.1	0.05	ug/L	WECKLAB
Chlorothalonil (CLTNIL)	525.2	0.1	ug/L	OCWD
Chlorpropham (CPRPHM)	525.2	0.1	ug/L	OCWD
Chlorpyrifos (ClPYRI)	525.2	0.1	ug/L	OCWD
Chrysene (CHRYS)	525.2	0.1	ug/L	OCWD
Chrysene (CHRYS)	625.1	9.6 - 10	ug/L	EURFCLLC
Chrysene (CHRYS)	625.1	9.5 - 10	ug/L	EURFCALT
Chrysene (CHRYS)	8270C	1	ug/L	WECKLAB
Dalapon (DALAPN)	515.4	0.4	ug/L	WECKLAB
Dalapon (DALAPN)	552.2	1	ug/L	OCWD
DCPA-Dacthal (DCPA)	515.4	0.1	ug/L	WECKLAB
DCPA-Dacthal (DCPA)	525.2	0.1	ug/L	OCWD
Diazinon (DIAZI)	525.2	0.1	ug/L	OCWD
Dibenzo(a,h)anthracene (DBahAN)	525.2	0.1	ug/L	OCWD
Dibenzo(a,h)anthracene (DBahAN)	625.1	9.5 - 10	ug/L	EURFCALT
Dibenzo(a,h)anthracene (DBahAN)	625.1	9.6 - 10	ug/L	EURFCLLC
Dibenzo(a,h)anthracene (DBahAN)	8270C	2	ug/L	WECKLAB
Dicamba (DICAMB)	515.4	0.6	ug/L	WECKLAB

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Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Dichlorprop (24DP)	515.4	0.3	ug/L	WECKLAB
Dichlorvos (DCLVOS)	525.2	0.1	ug/L	OCWD
Dieldrin (DIELDR)	508.1	0.01	ug/L	WECKLAB
Dieldrin (DIELDR)	525.2	0.1	ug/L	OCWD
Dieldrin (DIELDR)	8081A	0.0098	ug/L	EURFCLLC
Dieldrin (DIELDR)	8081A	0.0049	ug/L	EURFCALT
Dieldrin (DIELDR)	8081A_LL	0.0048	ug/L	EURFCALT
Diethyl phthalate (DEP)	525.2	2	ug/L	OCWD
Diethyl phthalate (DEP)	625.1	9.5 - 10	ug/L	EURFCALT
Diethyl phthalate (DEP)	625.1	9.6 - 10	ug/L	EURFCLLC
Diethyl phthalate (DEP)	8270C	1	ug/L	WECKLAB
Diethylene Glycol (DEGLYCOL)	8015D	10,000	ug/L	EUROFBUF
Dimethoate (DMTH)	525.2	1	ug/L	OCWD
Dimethyl phthalate (DMP)	525.2	2	ug/L	OCWD
Dimethyl phthalate (DMP)	625.1	9.6 - 10	ug/L	EURFCLLC
Dimethyl phthalate (DMP)	625.1	9.5 - 10	ug/L	EURFCALT
Dimethyl phthalate (DMP)	8270C	1	ug/L	WECKLAB
Di-n-butylphthalate (DnBP)	525.2	2	ug/L	OCWD
Di-n-butylphthalate (DnBP)	625.1	9.6 - 10	ug/L	EURFCLLC
Di-n-butylphthalate (DnBP)	625.1	9.5 - 10	ug/L	EURFCALT
Di-n-butylphthalate (DnBP)	8270C	1	ug/L	WECKLAB
Di-n-octyl phthalate (DnOP)	525.2	2	ug/L	OCWD
Di-n-octyl phthalate (DnOP)	625.1	9.5 - 10	ug/L	EURFCALT
Di-n-octyl phthalate (DnOP)	625.1	9.7 - 24	ug/L	EURFCLLC
Di-n-octyl phthalate (DnOP)	8270C	1	ug/L	WECKLAB
Dinoseb (DINOSB)	515.4	0.4	ug/L	WECKLAB

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Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Diphenamid (DPHNMD)	525.2	0.1	ug/L	OCWD
Diquat (DIQUAT)	549.2	4	ug/L	OCWD
Diuron (DIURON)	CEC	0.005	ug/L	OCWD
Endosulfan I (ENDOI)	508.1	0.01	ug/L	WECKLAB
Endosulfan I (ENDOI)	525.2	0.1	ug/L	OCWD
Endosulfan I (ENDOI)	8081A	0.0098	ug/L	EURFCLLC
Endosulfan I (ENDOI)	8081A	0.0019	ug/L	EURFCALT
Endosulfan I (ENDOI)	8081A_LL	0.0019	ug/L	EURFCALT
Endosulfan sulfate (ENDOSL)	508.1	0.01	ug/L	WECKLAB
Endosulfan sulfate (ENDOSL)	525.2	0.1	ug/L	OCWD
Endosulfan sulfate (ENDOSL)	8081A	0.0049	ug/L	EURFCALT
Endosulfan sulfate (ENDOSL)	8081A	0.0098	ug/L	EURFCLLC
Endosulfan sulfate (ENDOSL)	8081A_LL	0.0048	ug/L	EURFCALT
Endothall (ENDOTL)	548.1	45	ug/L	WECKLAB
Endrin (ENDRIN)	508.1	0.01	ug/L	WECKLAB
Endrin (ENDRIN)	525.2	0.1	ug/L	OCWD
Endrin (ENDRIN)	8081A	0.0039	ug/L	EURFCLLC
Endrin (ENDRIN)	8081A	0.0049	ug/L	EURFCALT
Endrin (ENDRIN)	8081A_LL	0.0048	ug/L	EURFCALT
Endrin Aldehyde (ENDR-A)	508.1	0.01	ug/L	WECKLAB
Endrin Aldehyde (ENDR-A)	525.2	0.1	ug/L	OCWD
Endrin Aldehyde (ENDR-A)	8081A	0.02	ug/L	EURFCLLC
Endrin Aldehyde (ENDR-A)	8081A	0.049	ug/L	EURFCALT
Endrin Aldehyde (ENDR-A)	8081A_LL	0.048	ug/L	EURFCALT
Endrin Ketone (ENDR-K)	8081A	0.0049	ug/L	EURFCALT
Endrin Ketone (ENDR-K)	8081A	0.0098	ug/L	EURFCLLC
Endrin Ketone (ENDR-K)	8081A_LL	0.0048	ug/L	EURFCALT

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Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
EPTC (EPTC)	525.2	0.1	ug/L	OCWD
Erythromycin (ERYTHN)	CEC	1	ng/L	OCWD
Ethion (ETHION)	525.2	0.1	ug/L	OCWD
Ethoprop (ETHPRP)	525.2	0.1	ug/L	OCWD
Ethylene Glycol (GLYCOL)	8015B	10,000	ug/L	WECKLAB
Ethylene Glycol (GLYCOL)	8015D	10,000	ug/L	EUROFBUF
Etridiazole (ETRDZL)	525.2	0.1	ug/L	OCWD
Fluoranthene (FLANTH)	525.2	0.1	ug/L	OCWD
Fluoranthene (FLANTH)	625.1	9.6 - 10	ug/L	EURFCLLC
Fluoranthene (FLANTH)	625.1	9.5 - 10	ug/L	EURFCALT
Fluoranthene (FLANTH)	8270C	1	ug/L	WECKLAB
Fluorene (FLUOR)	525.2	0.1	ug/L	OCWD
Fluorene (FLUOR)	625.1	9.6 - 10	ug/L	EURFCLLC
Fluorene (FLUOR)	625.1	9.5 - 10	ug/L	EURFCALT
Fluorene (FLUOR)	8270C	1	ug/L	WECKLAB
Gemfibrozil (GMFIBZ)	CEC	1	ng/L	OCWD
Glyphosate (GLYPHO)	547	25	ug/L	OCWD
HCH-gamma (Lindane) (LINDNE)	508.1	0.01	ug/L	WECKLAB
HCH-gamma (Lindane) (LINDNE)	525.2	0.1	ug/L	OCWD
HCH-gamma (Lindane) (LINDNE)	8081A	0.0039	ug/L	EURFCLLC
HCH-gamma (Lindane) (LINDNE)	8081A	0.0019	ug/L	EURFCALT
HCH-gamma (Lindane) (LINDNE)	8081A_LL	0.0019	ug/L	EURFCALT
Heptachlor (HEPTA)	508.1	0.01	ug/L	WECKLAB
Heptachlor (HEPTA)	525.2	0.1	ug/L	OCWD
Heptachlor (HEPTA)	8081A	0.0019	ug/L	EURFCALT
Heptachlor (HEPTA)	8081A	0.0039	ug/L	EURFCLLC

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ORANGE COUNTY WATER DISTRICT
Water Quality Constituents With Laboratory Methods

Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Heptachlor (HEPTA)	8081A_LL	0.0019	ug/L	EURFCALT
Heptachlor epoxide (HEPEPX)	508.1	0.01	ug/L	WECKLAB
Heptachlor epoxide (HEPEPX)	525.2	0.1	ug/L	OCWD
Heptachlor epoxide (HEPEPX)	8081A	0.0039	ug/L	EURFCLLC
Heptachlor epoxide (HEPEPX)	8081A	0.0097	ug/L	EURFCALT
Heptachlor epoxide (HEPEPX)	8081A_LL	0.0096	ug/L	EURFCALT
Hexachlorobenzene (HEXCLB)	508.1	0.05	ug/L	WECKLAB
Hexachlorobenzene (HEXCLB)	525.2	0.1	ug/L	OCWD
Hexachlorobenzene (HEXCLB)	625.1	9.6 - 10	ug/L	EURFCLLC
Hexachlorobenzene (HEXCLB)	625.1	9.5 - 10	ug/L	EURFCALT
Hexachlorobenzene (HEXCLB)	8270C	1	ug/L	WECKLAB
Hexachlorocyclopentadiene (HClCPD)	508.1	0.05	ug/L	WECKLAB
Hexachlorocyclopentadiene (HClCPD)	525.2	0.1	ug/L	OCWD
Hexachlorocyclopentadiene (HClCPD)	625.1	24 - 26	ug/L	EURFCLLC
Hexachlorocyclopentadiene (HClCPD)	625.1	24 - 25	ug/L	EURFCALT
Hexachlorocyclopentadiene (HClCPD)	8270C	5	ug/L	WECKLAB
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	8330A	0.21 - 0.22	ug/L	EURDENVR
Hexazinone (HEXZON)	525.2	0.1	ug/L	OCWD
Ibuprofen (IBPRFN)	CEC	1	ng/L	OCWD
Indeno(1,2,3-cd)pyrene (INDPYR)	525.2	0.1	ug/L	OCWD
Indeno(1,2,3-cd)pyrene (INDPYR)	625.1	9.6 - 10	ug/L	EURFCLLC
Indeno(1,2,3-cd)pyrene (INDPYR)	625.1	9.5 - 10	ug/L	EURFCALT
Indeno(1,2,3-cd)pyrene (INDPYR)	8270C	2	ug/L	WECKLAB
Malathion (MALATH)	525.2	2	ug/L	OCWD
Methiocarb (MTHCRB)	531.2	4	ug/L	OCWD
Methomyl (MTHOMY)	531.2	1	ug/L	OCWD

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Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Methoxychlor (METHOX)	508.1	0.01	ug/L	WECKLAB
Methoxychlor (METHOX)	525.2	0.1	ug/L	OCWD
Methoxychlor (METHOX)	8081A	0.0097	ug/L	EURFCALT
Methoxychlor (METHOX)	8081A	0.0098	ug/L	EURFCLLC
Methoxychlor (METHOX)	8081A_LL	0.0096	ug/L	EURFCALT
methyl-Parathion (MPARA)	525.2	0.5	ug/L	OCWD
Metribuzin (MTRBZN)	525.2	0.1	ug/L	OCWD
Molinate (MOLINT)	525.2	0.1	ug/L	OCWD
N,N-diethyl-m-toluamide (DEET)	1694MESI	4	ng/L	WECKLAB
N,N-diethyl-m-toluamide (DEET)	CEC	1 - 10	ng/L	OCWD
N,N-diethyl-m-toluamide (DEET)	LC-MS-MS	10	ng/L	EUROFINS
Norflurazon (NORFLR)	525.2	0.1 - 1.0	ug/L	OCWD
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	8330A	0.21 - 0.22	ug/L	EURDENVR
Oxamyl (OXAMYL)	531.2	2	ug/L	OCWD
Oxybenzone (BP3)	1694MESI	4	ng/L	WECKLAB
Oxybenzone (BP3)	CEC	1	ng/L	OCWD
Oxybenzone (BP3)	LC-MS-MS	30	ng/L	EUROFINS
Paraquat (PARAQT)	549.2	4	ug/L	OCWD
Parathion (PARA)	525.2	0.5	ug/L	OCWD
Pentachlorophenol (PCP) (PCP)	515.4	0.2	ug/L	WECKLAB
Pentachlorophenol (PCP) (PCP)	525.2	1	ug/L	OCWD
Pentachlorophenol (PCP) (PCP)	625.1	9.7 - 24	ug/L	EURFCLLC
Pentachlorophenol (PCP) (PCP)	625.1	9.5 - 10	ug/L	EURFCALT
Pentachlorophenol (PCP) (PCP)	8270C	1	ug/L	WECKLAB
Pentachlorophenol (PCP) (PCP)	CEC	0.2	ug/L	OCWD

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Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Pentanal (PENTNL)	556	2	ug/L	WECKLAB
Permethrin-(total of cis/trans) (PMTHRN)	525.2	0.1	ug/L	OCWD
Phenanthrene (PHENAN)	525.2	0.1	ug/L	OCWD
Phenanthrene (PHENAN)	625.1	9.5 - 10	ug/L	EURFCALT
Phenanthrene (PHENAN)	625.1	9.6 - 10	ug/L	EURFCLLC
Phenanthrene (PHENAN)	8270C	1	ug/L	WECKLAB
Picloram (PICLOR)	515.4	0.6	ug/L	WECKLAB
Primidone (PRIMDN)	CEC	1	ng/L	OCWD
Prometryn (PROMET)	525.2	0.1	ug/L	OCWD
Pronamide (PROAMD)	525.2	0.1	ug/L	OCWD
Propachlor (PROPCL)	508.1	0.05	ug/L	WECKLAB
Propachlor (PROPCL)	525.2	0.1	ug/L	OCWD
Propanal (PROPNL)	556	2	ug/L	WECKLAB
Propazine (PROPAZ)	525.2	0.1	ug/L	OCWD
Propylene Glycol (PRGLYCOL)	8015D	10,000	ug/L	EUROFBUF
Pyrene (PYRENE)	525.2	0.1	ug/L	OCWD
Pyrene (PYRENE)	625.1	9.6 - 10	ug/L	EURFCLLC
Pyrene (PYRENE)	625.1	9.5 - 10	ug/L	EURFCALT
Pyrene (PYRENE)	8270C	1	ug/L	WECKLAB
Simazine (SIMAZ)	525.2	0.1	ug/L	OCWD
Simazine (SIMAZ)	CEC	0.005	ug/L	OCWD
Sulfamethoxazole (SULTHZ)	CEC	1 - 10	ng/L	OCWD
Tebuthiuron (TBTURN)	525.2	2	ug/L	OCWD
Terbacil (TRBACL)	525.2	0.1	ug/L	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratory; EBER: Eberline Analytical; EURDENVR: Eurofins TestAmerica, Denver; EURFCALT: Eurofins CalScience Tustin; EURFCLLC: Eurofins CalScience Lincoln; EUROFBUF: Eurofins Buffalo; EUROFCEI: Eurofins CEI; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins Sacramento; FGL: Fruit Growers Laboratory; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; TRUSSELL: Trussell Technologies; WECKLAB: Weck Laboratories

Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Thiobencarb (THIO)	525.2	0.1	ug/L	OCWD
Toxaphene Mixture (TOXA)	508.1	1	ug/L	WECKLAB
Toxaphene Mixture (TOXA)	8081A	0.059	ug/L	EURFCLLC
Toxaphene Mixture (TOXA)	8081A	0.097	ug/L	EURFCALT
Toxaphene Mixture (TOXA)	8081A_LL	0.096	ug/L	EURFCALT
Triclosan (TRICLN)	CEC	1	ng/L	OCWD
Trifluralin (TRFLRN)	508.1	0.01	ug/L	WECKLAB
Trifluralin (TRFLRN)	525.2	0.1	ug/L	OCWD
Trithion (TRTION)	525.2	0.1	ug/L	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratory; EBER: Eberline Analytical; EURDENVR: Eurofins TestAmerica, Denver; EURFCALT: Eurofins CalScience Tustin; EURFCLLC: Eurofins CalScience Lincoln; EUROFBUF: Eurofins Buffalo; EUROFCEI: Eurofins CEI; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins Sacramento; FGL: Fruit Growers Laboratory; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; TRUSSELL: Trussell Technologies; WECKLAB: Weck Laboratories

Appendix D

Pathogenic Microorganism Reduction Reports

Orange County Water District
Groundwater Replenishment System
2022 Annual Report

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

Date	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
							MFE		ROP		
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	NTU		NTU		TOC
	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
01/01/22	12.24	12.24	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/02/22	12.27	12.27	12.26	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/03/22	12.31	12.31	12.27	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/04/22	12.28	12.28	12.26	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/05/22	12.28	12.28	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/06/22	12.28	12.28	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/07/22	12.35	12.35	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/08/22	12.34	12.34	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/09/22	12.36	12.36	12.27	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/10/22	12.28	12.28	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/11/22	12.20	12.20	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/12/22	12.28	12.28	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/13/22	12.21	12.21	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/14/22	12.24	12.24	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/15/22	12.29	12.29	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/16/22	12.32	12.32	12.28	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/17/22	12.30	12.30	12.28	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/18/22	12.26	12.26	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/19/22	12.25	12.25	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/20/22	12.29	12.29	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/21/22	12.30	12.30	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/22/22	12.30	12.30	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/23/22	12.33	12.33	12.29	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/24/22	12.31	12.31	12.28	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/25/22	12.22	12.22	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/26/22	12.23	12.23	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/27/22	12.22	12.22	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/28/22	12.25	12.25	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/29/22	12.11	12.11	12.07	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/30/22	12.28	12.28	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/31/22	12.28	12.28	12.27	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
01/01/22	0.00	4.00	2.23	6.00	0.00	12.24
01/02/22	0.00	4.01	2.26	6.00	0.00	12.27
01/03/22	0.00	4.04	2.27	6.00	0.00	12.31
01/04/22	0.00	4.03	2.26	6.00	0.00	12.28
01/05/22	0.00	4.05	2.24	6.00	0.00	12.28
01/06/22	0.00	4.05	2.24	6.00	0.00	12.28
01/07/22	0.00	4.11	2.24	6.00	0.00	12.35
01/08/22	0.00	4.11	2.23	6.00	0.00	12.34
01/09/22	0.00	4.09	2.27	6.00	0.00	12.36
01/10/22	0.00	4.09	2.19	6.00	0.00	12.28
01/11/22	0.00	4.07	2.14	6.00	0.00	12.20
01/12/22	0.00	4.08	2.20	6.00	0.00	12.28
01/13/22	0.00	4.06	2.14	6.00	0.00	12.21
01/14/22	0.00	4.04	2.20	6.00	0.00	12.24
01/15/22	0.00	4.04	2.25	6.00	0.00	12.29
01/16/22	0.00	4.04	2.28	6.00	0.00	12.32
01/17/22	0.00	4.02	2.28	6.00	0.00	12.30
01/18/22	0.00	4.04	2.22	6.00	0.00	12.26
01/19/22	0.00	4.04	2.22	6.00	0.00	12.25
01/20/22	0.00	4.07	2.22	6.00	0.00	12.29
01/21/22	0.00	4.08	2.22	6.00	0.00	12.30
01/22/22	0.00	4.05	2.24	6.00	0.00	12.30
01/23/22	0.00	4.05	2.29	6.00	0.00	12.33
01/24/22	0.00	4.04	2.28	6.00	0.00	12.31
01/25/22	0.00	4.01	2.21	6.00	0.00	12.22
01/26/22	0.00	4.02	2.21	6.00	0.00	12.23
01/27/22	0.00	4.01	2.21	6.00	0.00	12.22
01/28/22	0.00	4.01	2.24	6.00	0.00	12.25
01/29/22	0.00	4.03	2.07	6.00	0.00	12.11
01/30/22	0.00	4.03	2.25	6.00	0.00	12.28
01/31/22	0.00	4.01	2.27	6.00	0.00	12.28

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
	LRV	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
01/01/22	0.00	0.00	2.23	6.00	4.00	12.23
01/02/22	0.00	0.00	2.26	6.00	4.00	12.26
01/03/22	0.00	0.00	2.27	6.00	4.00	12.27
01/04/22	0.00	0.00	2.26	6.00	4.00	12.26
01/05/22	0.00	0.00	2.24	6.00	4.00	12.24
01/06/22	0.00	0.00	2.24	6.00	4.00	12.24
01/07/22	0.00	0.00	2.24	6.00	4.00	12.24
01/08/22	0.00	0.00	2.23	6.00	4.00	12.23
01/09/22	0.00	0.00	2.27	6.00	4.00	12.27
01/10/22	0.00	0.00	2.19	6.00	4.00	12.19
01/11/22	0.00	0.00	2.14	6.00	4.00	12.14
01/12/22	0.00	0.00	2.20	6.00	4.00	12.20
01/13/22	0.00	0.00	2.14	6.00	4.00	12.14
01/14/22	0.00	0.00	2.20	6.00	4.00	12.20
01/15/22	0.00	0.00	2.25	6.00	4.00	12.25
01/16/22	0.00	0.00	2.28	6.00	4.00	12.28
01/17/22	0.00	0.00	2.28	6.00	4.00	12.28
01/18/22	0.00	0.00	2.22	6.00	4.00	12.22
01/19/22	0.00	0.00	2.22	6.00	4.00	12.22
01/20/22	0.00	0.00	2.22	6.00	4.00	12.22
01/21/22	0.00	0.00	2.22	6.00	4.00	12.22
01/22/22	0.00	0.00	2.24	6.00	4.00	12.24
01/23/22	0.00	0.00	2.29	6.00	4.00	12.29
01/24/22	0.00	0.00	2.28	6.00	4.00	12.28
01/25/22	0.00	0.00	2.21	6.00	4.00	12.21
01/26/22	0.00	0.00	2.21	6.00	4.00	12.21
01/27/22	0.00	0.00	2.21	6.00	4.00	12.21
01/28/22	0.00	0.00	2.24	6.00	4.00	12.24
01/29/22	0.00	0.00	2.07	6.00	4.00	12.07
01/30/22	0.00	0.00	2.25	6.00	4.00	12.25
01/31/22	0.00	0.00	2.27	6.00	4.00	12.27

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

MicroFiltration Process online monitoring results — Log Removal Value

Date	A01 LRV	A02 LRV	A03 LRV	A04 LRV	A05 LRV	A06 LRV	A07 LRV	A08 LRV	B01 LRV	B02 LRV	B03 LRV	B04 LRV	B05 LRV	B06 LRV	B07 LRV	B08 LRV
01/01/22	4.41	4.52	4.31	N/A *	N/A *	4.07	4.39	4.21	5.19	4.85	5.03	4.65	4.14	4.07	4.12	4.70
01/02/22	4.28	4.50	4.25	N/A *	N/A *	4.07	4.36	4.21	5.06	5.16	5.03	4.66	4.09	4.08	4.11	4.75
01/03/22	4.33	4.44	4.30	4.21	N/A *	4.12	4.34	4.15	5.00	5.17	5.01	4.60	4.07	4.07	4.11	4.70
01/04/22	4.39	4.45	4.21	4.05	N/A *	4.11	4.36	4.16	5.00	5.18	5.00	4.64	4.06	4.06	4.07	4.69
01/05/22	4.38	4.48	4.24	4.39	4.55	4.07	4.29	4.21	5.01	5.18	4.99	4.80	4.05	4.08	4.06	4.77
01/06/22	4.34	4.42	4.24	4.25	4.45	4.18	4.29	4.17	4.99	5.18	5.02	4.81	4.05	4.30	4.18	4.82
01/07/22	4.26	4.34	4.22	4.11	4.28	4.18	4.40	4.17	5.09	5.16	4.97	5.03	4.18	4.27	4.28	4.96
01/08/22	4.30	4.41	4.19	4.11	4.27	4.23	4.41	4.18	5.11	5.12	4.96	5.08	4.23	4.22	4.26	5.00
01/09/22	4.30	4.41	4.19	4.12	4.29	4.22	4.40	4.19	5.15	5.13	4.96	5.06	4.21	4.17	4.22	4.99
01/10/22	4.31	4.38	4.18	4.18	4.28	4.18	4.41	4.17	5.12	5.13	4.96	5.03	4.17	4.15	4.23	5.01
01/11/22	4.25	4.63	4.25	4.13	4.26	4.14	4.35	4.13	5.12	5.12	5.10	5.01	4.17	4.10	4.22	5.01
01/12/22	4.43	4.53	4.26	4.09	4.20	4.09	4.37	4.13	5.14	5.05	5.15	5.00	4.15	4.08	4.18	5.01
01/13/22	4.41	4.50	4.25	4.09	4.26	4.14	4.37	4.10	5.07	5.08	5.19	4.97	4.11	4.08	4.19	5.16
01/14/22	4.34	4.40	4.23	4.04	4.19	4.05	4.38	4.10	5.07	5.13	5.17	4.95	4.12	4.06	4.15	5.21
01/15/22	4.29	4.38	4.14	4.16	4.22	4.10	4.28	4.07	5.04	5.09	5.10	4.97	4.09	4.04	4.13	5.10
01/16/22	4.28	4.45	4.20	4.04	4.22	4.07	4.26	4.22	5.26	5.12	5.11	4.96	4.08	4.05	4.12	5.00
01/17/22	4.29	4.40	4.18	4.20	4.19	4.05	4.31	4.21	5.29	5.07	5.12	4.97	4.04	4.02	4.07	5.08
01/18/22	4.28	4.43	4.14	4.11	4.33	4.28	4.29	4.18	5.28	5.08	5.08	4.90	4.04	4.30	4.08	4.94
01/19/22	4.31	4.36	4.17	4.15	4.33	4.23	4.18	4.16	5.28	5.06	5.08	4.89	4.17	4.28	4.08	4.89
01/20/22	4.30	4.26	4.12	4.14	4.29	4.22	4.35	4.15	5.36	4.98	5.08	4.90	4.25	4.18	4.20	4.95
01/21/22	4.20	4.34	4.14	4.08	4.28	4.13	4.42	4.13	5.35	4.97	5.04	4.88	4.23	4.16	4.28	4.90
01/22/22	4.19	4.31	4.17	4.05	4.20	4.18	4.36	4.06	5.25	5.00	5.05	4.82	4.21	4.15	4.23	4.89
01/23/22	4.18	4.26	4.19	4.06	4.17	4.16	4.35	4.05	5.29	4.93	5.07	4.85	4.15	4.14	4.23	4.91
01/24/22	4.20	4.49	4.23	4.04	4.18	4.15	4.32	4.05	5.31	4.88	5.04	4.81	4.13	4.11	4.22	4.86
01/25/22	4.35	4.41	4.26	4.01	4.10	4.12	4.28	4.07	5.24	4.95	5.01	4.78	4.09	4.07	4.20	4.78
01/26/22	4.30	4.53	4.15	4.35	4.15	4.06	4.33	4.13	5.28	4.91	5.01	4.73	4.05	4.04	4.16	4.85
01/27/22	4.28	4.46	4.19	4.30	4.13	4.05	4.29	4.11	5.22	4.89	5.00	4.66	4.07	4.01	4.13	4.97
01/28/22	4.30	4.30	4.17	4.20	4.13	4.03	4.27	4.04	5.20	5.15	4.95	4.63	4.03	4.01	4.10	4.94
01/29/22	4.30	4.37	4.11	4.15	4.12	4.04	4.24	4.03	5.19	5.17	4.93	4.63	4.05	4.08	4.11	4.85
01/30/22	4.29	4.30	4.09	4.15	4.31	4.05	4.23	4.03	5.16	5.13	4.91	4.96	4.04	4.03	4.10	4.75
01/31/22	4.27	4.33	4.09	4.12	4.31	4.26	4.22	4.02	5.26	5.09	4.96	5.07	4.01	4.28	4.10	4.85

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell offline for maintenance

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
01/01/22	4.88	4.75	4.82	4.43	5.01	5.01	4.92	5.19	4.22	4.00	4.06	4.11	4.39	4.23	4.33	4.15
01/02/22	4.86	4.73	4.80	4.41	5.03	4.96	4.87	5.11	4.19	4.01	4.02	4.07	4.40	4.24	4.35	4.06
01/03/22	4.87	4.97	4.82	4.65	5.02	4.98	4.85	5.10	4.19	4.09	4.12	4.06	4.41	4.26	4.29	4.08
01/04/22	4.92	5.11	4.75	4.86	5.03	5.01	4.88	5.13	4.17	4.25	4.27	4.06	4.39	4.23	4.25	4.08
01/05/22	4.88	5.16	4.72	4.86	5.05	5.01	4.90	5.13	4.14	4.24	4.13	4.08	4.34	4.21	4.25	4.05
01/06/22	4.85	5.14	4.95	4.83	5.15	5.00	4.99	5.13	4.21	4.21	4.17	4.32	4.33	4.24	4.30	4.20
01/07/22	5.01	5.12	5.03	4.82	5.20	4.97	5.07	5.11	4.30	4.19	4.20	4.31	4.31	4.33	4.27	4.35
01/08/22	5.02	5.07	5.00	4.80	5.18	4.99	5.04	5.03	4.27	4.15	4.16	4.30	4.32	4.36	4.28	4.29
01/09/22	4.99	5.05	4.98	4.76	5.19	5.03	5.02	5.06	4.27	4.15	4.14	4.24	4.33	4.36	4.42	4.28
01/10/22	4.98	5.08	4.95	4.74	5.17	5.11	4.99	5.07	4.23	4.14	4.09	4.19	4.27	4.21	4.41	4.22
01/11/22	4.97	5.07	4.97	4.75	5.15	5.07	4.96	5.09	4.22	4.15	4.07	4.21	4.40	4.26	4.36	4.25
01/12/22	4.95	5.01	4.98	4.72	5.15	5.01	4.96	5.20	4.21	4.14	4.09	4.23	4.46	4.31	4.40	4.20
01/13/22	4.95	4.99	4.98	4.73	5.13	5.04	4.93	5.23	4.19	4.09	4.06	4.15	4.43	4.25	4.33	4.20
01/14/22	4.94	5.03	5.04	4.71	5.14	5.01	4.90	5.19	4.14	4.07	4.04	4.13	4.42	4.22	4.30	4.17
01/15/22	4.91	5.01	4.99	4.82	5.10	5.00	4.87	5.19	4.13	4.04	4.05	4.13	4.33	4.26	4.33	4.11
01/16/22	4.90	5.17	4.88	4.87	5.03	5.01	4.89	5.18	4.14	4.09	4.11	4.10	4.36	4.19	4.32	4.07
01/17/22	4.86	5.22	4.86	4.86	5.04	4.99	4.91	5.20	4.10	4.25	4.24	4.09	4.35	4.18	4.30	4.06
01/18/22	4.86	5.15	4.87	4.85	5.04	4.98	4.98	5.21	4.05	4.25	4.15	4.15	4.27	4.30	4.27	4.27
01/19/22	4.87	5.11	5.01	4.81	5.21	4.97	5.07	4.91	4.14	4.15	4.15	4.30	4.27	4.44	4.20	4.36
01/20/22	4.95	5.08	5.09	4.78	5.29	4.94	5.03	5.00	4.25	4.13	4.13	4.25	4.31	4.39	4.32	4.22
01/21/22	4.99	5.12	5.03	4.75	5.27	4.95	5.03	5.13	4.24	4.13	4.10	4.31	4.28	4.37	4.45	4.22
01/22/22	4.98	5.09	4.97	4.74	5.25	5.07	5.00	5.11	4.21	4.12	4.10	4.28	4.23	4.24	4.37	4.19
01/23/22	5.00	5.07	4.93	4.72	5.18	5.08	5.00	5.11	4.17	4.07	4.05	4.23	4.23	4.20	4.37	4.16
01/24/22	4.97	5.07	4.92	4.71	5.15	5.06	5.01	5.10	4.15	4.05	4.04	4.21	4.32	4.21	4.38	4.15
01/25/22	4.95	5.08	4.90	4.71	5.14	5.02	4.97	5.22	4.12	4.05	4.04	4.17	4.39	4.22	4.34	4.15
01/26/22	4.94	5.02	4.87	4.69	5.14	5.01	4.95	5.16	4.12	4.02	4.03	4.15	4.35	4.21	4.28	4.09
01/27/22	4.91	4.96	4.88	4.66	5.12	5.03	4.94	5.13	4.10	4.01	4.02	4.13	4.37	4.16	4.23	4.03
01/28/22	4.83	4.93	4.80	4.73	5.09	5.00	4.89	5.15	4.07	4.02	4.15	4.07	4.35	4.14	4.16	4.03
01/29/22	4.78	4.98	4.73	4.78	4.98	4.94	4.85	5.14	4.07	4.10	4.21	4.07	4.28	4.12	4.19	4.08
01/30/22	4.79	5.11	4.80	4.77	5.01	5.04	4.83	5.08	4.07	4.17	4.10	4.18	4.27	4.14	4.14	4.05
01/31/22	4.75	5.09	4.83	4.77	5.03	5.00	5.07	5.11	4.08	4.14	4.14	4.36	4.28	4.29	4.12	4.12

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value			
Date	E01 LRV	E02 LRV	E03 LRV	E04 LRV
01/01/22	4.09	4.07	N/A *	4.37
01/02/22	4.09	4.04	N/A *	4.35
01/03/22	4.12	4.04	N/A *	4.40
01/04/22	4.14	4.03	4.32	4.49
01/05/22	4.17	4.18	4.30	4.39
01/06/22	4.12	4.14	4.28	4.43
01/07/22	4.13	4.15	4.32	4.50
01/08/22	4.12	4.19	4.20	4.40
01/09/22	4.09	4.17	N/A *	N/A *
01/10/22	4.12	4.10	N/A *	4.56
01/11/22	4.07	4.11	N/A *	4.49
01/12/22	4.15	4.12	4.18	4.60
01/13/22	4.24	4.10	4.17	4.55
01/14/22	4.20	4.07	4.16	4.51
01/15/22	4.22	4.04	4.15	4.49
01/16/22	4.14	4.10	4.09	4.48
01/17/22	4.18	4.25	4.17	4.56
01/18/22	4.16	4.29	4.19	4.50
01/19/22	4.10	4.23	4.04	4.47
01/20/22	4.10	4.23	4.07	4.58
01/21/22	4.13	4.19	4.09	4.35
01/22/22	4.13	4.10	4.09	4.44
01/23/22	4.14	4.14	4.18	4.62
01/24/22	4.15	4.12	4.11	4.38
01/25/22	4.10	4.06	4.07	4.50
01/26/22	4.13	4.08	4.22	4.49
01/27/22	4.11	4.07	4.15	4.49
01/28/22	4.05	4.03	4.15	4.36
01/29/22	4.05	4.10	4.17	4.43
01/30/22	4.08	4.23	4.11	4.51
01/31/22	4.14	4.15	4.07	4.61

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell offline for maintenance

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

MicroFiltration Process online monitoring results

Effluent Turbidity - NTU

Date	A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		MFE
	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
01/01/22	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.03	0.04	0.12	0.12	0.02	0.03	0.04	0.04	0.04
01/02/22	0.03	0.03	0.02	0.02	0.02	0.04	0.03	0.03	0.03	0.04	0.04	0.04	0.13	0.14	0.02	0.03	0.04	0.05	0.04
01/03/22	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.08	0.14	0.02	0.03	0.05	0.06	0.04
01/04/22	0.03	0.03	0.02	0.04	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.05	0.05	0.02	0.03	0.05	0.05	0.03
01/05/22	0.03	0.03	0.02	0.03	0.02	0.03	0.03	0.05	0.03	0.05	0.03	0.04	0.05	0.06	0.02	0.03	0.05	0.05	0.03
01/06/22	0.03	0.03	0.02	0.03	0.02	0.03	0.03	0.05	0.04	0.06	0.04	0.04	0.04	0.06	0.02	0.03	0.03	0.05	0.03
01/07/22	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.03	0.03
01/08/22	0.03	0.04	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.03	0.04	0.02	0.03	0.02	0.03	0.03
01/09/22	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.03	0.03	0.02	0.03	0.02	0.02	0.03
01/10/22	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.03
01/11/22	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.02	0.05	0.02	0.02	0.03
01/12/22	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.04	0.03	0.04	0.04	0.04	0.03	0.03	0.02	0.04	0.02	0.03	0.03
01/13/22	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.04	0.03	0.04	0.04	0.04	0.03	0.04	0.02	0.02	0.02	0.03	0.03
01/14/22	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.04	0.03	0.04	0.04	0.05	0.03	0.03	0.02	0.02	0.02	0.03	0.03
01/15/22	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.04	0.04	0.04	0.05	0.06	0.03	0.03	0.02	0.03	0.03	0.03	0.03
01/16/22	0.03	0.03	0.02	0.02	0.02	0.08	0.03	0.03	0.03	0.04	0.05	0.06	0.03	0.04	0.02	0.03	0.03	0.03	0.03
01/17/22	0.03	0.03	0.02	0.03	0.02	0.05	0.03	0.04	0.03	0.04	0.07	0.09	0.03	0.04	0.02	0.04	0.03	0.03	0.03
01/18/22	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.03	0.06	0.06	0.11	0.03	0.04	0.02	0.04	0.03	0.03	0.03
01/19/22	0.03	0.03	0.02	0.03	0.02	0.03	0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.03	0.02	0.03	0.03	0.03	0.03
01/20/22	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.02	0.03	0.03
01/21/22	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.03	0.02	0.02	0.02	0.03	0.03
01/22/22	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.04	0.03	0.03	0.02	0.02	0.02	0.03	0.03
01/23/22	0.03	0.03	0.02	0.04	0.02	0.03	0.03	0.04	0.03	0.03	0.03	0.05	0.03	0.03	0.02	0.04	0.02	0.02	0.03
01/24/22	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.05	0.03	0.03	0.03	0.04	0.03	0.04	0.02	0.03	0.02	0.03	0.03
01/25/22	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.04	0.03	0.05	0.03	0.03	0.03	0.04	0.02	0.03	0.02	0.03	0.03
01/26/22	0.03	0.03	0.02	0.09	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.04	0.03	0.03	0.02	0.02	0.02	0.03	0.03
01/27/22	0.03	0.03	0.02	0.02	0.03	0.04	0.03	0.03	0.03	0.05	0.03	0.03	0.03	0.06	0.02	0.02	0.02	0.03	0.03
01/28/22	0.02	0.04	0.02	0.02	0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.05	0.02	0.02	0.02	0.03	0.03
01/29/22	0.02	0.03	0.02	0.10	0.03	0.03	0.03	0.05	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.02	0.03	0.03
01/30/22	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.05	0.03	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.03	0.03
01/31/22	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.05	0.03	0.06	0.03	0.03	0.03	0.04	0.02	0.03	0.02	0.03	0.03

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

Date	Reverse Osmosis Process online monitoring results																	
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
01/01/22	0.014	0.014	8.073	7.470	8.935	0.047	0.034	0.059	1,559	1,486	1,630	31	28	36	99.41	2.23	98.04	1.71
01/02/22	0.014	0.014	8.108	7.324	9.108	0.044	0.038	0.053	1,546	1,478	1,624	33	28	38	99.45	2.26	97.89	1.68
01/03/22	0.014	0.014	8.578	7.704	9.532	0.046	0.039	0.054	1,534	1,448	1,659	32	28	36	99.46	2.27	97.93	1.68
01/04/22	0.014	0.014	8.770	7.829	9.706	0.049	0.042	0.058	1,627	1,528	1,746	32	27	36	99.44	2.26	98.03	1.70
01/05/22	0.014	0.014	8.788	7.931	9.748	0.051	0.045	0.062	1,696	1,601	1,812	34	29	43	99.42	2.24	97.99	1.70
01/06/22	0.014	0.014	8.847	8.240	9.838	0.051	0.046	0.062	1,721	1,641	1,806	37	33	43	99.42	2.24	97.87	1.67
01/07/22	0.015	0.018	8.475	7.805	9.347	0.049	0.041	0.058	1,718	1,641	1,811	36	33	40	99.42	2.24	97.89	1.68
01/08/22	0.018	0.018	8.376	7.638	9.107	0.050	0.046	0.058	1,706	1,645	1,790	35	32	39	99.41	2.23	97.97	1.69
01/09/22	0.018	0.018	8.315	7.630	9.166	0.045	0.038	0.051	1,612	1,547	1,676	33	30	37	99.46	2.27	97.98	1.69
01/10/22	0.018	0.018	8.576	7.798	9.812	0.055	0.038	0.106 *	1,553	1,453	1,693	31	27	36	99.36	2.19	98.02	1.70
01/11/22	0.020	0.021	8.504	7.565	9.694	0.062	0.045	0.103 *	1,651	1,564	1,761	34	30	40	99.27	2.14	97.93	1.68
01/12/22	0.018	0.019	8.665	7.833	9.911	0.054	0.045	0.096	1,687	1,608	1,771	35	31	40	99.37	2.20	97.94	1.69
01/13/22	0.018	0.018	8.940	8.117	9.978	0.065	0.049	0.097	1,710	1,617	1,814	36	31	41	99.28	2.14	97.92	1.68
01/14/22	0.016	0.020	8.537	7.747	9.632	0.054	0.044	0.072	1,705	1,639	1,787	37	34	41	99.37	2.20	97.84	1.67
01/15/22	0.014	0.014	8.624	7.833	9.750	0.048	0.043	0.054	1,678	1,621	1,754	36	33	40	99.44	2.25	97.88	1.67
01/16/22	0.014	0.014	8.684	7.918	9.738	0.045	0.039	0.051	1,615	1,552	1,684	34	31	38	99.48	2.28	97.92	1.68
01/17/22	0.014	0.014	8.800	7.926	10.278	0.047	0.041	0.073	1,566	1,494	1,628	33	30	37	99.47	2.28	97.89	1.67
01/18/22	0.014	0.014	9.054	8.232	10.278	0.054	0.046	0.073	1,624	1,544	1,741	34	30	39	99.40	2.22	97.93	1.68
01/19/22	0.014	0.014	8.727	7.949	9.830	0.053	0.047	0.060	1,682	1,607	1,813	36	33	42	99.39	2.22	97.84	1.67
01/20/22	0.014	0.014	8.505	7.709	9.403	0.051	0.043	0.061	1,735	1,675	1,808	37	33	41	99.40	2.22	97.89	1.68
01/21/22	0.018	0.020	8.421	7.508	9.464	0.051	0.044	0.057	1,698	1,620	1,767	36	32	42	99.40	2.22	97.88	1.67
01/22/22	0.020	0.020	8.454	7.525	9.428	0.048	0.041	0.062	1,672	1,630	1,737	34	31	37	99.43	2.24	97.97	1.69
01/23/22	0.020	0.020	8.252	7.354	9.431	0.043	0.038	0.046	1,615	1,569	1,660	33	30	38	99.48	2.29	97.96	1.69
01/24/22	0.020	0.020	8.467	7.467	9.664	0.045	0.041	0.060	1,590	1,513	1,698	33	30	38	99.47	2.28	97.92	1.68
01/25/22	0.020	0.020	8.518	7.759	9.731	0.052	0.046	0.066	1,674	1,585	1,803	35	31	41	99.39	2.21	97.92	1.68
01/26/22	0.020	0.020	8.482	7.591	9.481	0.052	0.034	0.065	1,737	1,637	1,819	36	31	42	99.39	2.21	97.92	1.68
01/27/22	0.020	0.020	8.536	7.658	9.570	0.052	0.047	0.064	1,716	1,636	1,794	36	32	41	99.39	2.21	97.92	1.68
01/28/22	0.020	0.020	8.507	7.675	9.421	0.049	0.044	0.058	1,680	1,595	1,758	35	31	39	99.42	2.24	97.93	1.68
01/29/22	0.020	0.020	8.438	7.536	9.423	0.071	0.038	0.198 *	1,687	1,629	1,758	35	31	40	99.16	2.07	97.94	1.69
01/30/22	0.020	0.020	8.274	7.377	9.131	0.047	0.038	0.073	1,619	1,558	1,674	33	31	38	99.44	2.25	97.94	1.69
01/31/22	0.020	0.020	8.819	7.710	10.493	0.048	0.037	0.066	1,579	1,479	1,703	33	28	38	99.46	2.27	97.93	1.68

Notes:

* Value affected by short-term TOC increase.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	UltraViolet / AOP Process online monitoring results					
	UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/l	Log Removal
01/01/22	98.08	86.035	22,921.0	0.27	3.0	6
01/02/22	98.12	81.120	21,949.0	0.27	3.0	6
01/03/22	98.16	79.681	21,838.0	0.27	3.0	6
01/04/22	97.97	79.816	21,831.7	0.27	3.0	6
01/05/22	97.87	86.111	22,637.4	0.27	3.0	6
01/06/22	97.98	90.261	22,716.7	0.26	3.0	6
01/07/22	98.07	91.386	23,446.1	0.26	3.0	6
01/08/22	97.72	91.966	23,875.9	0.26	3.0	6
01/09/22	97.34	89.548	23,802.4	0.26	3.0	6
01/10/22	97.25	89.718	23,960.9	0.27	3.0	6
01/11/22	97.31	89.755	24,105.7	0.27	3.0	6
01/12/22	97.09	89.467	24,183.2	0.27	3.0	6
01/13/22	97.16	92.645	24,125.8	0.27	3.0	6
01/14/22	97.10	94.897	24,093.8	0.26	3.0	6
01/15/22	97.17	91.979	24,071.7	0.26	3.0	6
01/16/22	97.32	89.609	24,027.1	0.26	3.0	6
01/17/22	97.42	89.684	24,008.5	0.27	3.0	6
01/18/22	97.20	88.684	24,109.7	0.27	3.0	6
01/19/22	97.45	91.763	23,756.8	0.27	3.0	6
01/20/22	97.18	93.553	24,219.7	0.26	3.0	6
01/21/22	97.16	94.465	24,263.0	0.26	3.0	6
01/22/22	97.47	93.327	24,472.5	0.26	3.0	6
01/23/22	97.28	90.937	24,531.1	0.27	3.0	6
01/24/22	97.14	93.851	24,421.7	0.27	3.0	6
01/25/22	97.20	89.558	24,617.3	0.26	3.0	6
01/26/22	97.19	90.733	24,556.9	0.27	3.0	6
01/27/22	97.29	93.298	25,023.9	0.27	3.0	6
01/28/22	97.44	86.411	23,907.0	0.26	3.0	6
01/29/22	97.49	89.303	24,151.4	0.27	3.0	6
01/30/22	97.59	89.632	24,489.1	0.27	3.0	6
01/31/22	97.28	85.451	25,240.0	0.28	3.0	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
							MFE		ROP		
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	NTU		NTU		TOC
	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
02/01/22	12.24	12.24	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/02/22	12.23	12.23	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/03/22	12.25	12.25	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/04/22	12.22	12.22	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/05/22	12.21	12.21	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/06/22	12.24	12.24	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/07/22	12.26	12.26	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/08/22	12.21	12.21	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/09/22	12.22	12.22	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/10/22	12.21	12.21	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/11/22	12.19	12.19	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/12/22	12.20	12.20	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/13/22	12.26	12.26	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/14/22	12.23	12.23	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/15/22	12.21	12.21	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/16/22	12.23	12.23	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/17/22	12.21	12.21	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/18/22	12.22	12.22	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/19/22	12.23	12.23	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/20/22	12.24	12.24	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/21/22	12.26	12.26	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/22/22	12.23	12.23	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/23/22	12.24	12.24	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/24/22	12.18	12.18	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/25/22	12.14	12.14	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/26/22	12.18	12.18	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/27/22	12.28	12.28	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/28/22	12.25	12.25	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
02/01/22	0.00	4.03	2.21	6.00	0.00	12.24
02/02/22	0.00	4.04	2.19	6.00	0.00	12.23
02/03/22	0.00	4.05	2.20	6.00	0.00	12.25
02/04/22	0.00	4.03	2.19	6.00	0.00	12.22
02/05/22	0.00	4.01	2.20	6.00	0.00	12.21
02/06/22	0.00	4.00	2.24	6.00	0.00	12.24
02/07/22	0.00	4.01	2.25	6.00	0.00	12.26
02/08/22	0.00	4.02	2.20	6.00	0.00	12.21
02/09/22	0.00	4.03	2.19	6.00	0.00	12.22
02/10/22	0.00	4.03	2.18	6.00	0.00	12.21
02/11/22	0.00	4.01	2.18	6.00	0.00	12.19
02/12/22	0.00	4.00	2.20	6.00	0.00	12.20
02/13/22	0.00	4.02	2.24	6.00	0.00	12.26
02/14/22	0.00	4.02	2.22	6.00	0.00	12.23
02/15/22	0.00	4.01	2.20	6.00	0.00	12.21
02/16/22	0.00	4.00	2.23	6.00	0.00	12.23
02/17/22	0.00	4.00	2.21	6.00	0.00	12.21
02/18/22	0.00	4.01	2.21	6.00	0.00	12.22
02/19/22	0.00	4.02	2.21	6.00	0.00	12.23
02/20/22	0.00	4.00	2.24	6.00	0.00	12.24
02/21/22	0.00	4.02	2.24	6.00	0.00	12.26
02/22/22	0.00	4.01	2.22	6.00	0.00	12.23
02/23/22	0.00	4.00	2.23	6.00	0.00	12.24
02/24/22	0.00	4.02	2.16	6.00	0.00	12.18
02/25/22	0.00	4.02	2.13	6.00	0.00	12.14
02/26/22	0.00	4.02	2.15	6.00	0.00	12.18
02/27/22	0.00	4.04	2.24	6.00	0.00	12.28
02/28/22	0.00	4.01	2.24	6.00	0.00	12.25

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
02/01/22	0.00	0.00	2.21	6.00	4.00	12.21
02/02/22	0.00	0.00	2.19	6.00	4.00	12.19
02/03/22	0.00	0.00	2.20	6.00	4.00	12.20
02/04/22	0.00	0.00	2.19	6.00	4.00	12.19
02/05/22	0.00	0.00	2.20	6.00	4.00	12.20
02/06/22	0.00	0.00	2.24	6.00	4.00	12.24
02/07/22	0.00	0.00	2.25	6.00	4.00	12.25
02/08/22	0.00	0.00	2.20	6.00	4.00	12.20
02/09/22	0.00	0.00	2.19	6.00	4.00	12.19
02/10/22	0.00	0.00	2.18	6.00	4.00	12.18
02/11/22	0.00	0.00	2.18	6.00	4.00	12.18
02/12/22	0.00	0.00	2.20	6.00	4.00	12.20
02/13/22	0.00	0.00	2.24	6.00	4.00	12.24
02/14/22	0.00	0.00	2.22	6.00	4.00	12.22
02/15/22	0.00	0.00	2.20	6.00	4.00	12.20
02/16/22	0.00	0.00	2.23	6.00	4.00	12.23
02/17/22	0.00	0.00	2.21	6.00	4.00	12.21
02/18/22	0.00	0.00	2.21	6.00	4.00	12.21
02/19/22	0.00	0.00	2.21	6.00	4.00	12.21
02/20/22	0.00	0.00	2.24	6.00	4.00	12.24
02/21/22	0.00	0.00	2.24	6.00	4.00	12.24
02/22/22	0.00	0.00	2.22	6.00	4.00	12.22
02/23/22	0.00	0.00	2.23	6.00	4.00	12.23
02/24/22	0.00	0.00	2.16	6.00	4.00	12.16
02/25/22	0.00	0.00	2.13	6.00	4.00	12.13
02/26/22	0.00	0.00	2.15	6.00	4.00	12.15
02/27/22	0.00	0.00	2.24	6.00	4.00	12.24
02/28/22	0.00	0.00	2.24	6.00	4.00	12.24

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results — Log Removal Value															
	A01	A02	A03	A04	A05	A06	A07	A08	B01	B02	B03	B04	B05	B06	B07	B08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
02/01/22	4.24	4.28	4.15	4.07	4.29	4.24	4.44	4.03	5.20	5.09	4.93	5.09	4.20	4.21	4.08	4.99
02/02/22	4.26	4.13	4.13	4.14	4.23	4.22	4.39	4.04	5.14	5.11	4.90	5.10	4.22	4.19	4.06	4.94
02/03/22	4.19	4.23	4.27	4.10	4.23	4.16	4.31	4.15	5.17	5.07	4.86	5.10	4.22	4.13	4.25	4.87
02/04/22	4.19	4.23	4.22	4.08	4.25	4.14	4.28	4.14	5.11	5.05	4.85	5.13	4.15	4.09	4.33	4.78
02/05/22	4.17	4.41	4.23	4.10	4.20	4.10	4.37	4.10	5.13	5.05	5.08	5.10	4.11	4.07	4.31	4.78
02/06/22	4.30	4.54	4.24	4.09	4.16	4.09	4.36	4.09	5.09	5.13	5.15	5.13	4.16	4.06	4.29	4.85
02/07/22	4.30	4.51	4.19	4.08	4.13	4.07	4.33	4.06	5.09	5.05	5.13	5.10	4.16	4.07	4.28	4.87
02/08/22	4.30	4.50	4.16	4.19	4.14	4.09	4.29	4.04	5.03	4.96	5.12	5.02	4.06	4.05	4.23	4.83
02/09/22	4.31	4.38	4.20	4.16	4.07	4.09	4.23	4.03	4.98	5.03	5.13	4.99	4.10	4.04	4.18	4.90
02/10/22	4.28	4.41	4.19	4.23	4.05	4.06	4.27	4.03	4.98	5.04	5.11	5.02	4.12	4.03	4.20	5.01
02/11/22	4.22	4.39	4.21	4.20	4.07	4.06	4.25	4.29	5.31	5.01	5.07	4.98	4.14	4.01	4.20	4.89
02/12/22	4.31	4.37	4.17	4.13	4.27	4.35	4.23	4.18	5.32	5.01	5.04	4.98	4.12	4.00	4.20	4.83
02/13/22	4.30	4.38	4.18	4.08	4.30	4.25	4.39	4.16	5.22	5.00	5.04	5.00	4.09	4.15	4.19	4.99
02/14/22	4.12	4.37	4.13	4.07	4.31	4.19	4.31	4.14	5.30	4.94	5.02	4.98	4.26	4.15	NA *	5.03
02/15/22	4.24	4.30	4.15	4.13	4.25	4.14	4.37	4.11	5.28	4.90	5.00	4.96	4.27	4.09	NA *	4.80
02/16/22	4.22	4.28	4.08	4.08	4.25	4.10	4.35	4.04	5.27	4.88	4.96	4.94	4.20	4.00	NA *	4.84
02/17/22	4.16	4.58	4.08	4.06	4.18	4.13	4.27	4.05	5.24	4.80	4.98	4.88	4.16	4.06	NA *	4.84
02/18/22	4.17	4.52	4.08	4.22	4.14	4.11	4.24	4.20	5.17	4.80	4.96	4.86	4.09	4.04	4.75	4.77
02/19/22	4.35	4.39	4.21	4.22	4.11	4.09	4.24	4.19	5.25	4.78	4.95	4.82	4.12	4.05	4.95	4.79
02/20/22	4.27	4.30	4.20	4.18	4.15	4.06	4.26	4.13	5.24	4.78	4.93	4.82	4.11	4.05	4.87	4.84
02/21/22	4.26	4.27	4.10	4.19	4.15	4.02	4.24	4.10	5.23	4.74	4.94	4.80	4.10	4.05	4.86	4.84
02/22/22	4.31	4.35	4.20	4.12	4.11	4.03	4.21	4.08	5.20	4.72	4.85	4.78	4.05	4.02	4.82	4.81
02/23/22	4.28	4.33	4.12	4.13	4.11	4.02	4.19	4.05	5.13	5.03	4.83	4.77	4.06	4.00	4.77	4.75
02/24/22	4.29	4.26	4.18	4.06	4.30	4.02	4.17	4.05	5.10	5.03	4.79	4.70	4.07	4.05	4.71	4.70
02/25/22	4.25	4.34	4.14	4.05	4.28	4.07	4.21	4.03	5.17	4.98	4.73	5.03	4.02	4.19	4.74	4.67
02/26/22	4.25	4.32	4.10	4.04	4.23	4.11	4.31	4.04	5.17	4.99	4.73	5.09	4.17	4.12	4.78	4.61
02/27/22	4.26	4.32	4.12	4.10	4.24	4.07	4.29	4.04	5.13	5.02	4.74	5.08	4.23	4.11	4.77	4.64
02/28/22	4.18	4.28	4.12	4.05	4.23	4.09	4.30	4.01	5.08	5.04	4.72	5.14	4.23	4.11	4.75	4.65

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell offline for membrane replacement.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
02/01/22	4.70	5.07	5.13	4.75	5.22	4.93	5.15	5.08	4.30	4.11	4.15	4.30	4.24	4.41	4.11	4.29
02/02/22	4.96	5.04	5.23	4.70	5.27	4.90	5.06	5.02	4.27	4.10	4.11	4.32	4.20	4.33	4.20	4.27
02/03/22	5.01	5.01	5.19	4.69	5.21	5.07	5.01	5.01	4.19	4.10	4.06	4.29	4.15	4.28	4.42	4.22
02/04/22	4.99	4.97	5.14	4.69	5.17	5.12	4.93	5.00	4.20	4.06	4.03	4.25	4.13	4.26	4.37	4.15
02/05/22	4.96	4.96	5.10	4.68	5.20	5.05	4.99	4.99	4.18	4.02	4.01	4.19	4.27	4.24	4.37	4.15
02/06/22	4.94	4.98	5.12	4.67	5.17	5.04	5.02	5.15	4.21	4.00	4.01	4.15	4.38	4.27	4.35	4.14
02/07/22	4.96	4.96	5.11	4.61	5.19	5.02	5.03	5.26	4.23	4.15	4.01	4.12	4.38	4.27	4.33	4.14
02/08/22	4.91	4.93	5.08	4.56	5.19	5.02	4.96	5.19	4.19	4.11	4.02	4.14	4.36	4.24	4.17	4.11
02/09/22	4.87	4.92	5.12	4.83	5.22	5.04	4.96	5.20	4.13	4.08	4.29	4.14	4.33	4.23	4.17	4.04
02/10/22	4.86	4.89	5.11	4.94	5.20	5.01	4.97	5.19	4.07	4.07	4.23	4.08	4.27	4.12	4.22	4.05
02/11/22	4.83	4.99	5.03	4.85	5.12	4.89	4.95	5.15	4.02	4.05	4.19	4.09	4.27	4.13	4.21	4.07
02/12/22	4.81	5.18	5.00	4.83	5.08	5.02	4.90	5.10	4.05	4.03	4.16	4.20	4.25	4.24	4.17	4.17
02/13/22	4.79	5.12	5.01	4.80	5.08	5.01	4.92	5.10	4.37	4.02	4.11	4.30	4.27	4.35	4.16	4.38
02/14/22	4.77	5.07	5.10	4.76	5.14	4.90	5.08	5.14	4.32	4.02	4.10	4.21	4.27	4.29	4.14	4.28
02/15/22	4.77	5.03	5.17	4.72	5.24	4.89	5.09	5.12	4.20	4.02	4.07	4.22	4.22	4.27	4.38	4.21
02/16/22	4.92	5.05	5.09	4.70	5.20	5.06	5.05	5.04	4.14	4.01	4.10	4.21	4.18	4.19	4.38	4.17
02/17/22	4.89	4.99	5.05	4.68	5.15	5.06	4.98	4.99	4.05	4.00	4.10	4.16	4.17	4.17	4.34	4.15
02/18/22	4.84	4.97	5.02	4.63	5.15	5.04	4.95	4.95	4.05	4.11	4.05	4.11	4.21	4.19	4.29	4.11
02/19/22	4.87	5.00	4.99	4.63	5.15	5.01	4.93	5.06	4.10	4.07	4.02	4.08	4.30	4.18	4.28	4.05
02/20/22	4.81	4.97	5.02	4.57	5.13	4.98	4.93	5.13	4.11	4.03	4.00	4.06	4.35	4.13	4.23	4.03
02/21/22	4.75	4.93	5.03	4.60	5.10	5.00	4.92	5.08	4.09	4.04	4.24	4.05	4.33	4.14	4.20	4.03
02/22/22	4.79	4.86	4.94	4.74	5.08	4.98	4.88	5.10	4.06	4.08	4.24	4.05	4.25	4.13	4.18	4.05
02/23/22	4.72	5.04	4.88	4.79	5.07	4.93	4.84	5.11	4.05	4.16	4.21	4.04	4.22	4.11	4.11	4.09
02/24/22	4.72	5.05	4.88	4.75	4.99	4.87	4.84	5.04	4.03	4.14	4.18	4.10	4.19	4.09	4.10	4.07
02/25/22	4.72	5.04	4.86	4.73	4.96	4.85	4.98	5.03	4.02	4.15	4.15	4.19	4.13	4.20	4.13	4.12
02/26/22	4.71	5.06	4.86	4.72	4.98	4.87	5.07	5.07	4.13	4.14	4.14	4.16	4.16	4.30	4.15	4.22
02/27/22	4.81	5.10	5.05	4.70	5.12	4.86	5.04	5.04	4.23	4.10	4.11	4.15	4.14	4.27	4.25	4.18
02/28/22	5.00	5.07	5.13	4.68	5.21	5.01	5.02	4.95	4.22	4.08	4.07	4.21	4.14	4.22	4.41	4.17

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

MicroFiltration Process online monitoring results

Log Removal Value

Date	E01 LRV	E02 LRV	E03 LRV	E04 LRV
02/01/22	4.07	4.15	4.13	4.66
02/02/22	4.09	4.14	4.07	4.39
02/03/22	4.05	4.06	4.10	4.36
02/04/22	4.04	4.05	4.23	4.50
02/05/22	4.05	4.06	4.04	4.27
02/06/22	4.02	4.02	4.10	4.40
02/07/22	4.21	4.05	4.13	4.76
02/08/22	4.31	4.02	4.12	4.46
02/09/22	4.14	4.24	4.22	4.50
02/10/22	4.14	4.14	4.14	4.68
02/11/22	4.09	4.15	4.03	4.41
02/12/22	4.15	4.18	4.01	4.42
02/13/22	4.10	4.18	4.04	4.40
02/14/22	4.12	4.09	4.06	4.42
02/15/22	4.07	4.01	4.05	4.56
02/16/22	4.11	4.01	4.10	4.48
02/17/22	4.14	4.01	4.02	4.34
02/18/22	4.14	4.01	4.06	4.65
02/19/22	4.11	4.02	4.07	4.48
02/20/22	4.05	4.04	4.02	4.42
02/21/22	4.10	4.10	4.24	4.23
02/22/22	4.09	4.28	4.01	4.48
02/23/22	4.04	4.20	4.02	4.52
02/24/22	4.03	4.19	4.07	4.59
02/25/22	4.02	4.11	4.10	4.67
02/26/22	4.02	4.06	4.03	4.45
02/27/22	4.05	4.10	4.10	4.47
02/28/22	4.10	4.06	4.19	4.56

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	MicroFiltration Process online monitoring results Effluent Turbidity - NTU																		
	A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		MFE
	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
02/01/22	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.09	0.03	0.04	0.03	0.04	0.03	0.03	0.02	0.03	0.02	0.03	0.03
02/02/22	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.04	0.03	0.05	0.03	0.03	0.03	0.03	0.02	0.03	0.02	0.03	0.03
02/03/22	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.06	0.03	0.03	0.03	0.03	0.03	0.04	0.02	0.03	0.02	0.03	0.03
02/04/22	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03
02/05/22	0.03	0.04	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.05	0.02	0.03	0.03	0.03	0.03
02/06/22	0.02	0.04	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.04	0.02	0.03	0.03	0.06	0.03
02/07/22	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.04	0.03	0.04	0.03	0.03	0.03	0.04	0.02	0.03	0.03	0.03	0.03
02/08/22	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.07	0.02	0.03	0.03	0.04	0.03
02/09/22	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.04	0.03	0.06	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.04	0.03
02/10/22	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.06	0.03	0.06	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03
02/11/22	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.03	0.02	0.03	0.03	0.06	0.03
02/12/22	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.04	0.03	0.05	0.03	0.03	0.03	0.04	0.03	0.05	0.03	0.03	0.03
02/13/22	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.04	0.02	0.03	0.03	0.03	0.03
02/14/22	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.07	0.03	0.03	0.02	0.05	0.03	0.03	0.03
02/15/22	0.03	0.05	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.07	0.06	0.08	0.03	0.03	0.02	0.03	0.03	0.03	0.03
02/16/22	0.03	0.06	0.02	0.02	0.03	0.03	0.03	0.04	0.03	0.04	0.06	0.10	0.03	0.03	0.02	0.02	0.03	0.03	0.03
02/17/22	0.02	0.03	0.02	0.02	0.03	0.03	0.02	0.03	0.03	0.04	0.03	0.06	0.03	0.03	0.02	0.04	0.02	0.03	0.02
02/18/22	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.07	0.03	0.05	0.03	0.04	0.03	0.03	0.02	0.04	0.02	0.03	0.03
02/19/22	0.02	0.03	0.02	0.02	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.05	0.02	0.04	0.02	0.03	0.03
02/20/22	0.02	0.03	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.04	0.03	0.03	0.02	0.03	0.02	0.05	0.02
02/21/22	0.02	0.03	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.05	0.03	0.04	0.03	0.04	0.02	0.04	0.03	0.03	0.03
02/22/22	0.02	0.03	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.09	0.03	0.04	0.02	0.03	0.03	0.03	0.03
02/23/22	0.02	0.02	0.02	0.03	0.03	0.06	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.02	0.04	0.02	0.03	0.02
02/24/22	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.05	0.03	0.03	0.03	0.03	0.02	0.04	0.02	0.04	0.02
02/25/22	0.02	0.03	0.02	0.02	0.03	0.03	0.03	0.04	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.04	0.02	0.03	0.03
02/26/22	0.02	0.03	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.02	0.04	0.02	0.03	0.02
02/27/22	0.02	0.03	0.02	0.02	0.03	0.12	0.03	0.09	0.03	0.05	0.03	0.03	0.03	0.07	0.02	0.04	0.02	0.04	0.02
02/28/22	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Reverse Osmosis Process online monitoring results																	
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
02/01/22	0.020	0.020	9.154	8.063	10.342	0.057	0.052	0.084	1,662	1,554	1,834	35	28	43	99.38	2.21	97.89	1.68
02/02/22	0.020	0.020	8.788	8.094	9.879	0.057	0.051	0.066	1,744	1,660	1,852	36	32	42	99.35	2.19	97.93	1.68
02/03/22	0.020	0.020	8.459	7.697	9.127	0.053	0.048	0.058	1,726	1,665	1,799	35	31	39	99.37	2.20	98.00	1.70
02/04/22	0.020	0.020	8.501	7.574	9.455	0.055	0.048	0.061	1,724	1,656	1,787	34	31	38	99.36	2.19	98.05	1.71
02/05/22	0.020	0.020	8.659	7.695	9.505	0.055	0.050	0.061	1,730	1,680	1,788	34	31	39	99.37	2.20	98.04	1.71
02/06/22	0.020	0.020	8.506	7.632	9.464	0.049	0.045	0.056	1,647	1,572	1,730	32	30	36	99.42	2.24	98.04	1.71
02/07/22	0.020	0.020	8.872	7.838	9.993	0.050	0.047	0.062	1,564	1,468	1,692	31	27	37	99.44	2.25	98.03	1.71
02/08/22	0.019	0.019	9.028	7.993	9.969	0.057	0.052	0.067	1,689	1,580	1,825	35	30	43	99.36	2.20	97.93	1.68
02/09/22	0.019	0.019	8.723	7.840	9.776	0.056	0.051	0.068	1,755	1,679	1,837	36	30	41	99.36	2.19	97.94	1.69
02/10/22	0.020	0.020	8.756	7.711	9.405	0.058	0.053	0.086	1,779	1,694	1,859	37	31	41	99.34	2.18	97.94	1.69
02/11/22	0.020	0.020	8.622	7.770	9.529	0.057	0.053	0.061	1,797	1,730	1,865	37	34	41	99.34	2.18	97.94	1.69
02/12/22	0.020	0.020	8.692	7.836	9.491	0.055	0.050	0.062	1,747	1,701	1,828	37	34	41	99.37	2.20	97.90	1.68
02/13/22	0.020	0.020	8.751	7.798	9.687	0.050	0.047	0.053	1,677	1,606	1,742	34	32	39	99.42	2.24	97.94	1.69
02/14/22	0.020	0.020	8.905	7.817	10.116	0.054	0.047	0.067	1,646	1,567	1,749	34	30	38	99.39	2.22	97.94	1.69
02/15/22	0.020	0.020	9.165	8.104	10.274	0.058	0.054	0.069	1,743	1,643	1,851	35	31	39	99.36	2.20	98.01	1.70
02/16/22	0.020	0.020	9.374	8.424	10.194	0.056	0.052	0.067	1,777	1,713	1,841	35	32	40	99.41	2.23	98.02	1.70
02/17/22	0.020	0.020	9.229	8.263	10.166	0.056	0.054	0.063	1,761	1,701	1,846	34	31	40	99.39	2.21	98.06	1.71
02/18/22	0.020	0.020	9.220	8.265	10.080	0.057	0.052	0.067	1,779	1,718	1,834	34	31	38	99.38	2.21	98.07	1.71
02/19/22	0.020	0.020	9.332	8.183	10.380	0.058	0.053	0.062	1,743	1,672	1,822	34	30	39	99.38	2.21	98.05	1.71
02/20/22	0.020	0.020	9.192	8.080	10.278	0.053	0.050	0.059	1,704	1,655	1,773	34	30	39	99.42	2.24	98.01	1.70
02/21/22	0.020	0.020	9.014	8.104	10.491	0.052	0.048	0.064	1,646	1,578	1,742	33	30	37	99.42	2.24	98.00	1.70
02/22/22	0.020	0.020	9.367	8.268	10.544	0.057	0.052	0.073	1,697	1,608	1,794	33	30	37	99.39	2.22	98.05	1.71
02/23/22	0.020	0.020	9.044	8.232	9.976	0.053	0.051	0.054	1,726	1,644	1,828	34	30	38	99.42	2.23	98.06	1.71
02/24/22	0.020	0.020	9.088	8.162	9.688	0.063	0.052	0.076	1,728	1,656	1,801	34	30	39	99.31	2.16	98.04	1.71
02/25/22	0.020	0.020	9.035	7.955	9.896	0.067	0.055	0.080	1,730	1,641	1,831	34	30	39	99.26	2.13	98.05	1.71
02/26/22	0.020	0.020	8.901	7.837	9.820	0.062	0.052	0.111 *	1,724	1,680	1,775	33	30	37	99.30	2.15	98.08	1.72
02/27/22	0.020	0.020	8.762	7.847	9.653	0.050	0.047	0.056	1,683	1,624	1,761	32	29	37	99.43	2.24	98.11	1.72
02/28/22	0.020	0.020	9.022	8.008	10.491	0.051	0.047	0.073	1,623	1,535	1,690	32	28	37	99.43	2.24	98.04	1.71

Notes:

* ROP TOC above internal critical control point (0.1 mg/L) observed for less than 15 min. Value on backup ROP TOC analyzer was not elevated.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	UltraViolet / AOP Process online monitoring results					
	UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/l	Log Removal
02/01/22	97.39	89.976	23,487.1	0.27	3.0	6
02/02/22	97.49	91.171	24,476.1	0.27	3.0	6
02/03/22	97.27	91.187	24,682.6	0.27	3.0	6
02/04/22	97.38	94.910	24,585.7	0.27	3.0	6
02/05/22	97.62	91.296	24,372.9	0.26	3.0	6
02/06/22	97.83	89.089	24,117.0	0.27	3.0	6
02/07/22	97.79	91.191	24,076.5	0.27	3.0	6
02/08/22	97.74	92.340	24,009.7	0.26	3.0	6
02/09/22	97.69	87.735	23,477.4	0.26	3.0	6
02/10/22	97.55	91.480	23,119.8	0.26	3.0	6
02/11/22	97.74	92.241	24,069.8	0.26	3.0	6
02/12/22	97.90	91.316	23,890.3	0.26	3.0	6
02/13/22	97.92	93.979	24,121.5	0.26	3.0	6
02/14/22	97.74	92.182	24,116.0	0.26	3.0	6
02/15/22	97.93	90.230	24,120.0	0.26	3.0	6
02/16/22	98.02	90.948	24,171.1	0.27	3.0	6
02/17/22	98.02	89.065	24,804.5	0.27	3.0	6
02/18/22	97.67	88.383	24,155.2	0.27	3.0	6
02/19/22	97.52	93.502	23,343.7	0.26	3.0	6
02/20/22	97.31	92.592	24,248.1	0.26	3.0	6
02/21/22	97.28	91.321	24,286.5	0.26	3.0	6
02/22/22	97.01	88.886	24,371.0	0.27	3.0	6
02/23/22	96.99	86.790	24,355.8	0.27	3.0	6
02/24/22	97.38	87.479	24,903.2	0.27	3.0	6
02/25/22	97.26	89.713	24,835.6	0.27	3.0	6
02/26/22	97.23	91.921	24,123.4	0.27	3.0	6
02/27/22	97.21	89.671	24,710.7	0.27	3.0	6
02/28/22	97.36	89.713	24,681.2	0.28	3.0	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

Date	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	MFE NTU		ROP NTU		TOC
	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
03/01/22	12.23	12.23	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/02/22	12.21	12.21	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/03/22	12.20	12.20	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/04/22	12.23	12.23	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/05/22	12.24	12.24	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/06/22	12.27	12.27	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/07/22	12.26	12.26	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/08/22	12.20	12.20	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/09/22	12.20	12.20	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/10/22	12.20	12.20	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/11/22	12.21	12.21	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/12/22	12.22	12.22	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/13/22	12.23	12.23	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/14/22	12.20	12.20	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/15/22	12.20	12.20	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/16/22	12.21	12.21	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/17/22	12.21	12.21	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/18/22	12.20	12.20	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/19/22	12.21	12.21	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/20/22	12.24	12.24	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/21/22	12.25	12.25	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/22/22	12.18	12.18	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/23/22	12.17	12.17	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/24/22	12.16	12.16	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/25/22	12.12	12.12	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/26/22	12.16	12.16	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/27/22	12.20	12.20	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/28/22	12.25	12.25	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/29/22	12.24	12.24	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/30/22	12.21	12.21	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/31/22	12.20	12.20	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
03/01/22	0.00	4.03	2.20	6.00	0.00	12.23
03/02/22	0.00	4.02	2.19	6.00	0.00	12.21
03/03/22	0.00	4.02	2.17	6.00	0.00	12.20
03/04/22	0.00	4.01	2.21	6.00	0.00	12.23
03/05/22	0.00	4.02	2.22	6.00	0.00	12.24
03/06/22	0.00	4.02	2.25	6.00	0.00	12.27
03/07/22	0.00	4.01	2.25	6.00	0.00	12.26
03/08/22	0.00	4.01	2.19	6.00	0.00	12.20
03/09/22	0.00	4.01	2.19	6.00	0.00	12.20
03/10/22	0.00	4.01	2.18	6.00	0.00	12.20
03/11/22	0.00	4.03	2.19	6.00	0.00	12.21
03/12/22	0.00	4.02	2.19	6.00	0.00	12.22
03/13/22	0.00	4.01	2.22	6.00	0.00	12.23
03/14/22	0.00	4.00	2.20	6.00	0.00	12.20
03/15/22	0.00	4.03	2.17	6.00	0.00	12.20
03/16/22	0.00	4.02	2.19	6.00	0.00	12.21
03/17/22	0.00	4.02	2.19	6.00	0.00	12.21
03/18/22	0.00	4.02	2.18	6.00	0.00	12.20
03/19/22	0.00	4.01	2.20	6.00	0.00	12.21
03/20/22	0.00	4.00	2.23	6.00	0.00	12.24
03/21/22	0.00	4.01	2.24	6.00	0.00	12.25
03/22/22	0.00	4.03	2.15	6.00	0.00	12.18
03/23/22	0.00	4.02	2.15	6.00	0.00	12.17
03/24/22	0.00	4.03	2.13	6.00	0.00	12.16
03/25/22	0.00	4.01	2.11	6.00	0.00	12.12
03/26/22	0.00	4.01	2.14	6.00	0.00	12.16
03/27/22	0.00	4.01	2.20	6.00	0.00	12.20
03/28/22	0.00	4.01	2.24	6.00	0.00	12.25
03/29/22	0.00	4.01	2.23	6.00	0.00	12.24
03/30/22	0.00	4.01	2.20	6.00	0.00	12.21
03/31/22	0.00	4.01	2.19	6.00	0.00	12.20

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
	LRV	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
03/01/22	0.00	0.00	2.20	6.00	4.00	12.20
03/02/22	0.00	0.00	2.19	6.00	4.00	12.19
03/03/22	0.00	0.00	2.17	6.00	4.00	12.17
03/04/22	0.00	0.00	2.21	6.00	4.00	12.21
03/05/22	0.00	0.00	2.22	6.00	4.00	12.22
03/06/22	0.00	0.00	2.25	6.00	4.00	12.25
03/07/22	0.00	0.00	2.25	6.00	4.00	12.25
03/08/22	0.00	0.00	2.19	6.00	4.00	12.19
03/09/22	0.00	0.00	2.19	6.00	4.00	12.19
03/10/22	0.00	0.00	2.18	6.00	4.00	12.18
03/11/22	0.00	0.00	2.19	6.00	4.00	12.19
03/12/22	0.00	0.00	2.19	6.00	4.00	12.19
03/13/22	0.00	0.00	2.22	6.00	4.00	12.22
03/14/22	0.00	0.00	2.20	6.00	4.00	12.20
03/15/22	0.00	0.00	2.17	6.00	4.00	12.17
03/16/22	0.00	0.00	2.19	6.00	4.00	12.19
03/17/22	0.00	0.00	2.19	6.00	4.00	12.19
03/18/22	0.00	0.00	2.18	6.00	4.00	12.18
03/19/22	0.00	0.00	2.20	6.00	4.00	12.20
03/20/22	0.00	0.00	2.23	6.00	4.00	12.23
03/21/22	0.00	0.00	2.24	6.00	4.00	12.24
03/22/22	0.00	0.00	2.15	6.00	4.00	12.15
03/23/22	0.00	0.00	2.15	6.00	4.00	12.15
03/24/22	0.00	0.00	2.13	6.00	4.00	12.13
03/25/22	0.00	0.00	2.11	6.00	4.00	12.11
03/26/22	0.00	0.00	2.14	6.00	4.00	12.14
03/27/22	0.00	0.00	2.20	6.00	4.00	12.20
03/28/22	0.00	0.00	2.24	6.00	4.00	12.24
03/29/22	0.00	0.00	2.23	6.00	4.00	12.23
03/30/22	0.00	0.00	2.20	6.00	4.00	12.20
03/31/22	0.00	0.00	2.19	6.00	4.00	12.19

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value															
	A01	A02	A03	A04	A05	A06	A07	A08	B01	B02	B03	B04	B05	B06	B07	B08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
03/01/22	4.11	4.56	4.05	4.06	4.16	4.08	4.26	4.14	5.07	4.95	4.68	5.07	4.20	N/A *	4.73	4.67
03/02/22	4.12	4.32	4.09	4.04	4.05	4.07	4.26	4.05	5.01	4.96	4.69	5.06	4.15	N/A *	4.73	4.66
03/03/22	4.38	4.48	4.12	4.20	4.13	4.09	4.29	4.05	5.03	4.97	5.01	5.06	4.14	N/A *	4.74	4.66
03/04/22	4.35	4.43	4.19	4.22	4.09	4.07	4.29	4.06	5.06	4.98	5.10	5.05	4.11	N/A *	4.73	4.66
03/05/22	4.32	4.43	4.11	4.18	4.05	4.04	4.26	4.04	5.06	4.96	5.06	5.03	4.09	N/A *	4.73	4.86
03/06/22	4.31	4.38	4.16	4.17	4.05	4.03	4.24	4.03	5.10	4.97	5.01	5.08	4.09	4.94	4.70	4.95
03/07/22	4.31	4.39	4.15	4.16	4.01	4.01	4.23	4.03	5.04	4.99	4.98	5.08	4.07	5.01	4.70	4.96
03/08/22	4.15	4.28	4.13	4.13	4.15	4.01	4.20	4.01	4.93	4.98	4.96	5.04	4.06	4.92	4.70	4.97
03/09/22	4.19	4.28	4.10	4.08	4.20	4.29	4.17	4.01	5.21	4.92	4.96	5.01	4.04	5.11	4.90	4.93
03/10/22	4.21	4.31	4.03	4.15	4.24	4.20	4.37	4.27	5.31	4.90	4.95	5.00	4.21	5.16	5.08	4.84
03/11/22	4.19	4.30	4.03	4.10	4.19	4.17	4.35	4.19	5.31	4.93	4.99	4.96	4.24	5.15	5.04	4.81
03/12/22	4.17	4.29	4.02	4.07	4.06	4.13	4.35	4.15	5.27	4.86	5.01	4.96	4.21	5.12	5.03	4.80
03/13/22	4.14	4.18	N/A**	4.06	4.09	4.16	4.26	4.13	5.31	4.82	4.93	4.94	4.23	5.06	5.05	4.82
03/14/22	4.13	4.52	4.00	4.12	4.04	4.10	4.26	4.11	5.26	4.86	4.97	4.93	4.22	5.07	5.08	4.82
03/15/22	4.10	4.49	4.07	4.12	4.07	4.07	4.22	4.08	5.26	4.84	4.98	4.89	N/A *	5.10	5.05	4.81
03/16/22	4.31	4.44	4.15	4.07	4.03	4.09	4.24	4.05	5.25	4.82	4.93	4.89	N/A *	5.14	5.03	4.83
03/17/22	4.35	4.40	4.11	4.10	4.05	4.07	4.23	4.04	5.23	4.85	4.90	4.84	N/A *	5.06	4.55	4.74
03/18/22	4.33	4.36	4.17	4.11	4.02	4.04	4.24	4.04	5.24	4.83	4.91	4.89	5.03	5.07	4.69	4.67
03/19/22	4.35	4.39	4.11	4.06	4.01	4.01	4.21	4.21	5.25	4.80	4.92	4.86	5.47	5.03	4.92	4.72
03/20/22	4.35	4.43	4.22	4.06	4.01	4.00	4.25	4.19	5.32	4.80	4.89	4.84	5.43	5.02	4.90	4.67
03/21/22	4.33	4.41	4.18	4.05	4.09	4.22	4.22	4.14	5.28	5.24	4.88	4.81	5.38	5.03	5.13	4.60
03/22/22	4.34	4.38	4.17	4.03	4.14	4.23	4.39	4.14	5.18	5.29	4.88	4.77	5.35	5.02	5.22	4.59
03/23/22	4.31	4.29	4.10	4.02	4.12	4.15	4.32	4.09	5.14	5.27	4.85	5.02	5.32	4.97	5.20	4.55
03/24/22	4.27	4.25	4.07	4.03	4.09	4.13	4.39	4.08	5.19	5.23	4.88	5.15	5.36	5.00	5.22	4.85
03/25/22	4.27	4.30	4.02	4.01	4.12	4.16	4.37	4.08	5.19	5.23	4.87	5.13	5.37	4.99	5.21	4.98
03/26/22	4.21	4.56	4.01	4.17	4.07	4.15	4.35	4.04	5.10	5.21	4.81	5.08	5.31	4.99	5.20	4.94
03/27/22	4.19	4.55	4.03	4.12	4.03	4.14	4.30	4.01	5.09	5.22	4.76	5.09	5.29	4.94	5.18	4.93
03/28/22	4.37	4.52	4.01	4.04	4.02	4.12	4.30	4.14	5.12	5.17	4.72	5.15	5.28	4.94	5.21	4.96
03/29/22	4.38	4.47	4.32	4.10	4.01	4.08	4.30	4.12	5.05	5.14	5.00	5.14	5.26	4.94	5.16	4.90
03/30/22	4.35	4.35	4.23	4.10	4.02	4.04	4.24	4.07	4.99	5.18	5.06	5.10	5.29	4.91	5.15	4.88
03/31/22	4.31	4.38	4.19	4.07	4.07	4.03	4.22	4.06	4.94	5.16	5.04	5.01	5.22	4.87	5.19	4.88

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell offline for new membrane replacement.

** Cell offline for maintenance.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results															
	Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
03/01/22	4.96	4.98	5.11	4.64	5.17	5.08	4.99	4.97	4.20	4.07	4.03	4.23	4.15	4.19	4.35	4.16
03/02/22	4.87	4.96	5.10	4.59	5.17	5.01	4.97	4.97	4.13	4.08	4.03	4.15	4.19	4.15	4.33	4.12
03/03/22	4.86	4.95	5.03	4.59	5.17	5.00	4.97	5.18	4.08	4.22	4.03	4.11	4.30	4.18	4.16	4.06
03/04/22	4.87	4.91	5.02	4.58	5.15	5.02	4.98	5.19	4.08	4.33	4.03	4.09	4.36	4.16	4.17	4.04
03/05/22	4.83	4.87	5.03	4.58	5.12	4.97	4.93	5.11	4.07	4.19	4.03	4.13	4.35	4.14	4.23	4.02
03/06/22	4.78	4.88	4.99	4.77	5.07	4.95	4.89	5.10	4.07	4.17	4.19	4.11	4.33	4.09	4.16	4.02
03/07/22	4.81	4.86	4.97	4.83	5.11	4.98	4.88	5.11	4.05	4.20	4.16	4.03	4.31	4.05	4.13	4.03
03/08/22	4.81	5.02	4.93	4.77	5.11	4.99	4.86	5.11	4.02	4.19	4.16	4.10	4.25	4.06	4.18	4.05
03/09/22	4.71	5.11	4.87	4.74	5.06	4.94	4.84	5.09	4.02	4.14	4.13	4.39	4.19	4.25	4.14	4.19
03/10/22	4.66	5.09	4.78	4.71	5.01	4.90	4.87	5.04	4.30	4.08	4.10	4.32	4.12	4.33	4.11	4.35
03/11/22	4.62	5.04	5.06	4.67	5.15	4.87	4.96	5.02	4.21	4.06	4.07	4.29	4.13	4.27	4.17	4.23
03/12/22	4.84	5.05	5.17	4.63	5.30	4.87	5.02	5.01	4.18	4.07	4.08	4.23	4.14	4.19	4.34	4.24
03/13/22	4.98	5.03	5.13	4.60	5.29	4.99	5.03	4.96	4.23	4.06	4.06	4.21	4.12	4.26	4.38	4.15
03/14/22	4.99	4.98	5.10	4.58	5.24	5.05	5.01	4.92	4.20	4.04	4.06	4.20	4.11	4.23	4.29	4.13
03/15/22	4.93	4.98	5.09	4.55	5.17	5.03	4.97	4.99	4.17	4.05	4.03	4.13	4.20	4.20	4.19	4.11
03/16/22	4.87	4.94	5.11	4.54	5.15	5.06	4.94	5.16	4.12	4.16	4.02	4.07	4.34	4.15	4.20	4.07
03/17/22	4.90	4.89	5.11	4.54	5.15	5.00	4.96	5.15	4.12	4.29	4.02	4.08	4.32	4.10	4.22	4.04
03/18/22	4.86	4.85	5.10	4.51	5.14	5.00	4.97	5.18	4.09	4.23	4.09	4.07	4.32	4.14	4.19	4.09
03/19/22	4.84	4.86	5.02	4.65	5.15	5.02	4.98	5.17	4.11	4.20	4.19	4.06	4.28	4.14	4.22	4.06
03/20/22	4.84	5.04	5.02	4.78	5.06	5.00	4.95	5.15	4.10	4.24	4.13	4.07	4.31	4.13	4.25	4.03
03/21/22	4.80	5.11	5.04	4.75	5.05	5.00	4.93	5.15	4.07	4.22	4.12	4.19	4.31	4.19	4.19	4.01
03/22/22	4.77	5.09	5.00	4.71	5.08	4.98	5.05	5.13	4.15	4.16	4.12	4.22	4.32	4.36	4.09	4.11
03/23/22	4.74	5.02	4.95	4.71	5.12	4.93	5.12	5.13	4.30	4.20	4.08	4.27	4.31	4.31	4.11	4.26
03/24/22	4.73	4.98	5.18	4.69	5.21	4.95	5.07	5.15	4.23	4.18	4.08	4.31	4.31	4.29	4.21	4.28
03/25/22	4.83	5.01	5.24	4.62	5.26	4.98	5.03	5.15	4.22	4.15	4.03	4.28	4.23	4.27	4.40	4.25
03/26/22	4.91	5.00	5.19	4.63	5.21	5.10	5.03	5.11	4.19	4.11	4.02	4.22	4.18	4.23	4.36	4.22
03/27/22	4.94	4.97	5.15	4.61	5.15	5.09	5.03	5.04	4.19	4.09	4.03	4.21	4.25	4.18	4.34	4.18
03/28/22	4.92	4.93	5.10	4.56	5.14	5.06	5.00	5.04	4.16	4.17	4.01	4.21	4.29	4.13	4.32	4.15
03/29/22	4.86	4.87	5.06	4.51	5.14	4.99	4.96	5.23	4.12	4.31	4.02	4.15	4.34	4.16	4.28	4.10
03/30/22	4.84	4.85	5.05	4.48	5.10	5.02	4.93	5.21	4.12	4.24	4.24	4.04	4.35	4.12	4.25	4.08
03/31/22	4.80	4.81	5.04	4.55	5.09	5.00	4.91	5.16	4.06	4.18	4.12	4.03	4.31	4.09	4.08	4.02

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

Date	MicroFiltration Process online monitoring results Log Removal Value **E01** LRV	**E02** LRV	**E03** LRV	**E04** LRV
03/01/22	4.04	4.06	4.04	4.46
03/02/22	4.06	4.02	4.09	4.33
03/03/22	4.02	4.03	4.17	4.53
03/04/22	4.03	4.01	4.03	4.40
03/05/22	4.07	4.03	4.09	4.47
03/06/22	4.25	4.14	4.19	4.62
03/07/22	4.17	4.25	4.03	4.41
03/08/22	4.17	4.15	4.05	4.41
03/09/22	4.17	4.11	4.07	4.61
03/10/22	4.01	4.10	4.07	4.33
03/11/22	4.11	4.05	4.14	4.40
03/12/22	4.11	4.08	4.14	4.58
03/13/22	4.10	4.06	4.01	4.44
03/14/22	4.17	4.04	4.12	4.39
03/15/22	4.24	4.04	4.06	4.42
03/16/22	4.13	4.04	4.05	4.33
03/17/22	4.10	4.02	4.02	4.38
03/18/22	4.10	4.09	4.04	4.47
03/19/22	4.16	4.27	4.03	4.42
03/20/22	4.16	4.18	4.03	4.37
03/21/22	4.08	4.11	4.07	4.49
03/22/22	4.09	4.07	4.04	4.39
03/23/22	4.09	4.02	4.12	4.44
03/24/22	4.26	4.10	4.27	4.60
03/25/22	4.19	4.08	4.19	4.50
03/26/22	4.12	4.02	4.25	4.38
03/27/22	4.17	4.03	4.27	4.55
03/28/22	4.07	4.02	4.10	4.36
03/29/22	4.09	4.02	4.09	4.48
03/30/22	4.09	4.01	4.18	4.54
03/31/22	4.08	4.01	4.11	4.35

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Effluent Turbidity - NTU																			
	A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		MFE
Date	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
03/01/22	0.02	0.04	0.02	0.05	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03
03/02/22	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.02	0.03	0.02	0.03	0.02
03/03/22	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.02	0.03	0.02	0.04	0.02
03/04/22	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.04	0.03	0.04	0.02	0.03	0.03	0.03	0.02	0.03	0.02	0.04	0.02
03/05/22	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.04	0.02	0.03	0.02	0.04	0.02
03/06/22	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.08	0.03	0.03	0.02	0.03	0.03	0.03	0.02	0.03	0.02	0.03	0.02
03/07/22	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.02	0.03	0.02	0.02	0.02
03/08/22	0.02	0.04	0.02	0.03	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.05	0.03	0.04	0.02	0.03	0.02
03/09/22	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.14	0.03	0.03	0.02	0.07	0.03	0.03	0.03	0.04	0.02	0.03	0.03
03/10/22	0.02	0.03	0.02	0.03	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03
03/11/22	0.02	0.03	0.02	0.03	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03
03/12/22	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.02	0.03	0.03	0.05	0.03	0.03	0.02	0.03	0.02
03/13/22	0.02	0.04	0.02	0.03	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03
03/14/22	0.02	0.04	0.02	0.03	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.06	0.03	0.04	0.03	0.03	0.03
03/15/22	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.04	0.03	0.04	0.03	0.03	0.03	0.03	0.03
03/16/22	0.02	0.04	0.02	0.03	0.02	0.03	0.03	0.04	0.03	0.04	0.03	0.03	0.03	0.04	0.03	0.03	0.02	0.03	0.03
03/17/22	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02
03/18/22	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.05	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
03/19/22	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
03/20/22	0.02	0.03	0.02	0.03	0.02	0.02	0.03	0.04	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
03/21/22	0.02	0.03	0.02	0.03	0.02	0.04	0.03	0.06	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.03
03/22/22	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.05	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03
03/23/22	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
03/24/22	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03
03/25/22	0.02	0.04	0.02	0.03	0.02	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
03/26/22	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.04	0.03	0.03	0.03	0.04	0.03	0.04	0.03	0.03	0.03	0.03	0.03
03/27/22	0.02	0.03	0.02	0.03	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
03/28/22	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
03/29/22	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.04	0.03	0.03	0.03
03/30/22	0.02	0.03	0.02	0.03	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03
03/31/22	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.02	0.03	0.03	0.03	0.03

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Reverse Osmosis Process online monitoring results																
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
03/01/22	0.020	0.020	9.304	8.295	10.594	0.059	0.054	0.074	1,705	1,609	1,837	34	29	40	99.37	2.20	98.01	1.70
03/02/22	0.020	0.020	9.324	8.427	10.396	0.061	0.056	0.075	1,765	1,674	1,871	35	29	40	99.35	2.19	98.03	1.71
03/03/22	0.020	0.020	9.443	8.593	10.080	0.063	0.058	0.071	1,749	1,676	1,825	35	31	40	99.33	2.17	98.02	1.70
03/04/22	0.018	0.020	9.181	8.319	10.074	0.056	0.052	0.064	1,730	1,666	1,803	35	31	39	99.39	2.21	97.99	1.70
03/05/22	0.017	0.017	9.226	8.306	10.176	0.056	0.048	0.065	1,722	1,675	1,774	33	31	36	99.39	2.22	98.09	1.72
03/06/22	0.017	0.017	9.072	8.067	10.082	0.051	0.047	0.056	1,639	1,593	1,699	32	29	36	99.44	2.25	98.04	1.71
03/07/22	0.017	0.017	9.109	8.032	10.477	0.051	0.048	0.071	1,580	1,483	1,723	32	27	37	99.44	2.25	98.00	1.70
03/08/22	0.017	0.017	9.429	8.322	10.580	0.060	0.054	0.073	1,700	1,596	1,845	33	30	38	99.36	2.19	98.04	1.71
03/09/22	0.017	0.017	9.379	8.343	10.579	0.060	0.054	0.073	1,764	1,668	1,871	35	30	40	99.36	2.19	98.04	1.71
03/10/22	0.017	0.017	9.623	8.534	10.636	0.063	0.059	0.074	1,750	1,675	1,818	35	31	40	99.35	2.18	97.98	1.70
03/11/22	0.017	0.017	9.502	8.585	10.826	0.062	0.054	0.074	1,746	1,672	1,825	35	31	39	99.35	2.19	98.00	1.70
03/12/22	0.017	0.017	9.275	8.206	10.177	0.060	0.054	0.073	1,738	1,690	1,814	36	33	40	99.36	2.19	97.95	1.69
03/13/22	0.017	0.017	9.284	8.234	10.681	0.056	0.051	0.067	1,664	1,619	1,719	34	31	38	99.39	2.22	97.95	1.69
03/14/22	0.017	0.017	9.433	8.455	10.776	0.059	0.052	0.085	1,636	1,552	1,717	34	31	39	99.37	2.20	97.91	1.68
03/15/22	0.017	0.017	9.481	8.764	10.835	0.063	0.058	0.086	1,694	1,611	1,814	36	32	42	99.33	2.17	97.89	1.68
03/16/22	0.017	0.017	9.189	8.567	10.080	0.060	0.057	0.064	1,742	1,666	1,834	37	33	42	99.35	2.19	97.86	1.67
03/17/22	0.017	0.017	9.015	8.315	9.672	0.058	0.054	0.070	1,741	1,671	1,821	37	34	42	99.36	2.19	97.86	1.67
03/18/22	0.015	0.017	8.974	8.276	9.994	0.059	0.054	0.067	1,735	1,661	1,820	37	32	42	99.34	2.18	97.89	1.67
03/19/22	0.014	0.014	8.998	8.213	9.987	0.056	0.051	0.064	1,718	1,655	1,795	36	33	41	99.38	2.20	97.88	1.67
03/20/22	0.014	0.014	8.971	8.131	9.895	0.052	0.049	0.063	1,647	1,590	1,712	35	32	39	99.42	2.23	97.89	1.68
03/21/22	0.014	0.014	9.144	8.431	10.295	0.053	0.049	0.074	1,613	1,538	1,713	34	31	40	99.42	2.24	97.87	1.67
03/22/22	0.014	0.014	9.248	8.586	10.295	0.065	0.056	0.078	1,697	1,613	1,806	36	32	42	99.30	2.15	97.86	1.67
03/23/22	0.014	0.014	9.124	8.349	9.994	0.065	0.060	0.077	1,740	1,647	1,840	37	33	43	99.28	2.15	97.86	1.67
03/24/22	0.014	0.014	9.039	8.472	9.759	0.067	0.061	0.079	1,802	1,748	1,859	38	33	43	99.26	2.13	97.89	1.68
03/25/22	0.015	0.017	8.958	8.284	10.098	0.069	0.058	0.089	1,774	1,683	1,877	37	32	43	99.23	2.11	97.90	1.68
03/26/22	0.014	0.014	8.979	8.173	9.951	0.064	0.055	0.089	1,762	1,696	1,844	37	33	42	99.28	2.14	97.91	1.68
03/27/22	0.014	0.014	9.085	8.247	10.193	0.058	0.051	0.064	1,701	1,635	1,783	35	33	40	99.36	2.20	97.92	1.68
03/28/22	0.014	0.014	9.094	8.460	10.098	0.052	0.048	0.059	1,620	1,552	1,680	33	30	37	99.43	2.24	97.95	1.69
03/29/22	0.014	0.014	9.213	8.528	10.098	0.054	0.051	0.062	1,656	1,549	1,827	34	29	41	99.42	2.23	97.95	1.69
03/30/22	0.014	0.014	9.216	8.477	9.978	0.058	0.054	0.064	1,748	1,647	1,901	36	31	42	99.37	2.20	97.96	1.69
03/31/22	0.014	0.014	9.326	8.847	9.978	0.060	0.053	0.068	1,796	1,707	1,902	37	33	43	99.36	2.19	97.94	1.69

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	UltraViolet / AOP Process online monitoring results					
Date	UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/L	Log Removal
03/01/22	97.34	89.368	23,939.1	0.28	3	6
03/02/22	97.12	89.099	24,448.2	0.28	3	6
03/03/22	97.07	91.744	24,716.4	0.28	3	6
03/04/22	96.96	92.192	24,793.6	0.27	3	6
03/05/22	97.17	88.902	24,731.7	0.27	3	6
03/06/22	97.10	89.669	24,522.1	0.28	3	6
03/07/22	97.23	88.779	24,674.1	0.28	3	6
03/08/22	97.23	89.667	24,668.0	0.28	3	6
03/09/22	97.10	88.912	24,625.0	0.27	3	6
03/10/22	97.18	91.585	24,401.7	0.27	3	6
03/11/22	97.17	91.613	24,670.7	0.27	3	6
03/12/22	97.12	92.082	24,632.0	0.27	3	6
03/13/22	97.51	86.810	24,621.6	0.27	3	6
03/14/22	97.58	89.519	23,600.1	0.27	3	6
03/15/22	97.58	89.525	24,628.2	0.28	3	6
03/16/22	97.54	89.522	24,624.6	0.27	3	6
03/17/22	97.63	88.027	24,481.9	0.27	3	6
03/18/22	97.59	87.970	24,570.0	0.28	3	6
03/19/22	97.72	89.700	24,340.2	0.28	3	6
03/20/22	97.95	89.572	24,637.3	0.27	3	6
03/21/22	97.78	89.621	24,631.2	0.27	3	6
03/22/22	97.86	89.620	24,619.8	0.27	3	6
03/23/22	97.86	85.169	24,615.0	0.27	3	6
03/24/22	97.93	80.280	23,763.9	0.28	3	6
03/25/22	97.61	91.426	22,537.3	0.28	3	6
03/26/22	97.74	94.426	23,960.9	0.26	3	6
03/27/22	97.91	92.258	24,317.6	0.26	3	6
03/28/22	98.02	89.521	24,315.5	0.26	3	6
03/29/22	98.03	89.690	24,268.7	0.27	3	6
03/30/22	97.99	92.502	24,491.9	0.27	3	6
03/31/22	97.84	92.306	25,006.7	0.27	3	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	MFE NTU		ROP NTU		TOC
	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
04/01/22	12.14	12.14	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/02/22	12.14	12.14	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/03/22	12.21	12.21	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/04/22	12.20	12.20	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/05/22	12.17	12.17	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/06/22	12.27	12.27	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/07/22	12.28	12.28	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/08/22	12.10	12.10	12.07	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/09/22	12.13	12.13	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/10/22	12.24	12.24	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/11/22	12.28	12.28	12.27	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/12/22	12.24	12.24	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/13/22	12.17	12.17	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/14/22	12.16	12.16	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/15/22	12.15	12.15	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/16/22	12.29	12.29	12.26	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/17/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A*	N/A*	N/A*	N/A*	N/A*
04/18/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A*	N/A*	N/A*	N/A*	N/A*
04/19/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A*	N/A*	N/A*	N/A*	N/A*
04/20/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A*	N/A*	N/A*	N/A*	N/A*
04/21/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A*	N/A*	N/A*	N/A*	N/A*
04/22/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A*	N/A*	N/A*	N/A*	N/A*
04/23/22	12.26	12.26	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/24/22	12.25	12.25	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/25/22	12.22	12.22	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/26/22	12.23	12.23	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/27/22	12.23	12.23	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/28/22	12.25	12.25	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/29/22	12.21	12.21	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/30/22	12.16	12.16	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

* GWRS AWPF offline for planned outage for GWRSFE construction project.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
04/01/22	0.00	4.00	2.13	6.00	0.00	12.14
04/02/22	0.00	4.01	2.13	6.00	0.00	12.14
04/03/22	0.00	4.01	2.19	6.00	0.00	12.21
04/04/22	0.00	4.01	2.19	6.00	0.00	12.20
04/05/22	0.00	4.02	2.15	6.00	0.00	12.17
04/06/22	0.00	4.08	2.18	6.00	0.00	12.27
04/07/22	0.00	4.07	2.21	6.00	0.00	12.28
04/08/22	0.00	4.03	2.07	6.00	0.00	12.10
04/09/22	0.00	4.01	2.12	6.00	0.00	12.13
04/10/22	0.00	4.04	2.20	6.00	0.00	12.24
04/11/22	0.00	4.01	2.27	6.00	0.00	12.28
04/12/22	0.00	4.01	2.23	6.00	0.00	12.24
04/13/22	0.00	4.00	2.17	6.00	0.00	12.17
04/14/22	0.00	4.02	2.14	6.00	0.00	12.16
04/15/22	0.00	4.02	2.13	6.00	0.00	12.15
04/16/22	0.00	4.03	2.26	6.00	0.00	12.29
04/17/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/18/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/19/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/20/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/21/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/22/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/23/22	0.00	4.08	2.18	6.00	0.00	12.26
04/24/22	0.00	4.04	2.21	6.00	0.00	12.25
04/25/22	0.00	4.02	2.20	6.00	0.00	12.22
04/26/22	0.00	4.06	2.17	6.00	0.00	12.23
04/27/22	0.00	4.03	2.20	6.00	0.00	12.23
04/28/22	0.00	4.02	2.23	6.00	0.00	12.25
04/29/22	0.00	4.01	2.20	6.00	0.00	12.21
04/30/22	0.00	4.01	2.16	6.00	0.00	12.16

Notes:

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Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
04/01/22	0.00	0.00	2.13	6.00	4.00	12.13
04/02/22	0.00	0.00	2.13	6.00	4.00	12.13
04/03/22	0.00	0.00	2.19	6.00	4.00	12.19
04/04/22	0.00	0.00	2.19	6.00	4.00	12.19
04/05/22	0.00	0.00	2.15	6.00	4.00	12.15
04/06/22	0.00	0.00	2.18	6.00	4.00	12.18
04/07/22	0.00	0.00	2.21	6.00	4.00	12.21
04/08/22	0.00	0.00	2.07	6.00	4.00	12.07
04/09/22	0.00	0.00	2.12	6.00	4.00	12.12
04/10/22	0.00	0.00	2.20	6.00	4.00	12.20
04/11/22	0.00	0.00	2.27	6.00	4.00	12.27
04/12/22	0.00	0.00	2.23	6.00	4.00	12.23
04/13/22	0.00	0.00	2.17	6.00	4.00	12.17
04/14/22	0.00	0.00	2.14	6.00	4.00	12.14
04/15/22	0.00	0.00	2.13	6.00	4.00	12.13
04/16/22	0.00	0.00	2.26	6.00	4.00	12.26
04/17/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/18/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/19/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/20/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/21/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/22/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/23/22	0.00	0.00	2.18	6.00	4.00	12.18
04/24/22	0.00	0.00	2.21	6.00	4.00	12.21
04/25/22	0.00	0.00	2.20	6.00	4.00	12.20
04/26/22	0.00	0.00	2.17	6.00	4.00	12.17
04/27/22	0.00	0.00	2.20	6.00	4.00	12.20
04/28/22	0.00	0.00	2.23	6.00	4.00	12.23
04/29/22	0.00	0.00	2.20	6.00	4.00	12.20
04/30/22	0.00	0.00	2.16	6.00	4.00	12.16

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

* GWRS AWPF offline for planned outage for GWRSFE construction project.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results															
	Log Removal Value															
	A01	A02	A03	A04	A05	A06	A07	A08	B01	B02	B03	B04	B05	B06	B07	B08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
04/01/22	4.27	4.33	4.14	4.06	4.20	4.01	4.17	4.02	4.87	5.16	5.05	5.05	5.21	4.83	5.14	5.06
04/02/22	4.21	4.34	4.10	4.05	4.22	4.01	4.14	4.02	4.90	5.10	5.06	5.03	5.23	5.05	5.12	5.18
04/03/22	4.23	4.35	4.16	4.05	4.15	4.15	4.16	4.03	4.92	5.17	5.06	5.03	5.22	5.12	5.15	5.15
04/04/22	4.21	4.33	4.19	4.05	4.15	4.18	4.33	4.01	4.87	5.14	5.04	5.01	5.21	5.11	5.13	5.14
04/05/22	4.18	4.17	4.20	4.02	4.14	4.18	4.34	4.20	5.21	5.11	5.04	5.04	5.19	5.10	5.12	5.10
04/06/22	4.18	4.26	4.16	4.17	4.17	4.14	4.35	4.25	5.38	5.09	5.04	4.99	5.22	5.08	5.11	5.10
04/07/22	4.19	4.51	4.09	4.21	4.15	4.10	4.31	4.12	5.30	5.06	4.99	4.97	5.17	5.07	5.10	5.09
04/08/22	4.14	4.45	4.11	4.04	4.11	4.03	4.27	4.08	5.25	5.04	5.00	4.95	5.18	5.07	5.12	5.08
04/09/22	4.11	4.43	4.11	4.01	4.08	4.06	4.27	4.11	5.24	5.01	4.98	4.88	5.16	5.05	5.08	5.08
04/10/22	4.28	4.31	4.05	4.05	4.06	4.05	4.21	4.05	5.21	4.99	4.94	4.92	5.14	5.05	5.05	5.07
04/11/22	4.27	4.37	N/A***	4.09	4.05	4.05	4.25	4.09	5.28	5.04	4.97	4.90	5.15	5.08	5.06	5.11
04/12/22	4.33	4.41	4.33	4.04	4.08	4.01	4.24	4.09	5.28	5.04	5.00	4.92	5.13	5.07	5.06	5.07
04/13/22	4.29	4.31	4.43	4.05	4.18	4.00	4.21	4.09	5.19	4.97	4.95	4.86	5.20	5.04	5.03	5.04
04/14/22	4.23	4.27	4.27	4.05	4.18	4.22	4.17	4.02	5.11	4.92	4.94	4.83	5.31	5.18	5.00	5.03
04/15/22	4.23	4.32	4.30	4.04	4.18	4.25	4.15	4.12	5.17	4.90	4.93	4.84	5.30	5.22	5.01	5.03
04/16/22	4.23	4.23	4.29	4.03	4.12	4.13	4.14	4.16	5.10	5.14	4.90	4.84	5.26	5.21	4.99	5.03
04/17/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/18/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/19/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/20/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/21/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/22/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/23/22	4.25	4.32	4.34	4.08	4.17	4.23	4.42	4.20	5.28	5.35	4.93	4.94	N/A**	N/A**	N/A**	N/A**
04/24/22	4.17	4.29	4.32	4.04	4.13	4.21	4.38	4.11	5.21	5.24	4.89	5.10	5.30	5.15	5.05	5.00
04/25/22	4.13	4.24	4.30	4.02	4.12	4.16	4.33	4.07	5.12	5.24	4.85	5.12	5.34	5.13	4.98	4.98
04/26/22	4.12	4.64	4.18	4.08	4.06	4.16	4.35	4.08	5.09	5.30	4.86	5.12	5.34	5.11	5.15	4.99
04/27/22	4.10	4.58	4.14	4.13	4.09	4.17	4.36	4.06	5.15	5.28	4.84	5.15	5.26	5.14	5.24	5.00
04/28/22	4.02	4.54	4.16	4.16	4.05	4.14	4.31	4.05	5.15	5.26	4.78	5.10	5.28	5.13	5.19	4.94
04/29/22	4.30	4.49	4.08	4.08	4.01	4.06	4.27	4.16	5.07	5.24	5.12	5.09	5.31	5.14	5.26	4.89
04/30/22	4.33	4.47	4.09	4.04	4.01	4.05	4.27	4.09	5.09	5.23	5.07	5.04	5.28	5.08	5.24	4.91

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* GWRS AWPF offline for planned outage for GWRSFE construction project.

** Cell not in service. *** Cell out of service for maintenance.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

MicroFiltration Process online monitoring results

Log Removal Value

Date	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
04/01/22	4.78	4.78	4.98	4.78	5.15	4.99	4.87	5.11	4.04	4.15	4.09	4.06	4.28	4.09	4.08	4.00
04/02/22	4.74	5.14	4.99	4.75	5.12	4.96	4.86	5.11	4.04	4.17	4.14	4.28	4.28	4.07	4.12	4.02
04/03/22	4.70	5.24	4.97	4.78	5.00	4.93	4.86	5.11	4.01	4.16	4.16	4.26	4.24	4.14	4.10	4.06
04/04/22	4.71	5.20	4.97	4.76	5.01	4.95	4.95	5.10	4.09	4.11	4.16	4.22	4.25	4.24	4.08	4.22
04/05/22	4.56	5.13	4.95	4.71	4.98	4.90	4.99	5.05	4.13	4.08	4.15	4.23	4.23	4.24	4.21	4.22
04/06/22	4.65	5.10	5.07	4.70	5.11	4.91	4.95	5.00	4.13	4.08	4.12	4.22	4.20	4.22	4.36	4.20
04/07/22	4.67	5.09	5.15	4.70	5.24	5.00	4.96	5.04	4.20	4.10	4.07	4.23	4.19	4.22	4.37	4.21
04/08/22	4.55	5.05	5.08	4.64	5.23	5.02	4.97	5.02	4.17	4.06	4.06	4.16	4.15	4.21	4.42	4.21
04/09/22	4.50	5.00	5.04	4.63	5.17	5.03	4.96	5.18	4.11	4.01	4.02	4.16	4.17	4.11	4.27	4.16
04/10/22	4.48	5.00	5.07	4.63	5.14	5.02	4.93	5.21	4.06	4.25	4.04	4.12	4.27	4.13	4.28	4.13
04/11/22	4.43	5.00	5.08	4.62	5.15	5.00	4.91	5.17	4.01	4.31	4.10	4.06	4.29	4.14	4.24	4.06
04/12/22	4.36	5.02	5.07	4.60	5.13	5.02	4.91	5.14	4.02	4.26	4.29	4.07	4.33	4.09	4.18	4.02
04/13/22	4.29	4.97	5.03	4.71	5.10	5.00	4.91	5.10	4.02	4.21	4.27	4.07	4.35	4.05	4.15	4.04
04/14/22	4.55	4.78	5.08	4.73	5.04	4.97	4.89	5.09	4.04	4.13	4.17	4.04	4.33	4.05	4.13	4.04
04/15/22	4.76	4.99	5.00	4.77	5.03	4.94	4.84	5.05	4.32	4.10	4.16	4.06	4.28	4.03	4.10	4.02
04/16/22	4.73	5.14	4.90	4.77	5.05	4.95	4.82	5.04	4.29	4.11	4.19	4.37	4.29	4.11	4.09	4.07
04/17/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/18/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/19/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/20/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/21/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/22/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/23/22	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**
04/24/22	4.79	5.13	5.05	4.79	5.05	4.98	5.11	5.10	4.31	4.13	4.12	4.30	4.31	4.32	4.27	4.30
04/25/22	5.00	5.07	4.94	4.73	5.11	4.91	4.99	5.03	4.28	4.07	4.10	4.23	4.19	4.20	4.47	4.20
04/26/22	5.04	5.08	4.98	4.73	5.20	5.08	5.00	4.99	4.27	4.07	4.09	4.25	4.18	4.23	4.37	4.19
04/27/22	4.99	5.08	5.13	4.74	5.23	5.13	5.02	5.04	4.20	4.06	4.03	4.23	4.19	4.27	4.33	4.18
04/28/22	4.98	4.98	5.14	4.70	5.22	5.04	5.02	5.10	4.19	4.04	4.05	4.24	4.02	4.21	4.34	4.20
04/29/22	4.95	4.95	5.21	4.64	5.19	5.02	5.01	5.18	4.22	4.11	4.06	4.23	4.08	4.18	4.34	4.19
04/30/22	4.94	4.98	5.17	4.63	5.14	5.04	5.00	5.18	4.17	4.30	4.01	4.16	4.25	4.16	4.24	4.18

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* GWRS AWPF offline for planned outage for GWRSFE construction project.

** Cell not in service.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

MicroFiltration Process online monitoring results

Log Removal Value

Date	E01 LRV	E02 LRV	E03 LRV	E04 LRV
04/01/22	4.09	4.14	4.04	4.37
04/02/22	4.15	4.12	4.05	4.50
04/03/22	4.17	4.13	4.06	4.40
04/04/22	4.18	4.10	4.20	4.40
04/05/22	4.16	4.09	4.32	4.45
04/06/22	4.19	4.11	4.19	4.40
04/07/22	4.23	4.07	4.14	4.38
04/08/22	4.15	4.08	4.25	4.42
04/09/22	4.20	4.07	4.13	4.47
04/10/22	4.18	4.04	4.09	4.41
04/11/22	4.17	4.03	4.25	4.58
04/12/22	4.17	4.02	4.13	4.53
04/13/22	4.13	4.10	4.20	4.54
04/14/22	4.06	4.19	4.27	4.70
04/15/22	4.07	4.14	4.16	4.52
04/16/22	4.09	4.13	4.09	4.48
04/17/22	N/A *	N/A *	N/A *	N/A *
04/18/22	N/A *	N/A *	N/A *	N/A *
04/19/22	N/A *	N/A *	N/A *	N/A *
04/20/22	N/A *	N/A *	N/A *	N/A *
04/21/22	N/A *	N/A *	N/A *	N/A *
04/22/22	N/A *	N/A *	N/A *	N/A *
04/23/22	N/A **	N/A **	N/A **	N/A **
04/24/22	N/A **	N/A **	N/A **	N/A **
04/25/22	N/A **	N/A **	N/A **	N/A **
04/26/22	4.27	4.20	4.35	4.76
04/27/22	4.23	4.14	4.31	4.66
04/28/22	4.22	4.11	4.20	4.52
04/29/22	4.18	4.14	4.15	4.47
04/30/22	4.16	4.09	4.21	4.57

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* GWRS AWPF offline for planned outage for GWRSFE construction project.

** Cell not in service.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

MicroFiltration Process online monitoring results

Effluent Turbidity - NTU

Date	A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		MFE
	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
04/01/22	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.05	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03
04/02/22	0.03	0.03	0.02	0.03	0.02	0.02	0.03	0.04	0.03	0.04	0.03	0.03	0.03	0.04	0.02	0.03	0.03	0.03	0.03
04/03/22	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03
04/04/22	0.03	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03
04/05/22	0.02	0.03	0.02	0.02	0.02	0.05	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
04/06/22	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.05	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
04/07/22	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.05	0.03	0.03	0.03	0.04	0.03	0.04	0.03	0.04	0.03
04/08/22	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
04/09/22	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
04/10/22	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03
04/11/22	0.03	0.04	0.02	0.04	0.02	0.02	0.03	0.03	0.03	0.05	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.04	0.03
04/12/22	0.03	0.03	0.02	0.02	0.02	0.05	0.03	0.08	0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.03	0.03	0.03	0.03
04/13/22	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.04	0.05	0.03	0.04	0.03	0.04	0.03	0.05	0.03	0.03	0.03
04/14/22	0.03	0.03	0.02	0.03	0.02	0.02	0.03	0.03	0.04	0.06	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03
04/15/22	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
04/16/22	0.03	0.04	0.02	0.05	0.02	0.05	0.03	0.03	0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.08	0.03
04/17/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/18/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/19/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/20/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/21/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/22/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/23/22	0.03	0.04	0.02	0.03	0.03	0.04	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	0.03
04/24/22	0.03	0.03	0.02	0.03	0.03	0.04	0.03	0.03	0.04	0.04	0.03	0.04	0.03	0.03	0.03	0.03	N/A**	N/A**	0.03
04/25/22	0.03	0.04	0.02	0.03	0.03	0.03	0.03	0.05	0.04	0.05	0.03	0.04	0.03	0.04	0.03	0.03	N/A**	N/A**	0.03
04/26/22	0.03	0.04	0.03	0.04	0.03	0.03	0.03	0.03	0.04	0.05	0.04	0.04	0.03	0.04	0.03	0.03	0.03	0.04	0.03
04/27/22	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.03	0.05	0.03	0.04	0.03	0.03	0.03	0.03	0.03
04/28/22	0.03	0.04	0.03	0.04	0.03	0.03	0.03	0.04	0.04	0.05	0.04	0.04	0.04	0.04	0.03	0.09	0.03	0.03	0.03
04/29/22	0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.04	0.04	0.05	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03
04/30/22	0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.03	0.04	0.06	0.04	0.06	0.04	0.05	0.03	0.03	0.03	0.04	0.03

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

* GWRS AWPF offline for planned outage for GWRSFE construction project.

** Cell not in service.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Reverse Osmosis Process online monitoring results																	
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
04/01/22	0.014	0.014	9.057	8.355	9.886	0.067	0.053	0.323**	1,778	1,695	1,856	38	32	47	99.26	2.13	97.88	1.67
04/02/22	0.014	0.014	9.074	8.478	9.969	0.068	0.059	0.091	1,750	1,688	1,836	37	33	41	99.25	2.13	97.91	1.68
04/03/22	0.014	0.014	8.817	8.192	9.803	0.056	0.052	0.060	1,672	1,614	1,759	34	32	38	99.36	2.19	97.94	1.69
04/04/22	0.014	0.014	8.963	8.247	10.175	0.058	0.051	0.074	1,607	1,525	1,746	33	30	39	99.36	2.19	97.94	1.69
04/05/22	0.014	0.014	9.103	8.352	10.279	0.065	0.060	0.073	1,719	1,631	1,854	35	31	41	99.29	2.15	97.98	1.69
04/06/22	0.014	0.014	8.826	8.099	9.928	0.058	0.054	0.062	1,760	1,665	1,892	36	32	43	99.34	2.18	97.94	1.69
04/07/22	0.014	0.014	9.269	8.586	10.158	0.057	0.049	0.066	1,780	1,693	1,867	38	34	45	99.38	2.21	97.85	1.67
04/08/22	0.014	0.014	9.076	6.703	11.186	0.078	0.047	0.167**	1,769	1,668	1,885	38	34	43	99.14	2.07	97.85	1.67
04/09/22	0.014	0.014	9.109	6.703	10.792	0.069	0.045	0.118**	1,766	1,698	1,852	37	34	41	99.25	2.12	97.90	1.68
04/10/22	0.014	0.014	8.884	8.025	10.294	0.056	0.043	0.077	1,686	1,607	1,769	36	33	41	99.37	2.20	97.87	1.67
04/11/22	0.014	0.014	8.864	8.124	9.768	0.048	0.043	0.054	1,640	1,555	1,738	36	33	39	99.46	2.27	97.83	1.66
04/12/22	0.014	0.014	8.874	8.166	9.778	0.053	0.046	0.058	1,740	1,649	1,893	37	34	41	99.41	2.23	97.87	1.67
04/13/22	0.014	0.014	8.708	8.022	9.539	0.059	0.054	0.087	1,783	1,704	1,890	38	35	43	99.32	2.17	97.84	1.67
04/14/22	0.014	0.014	8.660	7.847	9.460	0.062	0.053	0.087	1,800	1,716	1,910	40	36	44	99.28	2.14	97.80	1.66
04/15/22	0.014	0.014	8.815	7.937	9.425	0.065	0.051	0.100	1,799	1,705	1,890	40	35	44	99.26	2.13	97.80	1.66
04/16/22	0.014	0.014	8.718	7.944	9.381	0.048	0.044	0.054	1,778	1,727	1,864	39	34	45	99.45	2.26	97.81	1.66
04/17/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/18/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/19/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/20/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/21/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/22/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/23/22	0.014	0.014	9.389	8.379	10.776	0.062	0.051	0.082	1,734	1,671	1,807	39	29	45	99.34	2.18	97.74	1.65
04/24/22	0.014	0.014	9.488	8.410	10.870	0.059	0.046	0.076	1,706	1,651	1,776	38	35	43	99.38	2.21	97.75	1.65
04/25/22	0.014	0.014	9.375	8.580	10.775	0.060	0.047	0.090	1,653	1,566	1,761	36	33	41	99.36	2.20	97.80	1.66
04/26/22	0.014	0.014	9.580	8.702	10.877	0.065	0.058	0.084	1,747	1,640	1,886	38	31	44	99.32	2.17	97.85	1.67
04/27/22	0.014	0.014	9.239	8.669	9.994	0.058	0.052	0.068	1,771	1,700	1,860	38	34	43	99.37	2.20	97.84	1.67
04/28/22	0.014	0.014	9.174	8.523	9.994	0.054	0.050	0.067	1,763	1,701	1,835	39	34	44	99.41	2.23	97.81	1.66
04/29/22	0.014	0.014	9.261	8.652	9.924	0.059	0.051	0.073	1,782	1,714	1,878	39	35	44	99.37	2.20	97.81	1.66
04/30/22	0.014	0.014	9.398	8.387	10.793	0.065	0.054	0.091	1,751	1,693	1,832	37	33	43	99.30	2.16	97.86	1.67

Notes:

* GWRS AWPF offline for planned outage for GWRSFE construction project.

** Values affected by a short term TOC spike.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	UltraViolet / AOP Process online monitoring results					
	UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/L	Log Removal
04/01/22	97.79	92.560	24,872.5	0.27	3	6
04/02/22	97.94	89.814	24,652.7	0.27	3	6
04/03/22	97.94	89.741	24,646.2	0.27	3	6
04/04/22	97.72	89.800	24,665.8	0.27	3	6
04/05/22	97.59	89.804	24,696.6	0.27	3	6
04/06/22	97.20	89.777	24,676.3	0.27	3	6
04/07/22	96.86	83.261	24,681.9	0.28	3	6
04/08/22	96.62	94.925	23,129.5	0.28	3	6
04/09/22	96.68	93.777	24,581.0	0.26	3	6
04/10/22	96.78	87.942	24,450.4	0.26	3	6
04/11/22	96.71	85.217	22,918.0	0.26	3	6
04/12/22	96.42	85.225	22,323.9	0.26	3	6
04/13/22	96.44	83.112	22,402.7	0.26	3	6
04/14/22	96.40	89.128	23,512.5	0.27	3	6
04/15/22	96.35	88.627	24,597.5	0.27	3	6
04/16/22	96.84	69.755	22,428.3	0.27	3	6
04/17/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/18/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/19/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/20/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/21/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/22/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
04/23/22	97.32	63.046	4,869.2	0.30	3	6
04/24/22	96.88	86.140	18,505.2	0.27	3	6
04/25/22	97.27	82.209	22,585.1	0.26	3	6
04/26/22	97.12	83.387	22,181.2	0.27	3	6
04/27/22	97.06	91.672	23,086.2	0.27	3	6
04/28/22	97.21	88.515	24,789.5	0.26	3	6
04/29/22	97.14	93.279	23,193.6	0.25	3	6
04/30/22	97.28	92.715	24,080.3	0.26	3	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

* GWRS AWPF offline for planned outage for GWRSFE construction project.

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
							MFE		ROP		
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	NTU		NTU		TOC
	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
05/01/22	12.22	12.22	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/02/22	12.21	12.21	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/03/22	12.14	12.14	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/04/22	12.17	12.17	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/05/22	12.21	12.21	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/06/22	12.26	12.26	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/07/22	12.28	12.28	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/08/22	12.31	12.31	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/09/22	12.31	12.31	12.27	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/10/22	12.24	12.24	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/11/22	12.21	12.21	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/12/22	12.24	12.24	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/13/22	12.22	12.22	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/14/22	12.21	12.21	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/15/22	12.22	12.22	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/16/22	12.24	12.24	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/17/22	12.21	12.21	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/18/22	12.24	12.24	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/19/22	12.26	12.26	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/20/22	12.26	12.26	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/21/22	12.26	12.26	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/22/22	12.27	12.27	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/23/22	12.27	12.27	12.26	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/24/22	12.23	12.23	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/25/22	12.20	12.20	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/26/22	12.22	12.22	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/27/22	12.16	12.16	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/28/22	12.18	12.18	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/29/22	12.22	12.22	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/30/22	12.24	12.24	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/31/22	12.26	12.26	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
05/01/22	0.00	4.03	2.19	6.00	0.00	12.22
05/02/22	0.00	4.02	2.19	6.00	0.00	12.21
05/03/22	0.00	4.01	2.12	6.00	0.00	12.14
05/04/22	0.00	4.01	2.15	6.00	0.00	12.17
05/05/22	0.00	4.02	2.19	6.00	0.00	12.21
05/06/22	0.00	4.04	2.22	6.00	0.00	12.26
05/07/22	0.00	4.07	2.22	6.00	0.00	12.28
05/08/22	0.00	4.06	2.25	6.00	0.00	12.31
05/09/22	0.00	4.04	2.27	6.00	0.00	12.31
05/10/22	0.00	4.03	2.21	6.00	0.00	12.24
05/11/22	0.00	4.00	2.21	6.00	0.00	12.21
05/12/22	0.00	4.03	2.22	6.00	0.00	12.24
05/13/22	0.00	4.00	2.22	6.00	0.00	12.22
05/14/22	0.00	4.00	2.21	6.00	0.00	12.21
05/15/22	0.00	4.00	2.22	6.00	0.00	12.22
05/16/22	0.00	4.01	2.23	6.00	0.00	12.24
05/17/22	0.00	4.00	2.21	6.00	0.00	12.21
05/18/22	0.00	4.03	2.21	6.00	0.00	12.24
05/19/22	0.00	4.03	2.23	6.00	0.00	12.26
05/20/22	0.00	4.04	2.22	6.00	0.00	12.26
05/21/22	0.00	4.02	2.23	6.00	0.00	12.26
05/22/22	0.00	4.02	2.25	6.00	0.00	12.27
05/23/22	0.00	4.01	2.26	6.00	0.00	12.27
05/24/22	0.00	4.02	2.20	6.00	0.00	12.23
05/25/22	0.00	4.02	2.18	6.00	0.00	12.20
05/26/22	0.00	4.04	2.18	6.00	0.00	12.22
05/27/22	0.00	4.01	2.14	6.00	0.00	12.16
05/28/22	0.00	4.00	2.18	6.00	0.00	12.18
05/29/22	0.00	4.00	2.22	6.00	0.00	12.22
05/30/22	0.00	4.01	2.23	6.00	0.00	12.24
05/31/22	0.00	4.03	2.24	6.00	0.00	12.26

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
	LRV	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
05/01/22	0.00	0.00	2.19	6.00	4.00	12.19
05/02/22	0.00	0.00	2.19	6.00	4.00	12.19
05/03/22	0.00	0.00	2.12	6.00	4.00	12.12
05/04/22	0.00	0.00	2.15	6.00	4.00	12.15
05/05/22	0.00	0.00	2.19	6.00	4.00	12.19
05/06/22	0.00	0.00	2.22	6.00	4.00	12.22
05/07/22	0.00	0.00	2.22	6.00	4.00	12.22
05/08/22	0.00	0.00	2.25	6.00	4.00	12.25
05/09/22	0.00	0.00	2.27	6.00	4.00	12.27
05/10/22	0.00	0.00	2.21	6.00	4.00	12.21
05/11/22	0.00	0.00	2.21	6.00	4.00	12.21
05/12/22	0.00	0.00	2.22	6.00	4.00	12.22
05/13/22	0.00	0.00	2.22	6.00	4.00	12.22
05/14/22	0.00	0.00	2.21	6.00	4.00	12.21
05/15/22	0.00	0.00	2.22	6.00	4.00	12.22
05/16/22	0.00	0.00	2.23	6.00	4.00	12.23
05/17/22	0.00	0.00	2.21	6.00	4.00	12.21
05/18/22	0.00	0.00	2.21	6.00	4.00	12.21
05/19/22	0.00	0.00	2.23	6.00	4.00	12.23
05/20/22	0.00	0.00	2.22	6.00	4.00	12.22
05/21/22	0.00	0.00	2.23	6.00	4.00	12.23
05/22/22	0.00	0.00	2.25	6.00	4.00	12.25
05/23/22	0.00	0.00	2.26	6.00	4.00	12.26
05/24/22	0.00	0.00	2.20	6.00	4.00	12.20
05/25/22	0.00	0.00	2.18	6.00	4.00	12.18
05/26/22	0.00	0.00	2.18	6.00	4.00	12.18
05/27/22	0.00	0.00	2.14	6.00	4.00	12.14
05/28/22	0.00	0.00	2.18	6.00	4.00	12.18
05/29/22	0.00	0.00	2.22	6.00	4.00	12.22
05/30/22	0.00	0.00	2.23	6.00	4.00	12.23
05/31/22	0.00	0.00	2.24	6.00	4.00	12.24

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value															
	A01	A02	A03	A04	A05	A06	A07	A08	B01	B02	B03	B04	B05	B06	B07	B08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
05/01/22	4.32	4.41	4.09	4.04	N/A *	4.03	4.26	4.08	5.06	5.26	5.09	5.05	5.22	5.03	5.19	4.87
05/02/22	4.29	4.29	4.54	4.05	N/A *	4.02	4.21	4.07	5.04	5.15	5.00	5.03	5.18	5.02	5.16	5.07
05/03/22	4.26	4.38	4.30	4.04	4.10	4.15	4.16	4.02	4.98	5.15	5.01	4.98	5.18	5.24	5.16	5.17
05/04/22	4.26	4.38	4.22	4.16	4.30	4.20	4.17	4.04	4.98	5.18	5.01	4.98	5.27	5.29	5.17	5.15
05/05/22	4.26	4.28	4.32	4.06	4.27	4.17	4.32	4.02	4.95	5.19	4.99	4.98	5.23	5.23	5.20	5.09
05/06/22	4.19	4.26	4.22	4.04	4.27	4.15	4.37	4.16	5.38	5.13	4.96	4.99	5.19	5.24	5.16	5.07
05/07/22	4.21	4.25	4.18	4.07	4.18	4.12	4.32	4.10	5.36	5.20	4.94	4.99	5.21	5.19	5.13	5.07
05/08/22	4.20	4.27	4.18	4.06	4.18	4.13	4.34	4.16	5.31	5.18	4.95	4.95	5.21	5.16	5.16	5.05
05/09/22	4.23	4.57	4.19	4.04	4.21	4.09	4.36	4.16	5.34	5.12	4.93	4.96	5.17	5.16	5.19	5.05
05/10/22	4.10	4.47	4.12	4.06	4.10	4.03	4.29	4.12	5.33	5.08	4.89	4.97	5.17	5.15	5.16	5.02
05/11/22	4.29	4.51	4.14	4.17	4.12	4.04	4.31	4.12	5.31	5.12	4.89	4.90	5.13	5.13	5.10	5.00
05/12/22	4.28	4.47	4.12	4.08	4.08	4.03	4.30	4.09	5.40	5.09	4.88	4.92	5.12	5.16	5.09	4.97
05/13/22	4.31	4.35	4.12	4.06	4.05	4.03	4.26	4.07	5.31	5.04	4.88	4.88	5.10	5.14	5.10	5.00
05/14/22	4.27	4.41	4.09	4.07	4.03	4.00	4.21	4.07	5.29	5.07	4.88	4.84	5.09	5.20	5.11	4.99
05/15/22	4.21	4.38	4.12	4.07	4.05	4.29	4.20	4.07	5.27	5.09	4.89	4.82	5.26	5.16	5.10	4.97
05/16/22	4.20	4.29	4.20	4.05	4.28	4.18	4.19	4.11	5.29	5.03	4.86	4.77	5.27	5.13	5.08	4.98
05/17/22	4.23	4.23	4.28	4.04	4.26	4.13	4.18	4.12	5.29	5.00	4.82	4.75	5.36	5.11	5.08	4.97
05/18/22	4.16	4.25	4.14	4.03	4.27	4.09	4.32	4.10	5.26	5.31	4.81	4.69	5.38	5.10	5.02	4.96
05/19/22	4.14	4.26	4.19	4.03	4.30	4.08	4.36	4.10	5.23	5.45	4.79	4.69	5.31	5.11	5.02	4.94
05/20/22	4.13	4.23	4.19	N/A *	4.30	4.12	4.33	4.12	5.22	5.38	4.78	4.97	5.33	5.11	5.01	4.93
05/21/22	4.14	4.53	4.13	N/A *	4.22	4.06	4.28	4.06	5.18	5.33	4.74	5.07	5.30	5.10	4.99	4.89
05/22/22	4.10	4.43	4.09	N/A *	4.17	4.02	4.22	4.02	5.13	5.34	4.70	5.02	5.26	5.06	4.98	4.83
05/23/22	4.25	4.39	4.06	N/A *	4.13	4.02	4.28	4.02	5.10	5.33	4.67	5.05	5.23	5.06	4.93	4.83
05/24/22	4.33	4.37	4.03	4.44	4.12	4.05	4.26	4.14	5.06	5.28	4.61	5.01	5.22	5.07	4.93	4.83
05/25/22	4.32	4.36	4.06	4.31	4.19	4.02	4.22	4.10	5.09	5.28	5.06	5.04	5.22	5.06	4.96	4.81
05/26/22	4.26	4.33	4.04	4.14	4.05	4.23	4.20	4.07	5.04	5.23	5.08	4.99	5.21	5.03	5.16	4.79
05/27/22	4.24	4.22	4.06	4.14	4.09	4.22	4.18	4.03	5.04	5.22	5.03	5.01	5.19	5.04	5.21	4.77
05/28/22	4.18	4.24	4.02	4.15	4.10	4.16	4.13	4.04	5.01	5.29	4.96	4.99	5.19	4.99	5.22	5.00
05/29/22	4.21	4.26	4.25	4.06	4.26	4.10	4.14	4.02	4.95	5.26	4.98	4.97	5.20	5.24	5.22	5.04
05/30/22	4.19	4.26	4.33	4.10	4.26	4.09	4.01	4.02	4.99	5.24	4.98	4.94	5.17	5.27	5.21	5.08
05/31/22	4.19	4.17	4.21	4.10	4.21	4.10	4.38	4.13	4.95	5.23	4.92	4.93	5.16	5.23	5.22	5.12

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell offline for maintenance.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
05/01/22	4.87	4.97	5.10	4.75	5.12	5.04	5.00	5.18	4.13	4.26	4.04	4.09	4.29	4.17	4.19	4.09
05/02/22	4.90	4.91	5.05	4.83	5.11	5.03	5.00	5.15	4.10	4.25	4.17	4.05	4.29	4.13	4.17	4.10
05/03/22	4.88	4.87	5.01	4.77	5.05	5.02	4.96	5.13	4.07	4.22	4.20	4.02	4.33	4.10	4.18	4.09
05/04/22	4.83	5.04	5.05	4.75	5.08	5.00	4.93	5.11	4.17	4.22	4.21	4.01	4.32	4.12	4.21	4.05
05/05/22	4.84	5.05	5.06	4.71	5.14	4.95	4.94	5.09	4.28	4.17	4.18	4.11	4.28	4.15	4.22	4.12
05/06/22	4.78	5.04	5.02	4.71	5.12	4.91	4.97	5.08	4.26	4.13	4.14	4.22	4.29	4.18	4.10	4.36
05/07/22	4.84	5.02	5.01	4.71	5.06	4.91	4.98	5.08	4.25	4.14	4.13	4.16	4.30	4.22	4.24	4.27
05/08/22	4.99	5.00	5.03	4.67	5.07	4.91	4.98	5.07	4.21	4.12	4.13	4.13	4.23	4.23	4.38	4.24
05/09/22	5.06	5.01	5.15	4.65	5.14	4.95	5.01	5.05	4.18	4.11	4.11	4.17	4.18	4.24	4.33	4.15
05/10/22	5.03	5.01	5.17	4.65	5.15	5.05	5.00	5.01	4.16	4.06	4.05	4.16	4.18	4.23	4.32	4.15
05/11/22	5.00	4.95	5.17	4.59	5.11	5.04	4.97	5.03	4.11	4.03	4.00	4.06	4.10	4.19	4.32	4.15
05/12/22	4.96	4.91	5.18	4.56	5.11	5.00	4.95	5.09	4.09	4.08	4.06	4.07	4.13	4.17	4.28	4.09
05/13/22	4.97	4.86	5.15	4.59	5.11	5.00	4.96	5.08	4.06	4.21	4.22	4.07	4.29	4.14	4.24	4.07
05/14/22	4.98	4.88	5.17	4.85	5.14	5.00	4.97	5.11	4.06	4.21	4.17	4.06	4.33	4.08	4.23	4.10
05/15/22	4.94	4.90	5.14	4.91	5.14	4.96	4.90	5.12	4.03	4.21	4.15	4.06	4.32	4.07	4.17	4.02
05/16/22	4.87	5.18	5.07	4.86	5.05	4.95	4.89	5.05	4.17	4.12	4.12	4.04	4.26	4.04	4.17	4.01
05/17/22	4.88	5.17	5.03	4.83	5.00	4.94	4.91	4.98	4.27	4.07	4.06	4.13	4.24	4.17	4.13	4.00
05/18/22	4.84	5.15	5.10	4.83	4.98	4.92	5.02	4.97	4.18	4.04	4.06	4.22	4.20	4.29	4.10	4.09
05/19/22	4.81	5.12	5.10	4.82	4.98	4.89	5.09	4.99	4.10	4.06	4.08	4.21	4.21	4.24	4.18	4.22
05/20/22	4.81	5.11	4.96	4.81	5.11	4.90	4.99	4.99	4.09	4.06	4.04	4.17	4.20	4.24	4.36	4.21
05/21/22	4.94	5.08	5.11	4.77	5.17	4.95	4.94	4.98	4.09	4.03	4.02	4.17	4.11	4.23	4.34	4.18
05/22/22	5.00	5.08	5.14	4.72	5.12	5.03	4.94	4.91	4.07	4.02	4.03	4.11	4.06	4.21	4.31	4.15
05/23/22	4.93	5.06	5.11	4.69	5.13	5.05	4.97	5.03	4.06	4.06	4.01	4.09	4.03	4.16	4.31	4.15
05/24/22	4.93	5.06	5.13	4.67	5.12	5.01	4.96	5.14	4.03	4.04	4.02	4.10	4.04	4.12	4.25	4.11
05/25/22	4.91	5.02	5.14	4.64	5.09	4.98	4.93	5.06	4.09	4.06	4.24	4.06	4.12	4.07	4.19	4.07
05/26/22	4.84	4.95	5.09	4.78	5.08	4.95	4.92	5.05	4.31	4.12	4.13	4.04	4.20	4.09	4.20	4.05
05/27/22	4.83	4.98	4.94	4.91	5.07	4.91	4.90	5.04	4.28	4.11	4.13	4.05	4.23	4.07	4.12	4.04
05/28/22	4.82	4.96	4.98	4.84	5.03	4.89	4.88	5.02	4.27	4.10	4.13	4.37	4.23	4.05	4.13	4.00
05/29/22	4.81	5.02	5.02	4.83	5.01	4.89	4.87	5.00	4.22	4.07	4.09	4.24	4.21	4.05	4.13	4.00
05/30/22	4.77	5.14	4.97	4.79	4.98	4.88	4.83	5.00	4.19	4.07	4.04	4.24	4.14	4.27	4.10	4.27
05/31/22	4.72	5.15	4.88	4.78	4.93	4.82	4.95	5.01	4.20	4.03	4.06	4.26	4.03	4.23	4.12	4.28

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value			
	E01	E02	E03	E04
Date	LRV	LRV	LRV	LRV
05/01/22	4.15	4.10	4.14	4.48
05/02/22	4.12	4.07	4.25	4.51
05/03/22	4.06	4.01	4.26	4.63
05/04/22	4.05	4.02	4.22	4.54
05/05/22	4.12	4.07	4.13	4.44
05/06/22	4.23	4.21	4.15	4.49
05/07/22	4.19	4.22	4.26	4.68
05/08/22	4.16	4.16	4.23	4.53
05/09/22	4.11	4.12	4.22	4.56
05/10/22	4.04	4.13	4.17	4.66
05/11/22	4.03	4.04	4.24	4.43
05/12/22	4.03	4.03	4.27	4.53
05/13/22	4.00	4.04	4.15	4.62
05/14/22	4.26	4.03	4.25	4.52
05/15/22	4.19	4.00	4.32	4.49
05/16/22	4.22	4.31	4.20	4.49
05/17/22	4.21	4.18	4.11	4.58
05/18/22	4.19	4.18	4.08	4.76
05/19/22	4.19	4.18	4.22	4.56
05/20/22	4.17	4.18	4.19	4.64
05/21/22	4.13	4.14	4.21	4.70
05/22/22	4.07	4.14	4.25	4.54
05/23/22	4.20	4.07	4.20	4.40
05/24/22	4.26	4.08	4.32	4.50
05/25/22	4.19	4.04	4.23	4.52
05/26/22	4.17	4.05	4.19	4.44
05/27/22	4.16	4.01	4.34	4.59
05/28/22	4.15	4.03	4.22	4.52
05/29/22	4.13	4.13	4.26	4.52
05/30/22	4.09	4.14	4.29	4.61
05/31/22	4.03	4.18	4.32	4.50

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Date	MicroFiltration Process online monitoring results Effluent Turbidity - NTU																		
	A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		MFE
	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
05/01/22	0.030	0.062	0.031	0.037	0.036	0.045	0.031	0.040	0.044	0.049	0.049	0.057	0.040	0.045	0.032	0.114	0.034	0.043	0.036
05/02/22	0.030	0.043	0.033	0.039	0.037	0.047	0.032	0.048	0.045	0.047	0.058	0.068	0.040	0.043	0.031	0.034	0.033	0.036	0.038
05/03/22	0.029	0.036	0.029	0.041	0.031	0.048	0.032	0.045	0.042	0.048	0.051	0.101	0.037	0.044	0.030	0.035	0.032	0.036	0.035
05/04/22	0.028	0.040	0.022	0.033	0.021	0.023	0.028	0.032	0.038	0.041	0.029	0.044	0.033	0.044	0.027	0.079	0.028	0.030	0.028
05/05/22	0.028	0.030	0.022	0.029	0.022	0.024	0.028	0.034	0.040	0.041	0.032	0.090	0.033	0.036	0.028	0.079	0.029	0.047	0.029
05/06/22	0.028	0.031	0.022	0.031	0.022	0.030	0.029	0.061	0.039	0.042	0.032	0.036	0.033	0.036	0.027	0.028	0.028	0.033	0.029
05/07/22	0.028	0.042	0.023	0.026	0.022	0.025	0.028	0.032	0.040	0.044	0.036	0.043	0.034	0.043	0.028	0.045	0.028	0.031	0.030
05/08/22	0.028	0.030	0.021	0.024	0.021	0.024	0.028	0.031	0.041	0.045	0.041	0.048	0.034	0.037	0.027	0.029	0.028	0.031	0.030
05/09/22	0.029	0.044	0.022	0.024	0.022	0.024	0.029	0.043	0.042	0.053	0.050	0.057	0.035	0.048	0.028	0.030	0.029	0.034	0.032
05/10/22	0.030	0.036	0.023	0.026	0.023	0.025	0.031	0.033	0.044	0.053	0.056	0.063	0.037	0.043	0.029	0.031	0.031	0.036	0.034
05/11/22	0.031	0.067	0.022	0.042	0.022	0.025	0.037	0.046	0.040	0.045	0.043	0.063	0.033	0.040	0.034	0.049	0.031	0.033	0.033
05/12/22	0.029	0.035	0.021	0.026	0.021	0.023	0.040	0.094	0.037	0.038	0.027	0.030	0.029	0.040	0.038	0.058	0.031	0.032	0.030
05/13/22	0.028	0.032	0.021	0.023	0.021	0.023	0.040	0.042	0.037	0.041	0.028	0.030	0.029	0.033	0.038	0.040	0.031	0.037	0.030
05/14/22	0.029	0.033	0.022	0.024	0.022	0.024	0.041	0.049	0.039	0.043	0.028	0.033	0.030	0.034	0.038	0.043	0.033	0.043	0.031
05/15/22	0.029	0.039	0.023	0.030	0.022	0.024	0.042	0.046	0.038	0.040	0.029	0.032	0.030	0.032	0.038	0.040	0.034	0.043	0.032
05/16/22	0.029	0.032	0.023	0.028	0.022	0.025	0.041	0.045	0.039	0.042	0.029	0.033	0.031	0.034	0.039	0.042	0.034	0.044	0.032
05/17/22	0.030	0.033	0.023	0.026	0.022	0.028	0.042	0.046	0.039	0.041	0.030	0.033	0.032	0.038	0.039	0.045	0.037	0.041	0.033
05/18/22	0.029	0.034	0.023	0.027	0.023	0.026	0.041	0.046	0.039	0.044	0.031	0.036	0.031	0.035	0.039	0.043	0.034	0.041	0.032
05/19/22	0.030	0.033	0.023	0.027	0.024	0.028	0.042	0.103	0.039	0.048	0.032	0.037	0.031	0.035	0.040	0.043	0.030	0.031	0.032
05/20/22	0.030	0.033	0.022	0.027	0.023	0.027	0.040	0.044	0.039	0.042	0.032	0.036	0.031	0.036	0.039	0.043	0.030	0.041	0.032
05/21/22	0.030	0.034	0.022	0.024	0.023	0.025	0.040	0.044	0.039	0.045	0.033	0.043	0.032	0.039	0.039	0.041	0.031	0.032	0.032
05/22/22	0.029	0.032	0.022	0.024	0.023	0.025	0.040	0.043	0.038	0.041	0.032	0.038	0.031	0.034	0.039	0.042	0.032	0.033	0.032
05/23/22	0.030	0.034	0.022	0.025	0.023	0.025	0.041	0.054	0.039	0.041	0.033	0.037	0.032	0.035	0.040	0.043	0.035	0.038	0.033
05/24/22	0.031	0.033	0.023	0.026	0.023	0.027	0.042	0.059	0.040	0.042	0.035	0.041	0.033	0.051	0.040	0.059	0.037	0.040	0.034
05/25/22	0.031	0.035	0.023	0.025	0.024	0.027	0.041	0.048	0.040	0.042	0.035	0.038	0.033	0.040	0.040	0.057	0.040	0.043	0.034
05/26/22	0.030	0.033	0.023	0.029	0.023	0.027	0.041	0.049	0.034	0.042	0.036	0.041	0.032	0.036	0.040	0.043	0.036	0.043	0.033
05/27/22	0.029	0.036	0.021	0.023	0.022	0.023	0.039	0.043	0.030	0.031	0.036	0.040	0.031	0.035	0.039	0.046	0.030	0.032	0.031
05/28/22	0.029	0.032	0.022	0.031	0.022	0.025	0.040	0.042	0.030	0.035	0.037	0.041	0.032	0.035	0.039	0.046	0.031	0.035	0.031
05/29/22	0.030	0.034	0.023	0.027	0.022	0.024	0.041	0.051	0.031	0.033	0.038	0.043	0.032	0.034	0.040	0.044	0.033	0.035	0.032
05/30/22	0.030	0.034	0.023	0.028	0.022	0.025	0.041	0.046	0.030	0.034	0.038	0.045	0.032	0.036	0.041	0.047	0.035	0.040	0.032
05/31/22	0.030	0.037	0.023	0.030	0.022	0.025	0.041	0.046	0.031	0.035	0.039	0.045	0.033	0.041	0.041	0.048	0.039	0.041	0.033

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Reverse Osmosis Process online monitoring results																		
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
05/01/22	0.014	0.014	9.554	8.538	10.793	0.062	0.054	0.091	1,675	1,624	1,739	36	33	42	99.35	2.19	97.84	1.66
05/02/22	0.014	0.014	9.691	8.585	11.042	0.063	0.048	0.097	1,629	1,548	1,744	34	30	40	99.35	2.19	97.89	1.67
05/03/22	0.014	0.014	9.640	8.869	11.093	0.072	0.057	0.100 *	1,725	1,638	1,844	36	32	42	99.25	2.12	97.89	1.68
05/04/22	0.014	0.014	9.249	8.454	10.295	0.065	0.053	0.082	1,773	1,704	1,843	38	34	43	99.29	2.15	97.84	1.67
05/05/22	0.014	0.014	9.181	8.400	10.294	0.059	0.051	0.074	1,756	1,694	1,816	38	35	42	99.36	2.19	97.83	1.66
05/06/22	0.014	0.014	8.892	8.233	9.746	0.053	0.048	0.064	1,740	1,682	1,810	38	34	42	99.40	2.22	97.84	1.67
05/07/22	0.014	0.014	8.975	8.169	10.294	0.054	0.049	0.064	1,751	1,710	1,819	38	34	43	99.40	2.22	97.85	1.67
05/08/22	0.014	0.014	8.865	8.087	10.294	0.049	0.044	0.060	1,668	1,600	1,731	35	32	40	99.44	2.25	97.89	1.68
05/09/22	0.014	0.014	9.124	8.014	10.670	0.049	0.041	0.067	1,636	1,544	1,764	36	31	42	99.46	2.27	97.81	1.66
05/10/22	0.014	0.014	9.555	8.535	10.781	0.059	0.052	0.072	1,756	1,630	1,935	38	34	44	99.38	2.21	97.86	1.67
05/11/22	0.014	0.014	9.196	8.446	10.295	0.057	0.051	0.082	1,802	1,729	1,896	38	33	42	99.38	2.21	97.92	1.68
05/12/22	0.014	0.014	9.225	8.439	10.192	0.056	0.047	0.082	1,787	1,699	1,865	37	32	42	99.39	2.22	97.93	1.68
05/13/22	0.013	0.014	8.893	8.316	9.842	0.054	0.050	0.064	1,791	1,726	1,877	39	35	43	99.39	2.22	97.85	1.67
05/14/22	0.014	0.014	9.141	8.281	10.292	0.057	0.051	0.064	1,787	1,724	1,858	38	32	44	99.38	2.21	97.89	1.68
05/15/22	0.014	0.014	9.324	8.457	10.594	0.056	0.049	0.091	1,734	1,674	1,811	38	34	44	99.40	2.22	97.82	1.66
05/16/22	0.014	0.014	9.439	8.617	10.594	0.056	0.050	0.071	1,676	1,604	1,764	37	34	43	99.41	2.23	97.77	1.65
05/17/22	0.014	0.014	9.402	8.634	10.697	0.058	0.053	0.072	1,740	1,643	1,873	38	33	44	99.38	2.21	97.82	1.66
05/18/22	0.014	0.014	9.197	8.505	10.445	0.056	0.047	0.073	1,793	1,711	1,865	38	33	42	99.39	2.21	97.88	1.67
05/19/22	0.014	0.014	9.135	8.551	10.172	0.054	0.048	0.063	1,768	1,703	1,849	37	33	44	99.41	2.23	97.89	1.68
05/20/22	0.014	0.014	9.072	8.359	9.977	0.054	0.049	0.066	1,811	1,735	1,910	36	31	42	99.40	2.22	97.98	1.70
05/21/22	0.014	0.014	9.006	8.295	9.904	0.053	0.047	0.062	1,818	1,764	1,898	38	34	44	99.41	2.23	97.90	1.68
05/22/22	0.014	0.014	8.811	7.940	9.867	0.049	0.046	0.056	1,744	1,677	1,820	38	34	42	99.44	2.25	97.84	1.66
05/23/22	0.014	0.014	9.073	8.242	10.277	0.050	0.045	0.062	1,682	1,600	1,783	36	31	41	99.45	2.26	97.87	1.67
05/24/22	0.014	0.014	9.388	8.604	10.278	0.059	0.051	0.077	1,785	1,685	1,909	38	31	51	99.37	2.20	97.88	1.67
05/25/22	0.014	0.014	9.118	8.399	10.192	0.060	0.051	0.068	1,813	1,733	1,918	37	34	42	99.34	2.18	97.95	1.69
05/26/22	0.014	0.014	8.872	8.064	9.729	0.059	0.055	0.068	1,800	1,713	1,931	36	30	43	99.34	2.18	97.99	1.70
05/27/22	0.015	0.016	8.918	8.169	9.768	0.064	0.054	0.167 **	1,768	1,657	1,875	36	30	40	99.28	2.14	97.99	1.70
05/28/22	0.016	0.016	8.996	8.183	9.766	0.060	0.054	0.078	1,700	1,631	1,784	35	30	40	99.34	2.18	97.97	1.69
05/29/22	0.016	0.016	8.868	8.125	9.744	0.054	0.051	0.059	1,651	1,600	1,712	35	32	40	99.39	2.22	97.86	1.67
05/30/22	0.016	0.016	8.729	7.969	9.961	0.051	0.049	0.057	1,571	1,527	1,628	34	30	38	99.41	2.23	97.84	1.66
05/31/22	0.016	0.016	8.875	8.071	9.875	0.052	0.047	0.064	1,525	1,433	1,664	32	27	38	99.42	2.24	97.90	1.68

Notes:

* Values affected by a short term TOC spike.

** ROP TOC above internal critical control point (0.1 mg/L) observed for less than 15 min. Value on backup ROP TOC analyzer was not elevated.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	UltraViolet / AOP Process online monitoring results					
	UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/L	Log Removal
05/01/22	97.15	89.750	24,002.5	0.26	3	6
05/02/22	97.12	89.173	24,071.1	0.27	3	6
05/03/22	97.14	90.859	24,034.0	0.27	3	6
05/04/22	97.11	90.228	24,080.7	0.27	3	6
05/05/22	97.15	89.220	23,737.5	0.27	3	6
05/06/22	97.25	91.709	23,702.0	0.26	3	6
05/07/22	97.13	92.373	24,152.6	0.26	3	6
05/08/22	97.06	90.256	24,245.2	0.26	3	6
05/09/22	97.09	89.603	24,352.4	0.27	3	6
05/10/22	96.78	89.661	24,263.4	0.27	3	6
05/11/22	96.93	90.208	24,274.8	0.27	3	6
05/12/22	97.01	87.438	24,091.3	0.27	3	6
05/13/22	97.01	94.163	23,771.3	0.27	3	6
05/14/22	97.02	87.820	24,085.1	0.26	3	6
05/15/22	96.81	90.021	23,731.2	0.27	3	6
05/16/22	96.84	89.884	24,451.1	0.27	3	6
05/17/22	96.61	89.891	24,091.2	0.27	3	6
05/18/22	97.07	89.825	24,369.6	0.27	3	6
05/19/22	97.04	86.193	24,520.5	0.27	3	6
05/20/22	97.10	90.021	24,259.6	0.27	3	6
05/21/22	96.91	91.810	24,153.8	0.27	3	6
05/22/22	96.78	91.008	24,287.2	0.27	3	6
05/23/22	96.88	87.968	24,307.3	0.27	3	6
05/24/22	96.80	88.801	23,858.1	0.27	3	6
05/25/22	96.86	90.712	23,754.5	0.27	3	6
05/26/22	96.92	93.654	24,152.9	0.27	3	6
05/27/22	96.91	93.558	24,145.2	0.26	3	6
05/28/22	97.14	93.056	24,035.4	0.26	3	6
05/29/22	97.12	90.106	24,011.6	0.26	3	6
05/30/22	97.17	89.923	24,002.3	0.27	3	6
05/31/22	97.14	88.846	24,011.0	0.27	3	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
							MFE		ROP		
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	NTU		NTU		TOC
Date	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
06/01/22	12.15	12.15	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/02/22	12.13	12.13	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/03/22	12.17	12.17	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/04/22	12.18	12.18	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/05/22	12.25	12.25	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/06/22	12.24	12.24	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/07/22	12.18	12.18	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/08/22	12.12	12.12	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/09/22	12.16	12.16	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/10/22	12.17	12.17	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/11/22	12.18	12.18	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/12/22	12.24	12.24	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/13/22	12.22	12.22	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/14/22	12.18	12.18	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/15/22	12.17	12.17	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/16/22	12.12	12.12	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/17/22	12.17	12.17	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/18/22	12.18	12.18	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/19/22	12.20	12.20	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/20/22	12.25	12.25	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/21/22	12.25	12.25	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/22/22	12.27	12.27	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/23/22	12.20	12.20	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/24/22	12.16	12.16	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/25/22	12.18	12.18	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/26/22	12.19	12.19	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/27/22	12.19	12.19	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/28/22	12.17	12.17	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/29/22	12.13	12.13	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/30/22	12.14	12.14	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
06/01/22	0.00	4.02	2.14	6.00	0.00	12.15
06/02/22	0.00	4.00	2.13	6.00	0.00	12.13
06/03/22	0.00	4.01	2.16	6.00	0.00	12.17
06/04/22	0.00	4.00	2.18	6.00	0.00	12.18
06/05/22	0.00	4.03	2.23	6.00	0.00	12.25
06/06/22	0.00	4.03	2.21	6.00	0.00	12.24
06/07/22	0.00	4.03	2.15	6.00	0.00	12.18
06/08/22	0.00	4.01	2.11	6.00	0.00	12.12
06/09/22	0.00	4.03	2.13	6.00	0.00	12.16
06/10/22	0.00	4.02	2.15	6.00	0.00	12.17
06/11/22	0.00	4.01	2.17	6.00	0.00	12.18
06/12/22	0.00	4.06	2.19	6.00	0.00	12.24
06/13/22	0.00	4.02	2.19	6.00	0.00	12.22
06/14/22	0.00	4.03	2.15	6.00	0.00	12.18
06/15/22	0.00	4.02	2.14	6.00	0.00	12.17
06/16/22	0.00	4.01	2.11	6.00	0.00	12.12
06/17/22	0.00	4.01	2.16	6.00	0.00	12.17
06/18/22	0.00	4.02	2.16	6.00	0.00	12.18
06/19/22	0.00	4.01	2.20	6.00	0.00	12.20
06/20/22	0.00	4.01	2.24	6.00	0.00	12.25
06/21/22	0.00	4.00	2.24	6.00	0.00	12.25
06/22/22	0.00	4.03	2.25	6.00	0.00	12.27
06/23/22	0.00	4.01	2.19	6.00	0.00	12.20
06/24/22	0.00	4.04	2.12	6.00	0.00	12.16
06/25/22	0.00	4.04	2.14	6.00	0.00	12.18
06/26/22	0.00	4.02	2.17	6.00	0.00	12.19
06/27/22	0.00	4.02	2.17	6.00	0.00	12.19
06/28/22	0.00	4.04	2.13	6.00	0.00	12.17
06/29/22	0.00	4.01	2.12	6.00	0.00	12.13
06/30/22	0.00	4.00	2.14	6.00	0.00	12.14

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
	LRV	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
06/01/22	0.00	0.00	2.14	6.00	4.00	12.14
06/02/22	0.00	0.00	2.13	6.00	4.00	12.13
06/03/22	0.00	0.00	2.16	6.00	4.00	12.16
06/04/22	0.00	0.00	2.18	6.00	4.00	12.18
06/05/22	0.00	0.00	2.23	6.00	4.00	12.23
06/06/22	0.00	0.00	2.21	6.00	4.00	12.21
06/07/22	0.00	0.00	2.15	6.00	4.00	12.15
06/08/22	0.00	0.00	2.11	6.00	4.00	12.11
06/09/22	0.00	0.00	2.13	6.00	4.00	12.13
06/10/22	0.00	0.00	2.15	6.00	4.00	12.15
06/11/22	0.00	0.00	2.17	6.00	4.00	12.17
06/12/22	0.00	0.00	2.19	6.00	4.00	12.19
06/13/22	0.00	0.00	2.19	6.00	4.00	12.19
06/14/22	0.00	0.00	2.15	6.00	4.00	12.15
06/15/22	0.00	0.00	2.14	6.00	4.00	12.14
06/16/22	0.00	0.00	2.11	6.00	4.00	12.11
06/17/22	0.00	0.00	2.16	6.00	4.00	12.16
06/18/22	0.00	0.00	2.16	6.00	4.00	12.16
06/19/22	0.00	0.00	2.20	6.00	4.00	12.20
06/20/22	0.00	0.00	2.24	6.00	4.00	12.24
06/21/22	0.00	0.00	2.24	6.00	4.00	12.24
06/22/22	0.00	0.00	2.25	6.00	4.00	12.25
06/23/22	0.00	0.00	2.19	6.00	4.00	12.19
06/24/22	0.00	0.00	2.12	6.00	4.00	12.12
06/25/22	0.00	0.00	2.14	6.00	4.00	12.14
06/26/22	0.00	0.00	2.17	6.00	4.00	12.17
06/27/22	0.00	0.00	2.17	6.00	4.00	12.17
06/28/22	0.00	0.00	2.13	6.00	4.00	12.13
06/29/22	0.00	0.00	2.12	6.00	4.00	12.12
06/30/22	0.00	0.00	2.14	6.00	4.00	12.14

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value															
	A01	A02	A03	A04	A05	A06	A07	A08	B01	B02	B03	B04	B05	B06	B07	B08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
06/01/22	4.16	4.18	4.20	4.05	4.14	4.09	4.35	4.14	5.35	5.20	4.89	4.92	5.15	5.21	5.19	5.10
06/02/22	4.13	4.60	4.17	4.06	4.15	4.11	4.33	4.12	5.29	5.16	4.89	4.90	5.12	5.21	5.15	5.07
06/03/22	4.06	4.47	4.20	4.16	4.15	4.02	4.29	4.13	5.24	5.14	4.85	4.88	5.08	5.26	5.14	5.06
06/04/22	4.09	4.51	4.22	4.27	4.17	4.00	4.30	4.13	5.27	5.17	4.88	4.88	5.08	5.22	5.13	5.06
06/05/22	4.29	4.47	4.11	4.17	4.10	4.04	4.28	4.05	5.22	5.10	4.88	4.90	5.12	5.20	5.16	5.03
06/06/22	4.40	4.50	4.12	4.19	4.15	4.05	4.31	4.07	5.30	5.10	4.87	4.83	5.13	5.19	5.16	5.02
06/07/22	4.34	4.49	4.14	4.18	4.08	4.03	4.32	4.10	5.28	5.09	4.86	4.81	5.07	5.18	5.15	5.06
06/08/22	4.33	4.43	4.07	4.14	4.02	4.22	4.25	4.05	5.25	5.11	4.86	4.84	5.11	5.23	5.17	5.08
06/09/22	4.37	4.54	4.13	4.19	4.11	4.23	4.30	4.07	5.31	5.19	4.87	4.85	5.09	5.24	5.21	5.06
06/10/22	4.35	4.46	4.15	4.10	4.04	4.16	4.24	4.17	5.28	5.05	4.82	4.78	5.25	5.19	5.15	5.01
06/11/22	4.36	4.37	4.31	4.04	4.26	4.19	4.21	4.16	5.26	5.04	4.77	4.78	5.34	5.18	5.11	4.99
06/12/22	4.31	4.39	4.30	4.06	4.20	4.17	4.20	4.12	5.23	5.00	4.77	4.76	5.32	5.19	5.14	4.98
06/13/22	4.25	4.34	4.29	4.02	4.17	4.11	4.05	4.10	5.24	5.42	4.82	4.71	5.31	5.19	5.11	4.99
06/14/22	4.25	4.34	4.24	4.03	4.16	4.16	4.37	4.10	5.20	5.44	4.76	4.68	5.31	5.22	5.10	5.02
06/15/22	4.25	4.55	4.18	4.02	4.13	4.10	4.35	4.05	5.15	5.48	4.77	4.95	5.33	5.18	5.11	4.96
06/16/22	4.21	4.53	4.11	4.13	4.06	4.01	4.33	4.05	5.20	5.39	4.75	5.00	5.28	5.14	5.08	4.91
06/17/22	4.21	4.50	4.11	4.23	4.03	4.04	4.33	4.05	5.08	5.37	4.71	4.97	5.28	5.13	5.06	4.91
06/18/22	4.17	4.41	4.09	4.19	4.05	4.04	4.31	4.02	5.11	5.31	4.68	4.96	5.28	5.13	5.08	4.89
06/19/22	4.34	4.42	4.01	4.15	4.04	4.01	4.31	4.11	5.09	5.37	4.65	4.97	5.23	5.13	5.07	4.87
06/20/22	4.35	4.42	4.09	4.13	4.01	4.02	4.29	4.13	5.09	5.43	4.65	4.99	5.26	5.10	5.04	4.87
06/21/22	4.35	4.49	4.05	4.15	4.00	4.17	4.25	4.14	5.14	5.48	4.97	4.98	5.28	5.10	5.07	4.88
06/22/22	4.35	4.44	4.04	4.16	4.13	4.21	4.28	4.10	5.18	5.44	5.04	4.95	5.27	5.13	5.09	4.87
06/23/22	4.33	4.45	4.26	4.10	4.25	4.18	4.27	4.06	5.08	5.43	5.04	4.97	5.25	5.10	5.04	5.04
06/24/22	4.31	4.36	4.30	4.07	4.23	4.15	4.26	4.04	5.04	5.42	5.05	4.95	5.22	5.25	5.00	5.13
06/25/22	4.28	4.41	4.29	4.04	4.19	4.12	4.24	4.05	5.09	5.42	5.00	4.94	5.27	5.36	5.02	5.15
06/26/22	4.28	4.37	4.29	4.02	4.18	4.14	4.28	4.02	5.07	5.38	4.99	4.93	5.27	5.37	5.18	5.18
06/27/22	4.26	4.37	4.30	4.03	4.17	4.12	4.37	4.02	5.07	5.35	4.99	4.92	5.22	5.34	5.23	5.16
06/28/22	4.24	4.57	4.24	4.12	4.14	4.07	4.35	4.18	5.30	5.36	4.95	4.93	5.23	5.36	5.23	5.12
06/29/22	4.20	4.59	4.17	4.26	4.11	4.05	4.35	4.20	5.30	5.29	4.92	4.89	5.17	5.32	5.19	5.09
06/30/22	4.16	4.55	4.11	4.24	4.08	4.05	4.32	4.16	5.29	5.25	4.91	4.86	5.18	5.26	5.20	5.12

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
06/01/22	4.69	5.10	4.90	4.77	4.89	4.80	5.05	4.92	4.16	4.02	4.07	4.23	4.02	4.19	4.17	4.23
06/02/22	4.99	5.08	4.85	4.75	5.07	4.79	5.00	4.87	4.13	4.00	4.02	4.19	4.03	4.19	4.37	4.22
06/03/22	5.04	5.06	5.04	4.73	5.18	5.00	5.02	4.87	4.09	4.01	4.20	4.15	4.04	4.18	4.31	4.20
06/04/22	5.00	5.02	5.19	4.72	5.16	5.08	5.03	4.84	4.11	4.00	4.21	4.15	4.06	4.21	4.25	4.18
06/05/22	5.01	5.02	5.28	4.69	5.16	5.10	4.97	5.03	4.14	4.15	4.18	4.15	4.03	4.23	4.26	4.19
06/06/22	5.01	5.05	5.30	4.65	5.20	5.06	5.00	5.18	4.08	4.32	4.15	4.12	4.07	4.24	4.28	4.18
06/07/22	5.03	5.04	5.21	4.62	5.14	5.01	5.02	5.12	4.15	4.32	4.17	4.10	4.23	4.20	4.29	4.12
06/08/22	5.10	5.13	5.22	5.00	5.19	5.02	4.99	5.17	4.32	4.35	4.22	4.13	4.40	4.23	4.28	4.15
06/09/22	5.06	5.13	5.20	4.93	5.16	5.03	5.01	5.15	4.29	4.34	4.18	4.12	4.39	4.19	4.28	4.13
06/10/22	5.00	4.95	5.11	4.89	5.12	5.01	4.99	5.11	4.24	4.19	4.11	4.28	4.35	4.11	4.25	5.90 *
06/11/22	4.98	5.17	5.14	4.84	5.12	4.99	4.94	5.11	4.25	4.20	4.12	4.27	4.28	4.12	4.24	4.05
06/12/22	4.96	5.21	5.13	4.80	5.14	4.98	4.93	5.09	4.23	4.20	4.10	4.26	4.29	4.20	4.23	4.10
06/13/22	4.94	5.15	5.09	4.78	5.14	5.00	5.01	5.10	4.21	4.17	4.08	4.25	4.26	4.30	4.23	4.26
06/14/22	4.92	5.10	5.04	4.76	5.10	4.99	5.05	5.12	4.19	4.14	4.06	4.24	4.27	4.28	4.20	4.24
06/15/22	4.88	5.08	5.01	4.74	5.19	4.99	5.01	5.04	4.14	4.12	4.03	4.19	4.24	4.23	4.21	4.22
06/16/22	5.06	5.04	5.03	4.72	5.28	5.03	4.99	5.02	4.06	4.09	4.13	4.13	4.24	4.19	4.33	4.21
06/17/22	5.05	4.97	5.17	4.63	5.15	5.03	4.98	5.03	4.01	4.05	4.18	4.09	4.21	4.14	4.31	4.19
06/18/22	4.98	4.96	5.18	4.59	5.20	5.03	4.95	5.07	4.02	4.04	4.16	4.08	4.21	4.18	4.28	4.17
06/19/22	4.97	4.97	5.17	4.59	5.17	5.05	4.93	5.14	4.02	4.14	4.17	4.05	4.19	4.14	4.26	4.16
06/20/22	4.99	4.99	5.13	4.63	5.16	5.06	4.97	5.20	4.14	4.26	4.11	4.03	4.21	4.13	4.22	4.16
06/21/22	5.00	4.96	5.11	4.80	5.16	5.02	4.98	5.18	4.25	4.26	4.09	4.03	4.31	4.14	4.17	4.11
06/22/22	4.99	4.93	5.12	4.89	5.13	5.00	4.93	5.14	4.17	4.22	4.07	4.23	4.34	4.15	4.19	4.11
06/23/22	4.97	4.92	5.08	4.81	5.11	4.98	4.91	5.10	4.17	4.18	4.04	4.31	4.33	4.10	4.18	4.05
06/24/22	4.99	4.84	5.15	4.78	5.08	4.95	4.93	5.09	4.18	4.18	4.06	4.22	4.30	4.17	4.18	4.04
06/25/22	4.97	4.84	5.19	4.78	5.08	4.95	4.92	5.10	4.16	4.14	4.06	4.22	4.29	4.28	4.12	4.16
06/26/22	4.97	4.86	5.16	4.77	5.10	4.98	4.92	5.06	4.12	4.13	4.05	4.24	4.25	4.28	4.14	4.32
06/27/22	4.96	4.86	5.15	4.76	5.10	4.98	4.89	5.04	4.08	4.14	4.04	4.18	4.26	4.25	4.21	4.27
06/28/22	4.94	4.81	5.15	4.73	5.09	4.96	4.85	5.05	4.05	4.05	4.04	4.14	4.20	4.25	4.32	4.27
06/29/22	4.90	4.75	5.03	4.69	4.99	4.88	4.83	5.02	4.01	4.01	4.20	4.14	4.16	4.19	4.28	4.19
06/30/22	4.89	4.70	4.99	4.63	4.96	4.87	4.79	4.99	4.00	4.00	4.13	4.09	4.13	4.15	4.27	4.15

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Value is being investigated as a possible instrumentation issue.

	MicroFiltration Process online monitoring results Log Removal Value			
	E01	E02	E03	E04
Date	LRV	LRV	LRV	LRV
06/01/22	4.03	4.13	4.32	4.42
06/02/22	4.18	4.12	4.32	4.85
06/03/22	4.14	4.14	4.42	4.46
06/04/22	4.08	4.06	4.40	4.50
06/05/22	4.08	4.05	4.36	4.60
06/06/22	4.05	4.03	4.46	4.58
06/07/22	4.06	4.04	4.45	4.52
06/08/22	4.07	4.01	4.59	4.66
06/09/22	4.05	4.03	4.56	4.68
06/10/22	4.02	4.04	4.47	4.46
06/11/22	4.01	4.06	4.47	4.51
06/12/22	4.09	4.30	4.56	4.64
06/13/22	4.25	4.18	4.51	4.47
06/14/22	4.23	4.17	4.47	4.48
06/15/22	4.21	4.15	4.54	4.61
06/16/22	4.16	4.17	4.45	4.49
06/17/22	4.15	4.10	4.40	4.52
06/18/22	4.17	4.08	4.46	4.65
06/19/22	4.16	4.04	4.46	4.49
06/20/22	4.14	4.07	4.39	4.58
06/21/22	4.14	4.08	4.38	4.66
06/22/22	4.23	4.03	4.35	4.61
06/23/22	4.21	4.01	4.36	4.55
06/24/22	4.20	4.31	4.54	4.61
06/25/22	4.16	4.29	4.30	4.54
06/26/22	4.14	4.28	4.46	4.59
06/27/22	4.17	4.22	4.52	4.56
06/28/22	4.12	4.20	4.45	4.57
06/29/22	4.04	4.17	4.47	4.58
06/30/22	4.02	4.14	4.44	4.70

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Effluent Turbidity - NTU																		
	A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		MFE
Date	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
06/01/22	0.031	0.041	0.023	0.027	0.023	0.029	0.041	0.046	0.031	0.035	0.039	0.044	0.033	0.042	0.041	0.045	0.041	0.053	0.034
06/02/22	0.031	0.038	0.023	0.027	0.023	0.025	0.041	0.044	0.031	0.035	0.040	0.046	0.035	0.056	0.042	0.043	0.045	0.048	0.035
06/03/22	0.032	0.035	0.024	0.028	0.024	0.025	0.043	0.046	0.034	0.040	0.041	0.045	0.036	0.050	0.043	0.045	0.049	0.051	0.036
06/04/22	0.032	0.036	0.024	0.026	0.023	0.026	0.042	0.047	0.032	0.035	0.040	0.057	0.037	0.062	0.042	0.047	0.053	0.057	0.036
06/05/22	0.032	0.036	0.024	0.027	0.023	0.025	0.042	0.048	0.032	0.034	0.041	0.046	0.037	0.053	0.043	0.046	0.057	0.062	0.037
06/06/22	0.031	0.034	0.023	0.039	0.022	0.025	0.041	0.055	0.032	0.036	0.040	0.056	0.036	0.049	0.042	0.045	0.061	0.065	0.036
06/07/22	0.031	0.036	0.024	0.029	0.023	0.027	0.042	0.046	0.033	0.040	0.038	0.044	0.036	0.041	0.042	0.046	0.047	0.066	0.035
06/08/22	0.034	0.130	0.025	0.045	0.025	0.029	0.044	0.062	0.037	0.053	0.039	0.064	0.038	0.060	0.044	0.061	0.034	0.067	0.036
06/09/22	0.032	0.052	0.023	0.025	0.023	0.025	0.042	0.048	0.033	0.037	0.038	0.043	0.037	0.041	0.042	0.044	0.033	0.038	0.034
06/10/22	0.031	0.034	0.022	0.024	0.022	0.024	0.043	0.047	0.031	0.039	0.039	0.043	0.036	0.046	0.041	0.048	0.032	0.034	0.033
06/11/22	0.030	0.035	0.022	0.029	0.022	0.024	0.042	0.046	0.032	0.034	0.041	0.046	0.036	0.040	0.042	0.045	0.034	0.041	0.034
06/12/22	0.031	0.037	0.023	0.031	0.023	0.026	0.043	0.046	0.032	0.037	0.046	0.052	0.037	0.044	0.043	0.048	0.036	0.039	0.035
06/13/22	0.032	0.034	0.023	0.025	0.024	0.027	0.043	0.046	0.033	0.044	0.051	0.057	0.037	0.039	0.043	0.045	0.037	0.042	0.036
06/14/22	0.031	0.034	0.023	0.030	0.023	0.027	0.042	0.046	0.032	0.040	0.051	0.057	0.036	0.039	0.042	0.046	0.033	0.040	0.035
06/15/22	0.031	0.034	0.022	0.026	0.024	0.028	0.041	0.046	0.032	0.038	0.057	0.062	0.037	0.041	0.041	0.045	0.029	0.035	0.035
06/16/22	0.033	0.035	0.024	0.026	0.025	0.027	0.043	0.046	0.035	0.038	0.059	0.067	0.040	0.049	0.043	0.043	0.030	0.032	0.037
06/17/22	0.032	0.036	0.022	0.025	0.024	0.026	0.042	0.046	0.033	0.036	0.058	0.065	0.039	0.047	0.042	0.044	0.030	0.034	0.036
06/18/22	0.031	0.035	0.023	0.027	0.024	0.026	0.042	0.046	0.033	0.036	0.069	0.080	0.041	0.046	0.042	0.044	0.030	0.033	0.037
06/19/22	0.031	0.034	0.023	0.027	0.023	0.026	0.042	0.047	0.033	0.038	0.095	0.113	0.042	0.046	0.043	0.057	0.031	0.036	0.040
06/20/22	0.033	0.038	0.024	0.042	0.025	0.030	0.044	0.050	0.036	0.042	0.121	0.140	0.045	0.087	0.045	0.053	0.033	0.037	0.045
06/21/22	0.030	0.035	0.023	0.027	0.024	0.028	0.041	0.046	0.036	0.038	0.140	0.148	0.046	0.052	0.045	0.047	0.034	0.037	0.046
06/22/22	0.028	0.032	0.021	0.026	0.022	0.024	0.038	0.040	0.033	0.037	0.089	0.147	0.037	0.050	0.040	0.046	0.031	0.036	0.038
06/23/22	0.028	0.031	0.021	0.023	0.023	0.024	0.039	0.045	0.033	0.034	0.035	0.037	0.032	0.036	0.039	0.040	0.029	0.035	0.031
06/24/22	0.029	0.032	0.021	0.026	0.023	0.026	0.040	0.049	0.033	0.037	0.036	0.041	0.032	0.039	0.039	0.043	0.029	0.038	0.031
06/25/22	0.028	0.031	0.021	0.025	0.022	0.025	0.040	0.049	0.033	0.035	0.036	0.040	0.032	0.034	0.039	0.044	0.030	0.036	0.031
06/26/22	0.028	0.031	0.021	0.023	0.022	0.024	0.040	0.044	0.032	0.036	0.038	0.043	0.031	0.034	0.039	0.042	0.031	0.034	0.031
06/27/22	0.030	0.032	0.021	0.025	0.024	0.027	0.040	0.044	0.034	0.036	0.045	0.054	0.032	0.034	0.040	0.044	0.034	0.038	0.033
06/28/22	0.029	0.056	0.021	0.025	0.024	0.025	0.040	0.042	0.033	0.036	0.059	0.074	0.033	0.035	0.040	0.042	0.036	0.040	0.035
06/29/22	0.030	0.035	0.022	0.026	0.024	0.028	0.040	0.044	0.034	0.037	0.059	0.082	0.034	0.038	0.042	0.044	0.041	0.047	0.036
06/30/22	0.031	0.041	0.022	0.025	0.024	0.025	0.040	0.042	0.033	0.045	0.035	0.040	0.033	0.043	0.040	0.043	0.035	0.044	0.033

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Reverse Osmosis Process online monitoring results																	
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
06/01/22	0.016	0.016	8.967	8.127	9.779	0.066	0.056	0.082	1,651	1,544	1,807	34	29	41	99.27	2.14	97.92	1.68
06/02/22	0.016	0.016	9.008	8.309	9.796	0.067	0.061	0.082	1,682	1,605	1,763	35	29	41	99.25	2.13	97.91	1.68
06/03/22	0.015	0.016	8.794	8.182	9.671	0.061	0.056	0.073	1,685	1,591	1,823	33	29	37	99.31	2.16	98.06	1.71
06/04/22	0.015	0.016	8.684	7.943	9.605	0.057	0.053	0.067	1,677	1,613	1,768	33	30	38	99.34	2.18	98.01	1.70
06/05/22	0.016	0.016	8.769	7.982	9.678	0.052	0.034	0.057	1,604	1,556	1,659	32	29	37	99.41	2.23	98.00	1.70
06/06/22	0.016	0.016	8.822	8.026	10.065	0.054	0.048	0.073	1,547	1,481	1,641	32	28	38	99.38	2.21	97.94	1.69
06/07/22	0.016	0.016	9.114	8.320	10.191	0.064	0.056	0.074	1,621	1,524	1,758	34	29	40	99.30	2.15	97.93	1.68
06/08/22	0.017	0.026	9.043	8.447	9.742	0.070	0.062	0.180 *	1,712	1,649	1,758	31	25	54	99.22	2.11	98.16	1.74
06/09/22	0.016	0.016	8.838	8.511	9.599	0.065	0.059	0.075	1,677	1,603	1,777	32	25	42	99.27	2.13	98.08	1.72
06/10/22	0.016	0.016	8.622	7.988	9.332	0.061	0.057	0.075	1,658	1,591	1,747	35	31	39	99.29	2.15	97.90	1.68
06/11/22	0.016	0.016	8.569	7.858	9.503	0.058	0.054	0.062	1,638	1,576	1,721	34	30	41	99.33	2.17	97.94	1.69
06/12/22	0.016	0.016	8.510	7.916	9.269	0.055	0.049	0.062	1,590	1,540	1,645	33	30	39	99.35	2.19	97.90	1.68
06/13/22	0.016	0.016	8.642	7.874	9.857	0.055	0.051	0.071	1,562	1,495	1,663	34	29	39	99.36	2.19	97.84	1.67
06/14/22	0.016	0.016	8.873	8.272	9.857	0.063	0.057	0.072	1,639	1,542	1,762	35	29	41	99.29	2.15	97.84	1.67
06/15/22	0.016	0.016	8.620	8.040	9.576	0.062	0.058	0.071	1,695	1,615	1,778	37	32	42	99.28	2.14	97.84	1.67
06/16/22	0.016	0.016	9.013	8.315	10.431	0.070	0.059	0.100	1,680	1,616	1,763	36	32	41	99.23	2.11	97.86	1.67
06/17/22	0.016	0.016	8.412	7.768	9.255	0.058	0.051	0.066	1,686	1,591	1,816	37	32	44	99.31	2.16	97.81	1.66
06/18/22	0.016	0.016	8.483	7.761	9.267	0.058	0.054	0.066	1,671	1,600	1,750	37	33	43	99.31	2.16	97.77	1.65
06/19/22	0.016	0.016	8.370	7.758	9.072	0.053	0.049	0.060	1,600	1,529	1,676	36	32	41	99.36	2.20	97.75	1.65
06/20/22	0.016	0.016	8.591	7.735	10.173	0.050	0.043	0.058	1,567	1,491	1,660	37	32	43	99.42	2.24	97.64	1.63
06/21/22	0.016	0.016	9.163	8.545	10.173	0.052	0.000	0.059	1,634	1,523	1,782	39	33	45	99.43	2.24	97.64	1.63
06/22/22	0.016	0.016	8.856	8.238	9.645	0.050	0.046	0.056	1,662	1,562	1,767	40	35	45	99.43	2.25	97.61	1.62
06/23/22	0.016	0.016	9.060	8.547	10.590	0.058	0.049	0.092	1,674	1,598	1,748	40	35	45	99.36	2.19	97.61	1.62
06/24/22	0.016	0.016	8.489	7.924	9.212	0.064	0.047	0.082	1,638	1,545	1,735	39	34	44	99.24	2.12	97.62	1.62
06/25/22	0.016	0.016	8.465	7.869	9.259	0.062	0.058	0.074	1,595	1,528	1,688	38	33	42	99.27	2.14	97.65	1.63
06/26/22	0.016	0.016	8.355	7.689	9.243	0.056	0.049	0.060	1,545	1,493	1,600	37	33	42	99.33	2.17	97.62	1.62
06/27/22	0.016	0.016	8.669	7.921	9.859	0.058	0.050	0.075	1,515	1,460	1,612	37	32	42	99.33	2.17	97.58	1.62
06/28/22	0.016	0.016	8.827	8.082	9.726	0.065	0.057	0.074	1,598	1,499	1,748	39	34	45	99.26	2.13	97.57	1.61
06/29/22	0.016	0.016	8.661	7.995	9.705	0.066	0.057	0.183 **	1,647	1,569	1,747	40	35	45	99.24	2.12	97.58	1.62
06/30/22	0.016	0.016	8.861	8.416	9.478	0.064	0.059	0.076	1,651	1,562	1,765	39	34	43	99.28	2.14	97.64	1.63

Notes:

* Value affected by short term spike due to plant restart.

** Value affected by short term spike due to instrument maintenance.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	UltraViolet / AOP Process online monitoring results					
	UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/L	Log Removal
06/01/22	97.07	89.803	23,820.8	0.27	3	6
06/02/22	97.04	91.043	23,797.9	0.27	3	6
06/03/22	96.95	93.479	24,037.3	0.26	3	6
06/04/22	97.09	93.099	24,229.0	0.26	3	6
06/05/22	96.94	90.971	24,245.5	0.26	3	6
06/06/22	96.74	89.749	24,241.1	0.27	3	6
06/07/22	96.75	89.771	24,226.0	0.27	3	6
06/08/22	97.34	33.013	21,578.0	0.27	3	6
06/09/22	97.00	83.844	11,707.1	0.29	3	6
06/10/22	96.88	94.174	22,459.9	0.26	3	6
06/11/22	96.89	93.514	23,771.8	0.25	3	6
06/12/22	96.91	89.760	23,760.6	0.26	3	6
06/13/22	96.77	89.901	23,774.7	0.26	3	6
06/14/22	96.72	89.935	23,798.9	0.27	3	6
06/15/22	96.87	90.485	24,209.8	0.27	3	6
06/16/22	96.82	95.534	23,442.7	0.26	3	6
06/17/22	97.01	96.386	24,834.1	0.26	3	6
06/18/22	96.99	95.575	25,042.8	0.26	3	6
06/19/22	97.12	93.404	24,455.4	0.26	3	6
06/20/22	97.14	86.382	24,126.7	0.26	3	6
06/21/22	96.28	81.715	23,038.7	0.27	3	6
06/22/22	97.29	82.654	22,096.7	0.27	3	6
06/23/22	97.31	84.350	22,329.5	0.26	3	6
06/24/22	97.72	84.554	22,106.4	0.26	3	6
06/25/22	97.75	79.949	22,081.1	0.26	3	6
06/26/22	97.58	79.984	22,079.7	0.28	3	6
06/27/22	97.40	82.158	22,075.5	0.27	3	6
06/28/22	97.39	86.163	22,061.2	0.27	3	6
06/29/22	97.63	90.172	23,168.9	0.27	3	6
06/30/22	96.60	89.051	23,785.9	0.26	3	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
							MFE		ROP		
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	NTU		NTU		TOC
	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
07/01/22	12.15	12.15	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/02/22	12.18	12.18	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/03/22	12.23	12.23	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/04/22	12.27	12.27	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/05/22	12.23	12.23	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/06/22	12.21	12.21	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/07/22	12.21	12.21	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/08/22	12.24	12.24	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/09/22	12.24	12.24	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/10/22	12.26	12.26	12.26	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/11/22	12.22	12.22	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/12/22	12.18	12.18	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/13/22	12.14	12.14	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/14/22	12.09	12.09	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/15/22	12.15	12.15	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/16/22	12.17	12.17	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/17/22	12.18	12.18	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/18/22	12.23	12.23	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/19/22	12.26	12.26	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/20/22	12.18	12.18	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/21/22	12.19	12.19	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/22/22	12.15	12.15	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/23/22	12.19	12.19	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/24/22	12.20	12.20	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/25/22	12.19	12.19	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/26/22	12.14	12.14	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/27/22	12.18	12.18	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/28/22	12.20	12.20	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/29/22	12.17	12.17	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/30/22	12.16	12.16	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/31/22	12.19	12.19	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
	LRV	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
07/01/22	0.00	4.01	2.14	6.00	0.00	12.15
07/02/22	0.00	4.00	2.18	6.00	0.00	12.18
07/03/22	0.00	4.02	2.22	6.00	0.00	12.23
07/04/22	0.00	4.03	2.23	6.00	0.00	12.27
07/05/22	0.00	4.01	2.22	6.00	0.00	12.23
07/06/22	0.00	4.01	2.19	6.00	0.00	12.21
07/07/22	0.00	4.00	2.21	6.00	0.00	12.21
07/08/22	0.00	4.02	2.22	6.00	0.00	12.24
07/09/22	0.00	4.01	2.23	6.00	0.00	12.24
07/10/22	0.00	4.00	2.26	6.00	0.00	12.26
07/11/22	0.00	4.01	2.21	6.00	0.00	12.22
07/12/22	0.00	4.01	2.17	6.00	0.00	12.18
07/13/22	0.00	4.01	2.13	6.00	0.00	12.14
07/14/22	0.00	4.00	2.08	6.00	0.00	12.09
07/15/22	0.00	4.01	2.15	6.00	0.00	12.15
07/16/22	0.00	4.00	2.17	6.00	0.00	12.17
07/17/22	0.00	4.00	2.18	6.00	0.00	12.18
07/18/22	0.00	4.04	2.19	6.00	0.00	12.23
07/19/22	0.00	4.09	2.18	6.00	0.00	12.26
07/20/22	0.00	4.04	2.14	6.00	0.00	12.18
07/21/22	0.00	4.05	2.14	6.00	0.00	12.19
07/22/22	0.00	4.00	2.15	6.00	0.00	12.15
07/23/22	0.00	4.02	2.18	6.00	0.00	12.19
07/24/22	0.00	4.01	2.19	6.00	0.00	12.20
07/25/22	0.00	4.01	2.18	6.00	0.00	12.19
07/26/22	0.00	4.01	2.12	6.00	0.00	12.14
07/27/22	0.00	4.02	2.16	6.00	0.00	12.18
07/28/22	0.00	4.03	2.17	6.00	0.00	12.20
07/29/22	0.00	4.01	2.16	6.00	0.00	12.17
07/30/22	0.00	4.00	2.16	6.00	0.00	12.16
07/31/22	0.00	4.01	2.18	6.00	0.00	12.19

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
	LRV	LRV	LRV	LRV	LRV	LRV
07/01/22	0.00	0.00	2.14	6.00	4.00	12.14
07/02/22	0.00	0.00	2.18	6.00	4.00	12.18
07/03/22	0.00	0.00	2.22	6.00	4.00	12.22
07/04/22	0.00	0.00	2.23	6.00	4.00	12.23
07/05/22	0.00	0.00	2.22	6.00	4.00	12.22
07/06/22	0.00	0.00	2.19	6.00	4.00	12.19
07/07/22	0.00	0.00	2.21	6.00	4.00	12.21
07/08/22	0.00	0.00	2.22	6.00	4.00	12.22
07/09/22	0.00	0.00	2.23	6.00	4.00	12.23
07/10/22	0.00	0.00	2.26	6.00	4.00	12.26
07/11/22	0.00	0.00	2.21	6.00	4.00	12.21
07/12/22	0.00	0.00	2.17	6.00	4.00	12.17
07/13/22	0.00	0.00	2.13	6.00	4.00	12.13
07/14/22	0.00	0.00	2.08	6.00	4.00	12.08
07/15/22	0.00	0.00	2.15	6.00	4.00	12.15
07/16/22	0.00	0.00	2.17	6.00	4.00	12.17
07/17/22	0.00	0.00	2.18	6.00	4.00	12.18
07/18/22	0.00	0.00	2.19	6.00	4.00	12.19
07/19/22	0.00	0.00	2.18	6.00	4.00	12.18
07/20/22	0.00	0.00	2.14	6.00	4.00	12.14
07/21/22	0.00	0.00	2.14	6.00	4.00	12.14
07/22/22	0.00	0.00	2.15	6.00	4.00	12.15
07/23/22	0.00	0.00	2.18	6.00	4.00	12.18
07/24/22	0.00	0.00	2.19	6.00	4.00	12.19
07/25/22	0.00	0.00	2.18	6.00	4.00	12.18
07/26/22	0.00	0.00	2.12	6.00	4.00	12.12
07/27/22	0.00	0.00	2.16	6.00	4.00	12.16
07/28/22	0.00	0.00	2.17	6.00	4.00	12.17
07/29/22	0.00	0.00	2.16	6.00	4.00	12.16
07/30/22	0.00	0.00	2.16	6.00	4.00	12.16
07/31/22	0.00	0.00	2.18	6.00	4.00	12.18

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value															
	A01	A02	A03	A04	A05	A06	A07	A08	B01	B02	B03	B04	B05	B06	B07	B08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
07/01/22	4.27	4.38	4.07	4.20	4.03	4.01	4.28	4.13	5.28	5.26	4.85	4.84	5.15	5.29	5.20	5.08
07/02/22	4.30	4.42	4.03	4.13	4.03	4.00	4.24	4.14	5.28	5.24	4.82	4.84	5.10	5.27	5.17	5.05
07/03/22	4.27	4.33	4.02	4.05	4.02	4.14	4.25	4.13	5.22	5.16	4.84	4.81	5.08	5.24	5.15	5.06
07/04/22	4.22	4.39	4.12	4.12	4.36	4.26	4.23	4.10	5.28	5.13	4.83	4.80	5.05	5.24	5.16	5.07
07/05/22	4.23	4.33	4.13	4.04	4.32	4.18	4.16	4.05	5.20	5.14	4.84	4.77	5.02	5.23	5.19	5.05
07/06/22	4.16	4.25	4.20	4.07	4.30	4.17	4.13	4.07	5.23	5.09	4.83	4.72	5.24	5.25	5.17	5.05
07/07/22	4.12	4.25	4.32	4.05	4.29	4.10	4.17	4.03	5.23	5.05	4.75	4.72	5.31	5.20	5.14	5.04
07/08/22	4.06	4.24	4.30	4.04	4.26	4.16	4.10	4.03	5.16	5.10	4.71	4.72	5.29	5.24	5.14	5.00
07/09/22	4.05	4.18	4.23	4.02	4.28	4.13	4.31	4.01	5.15	5.42	4.68	4.70	5.27	5.18	5.14	4.97
07/10/22	4.03	4.48	4.28	4.05	4.28	4.15	4.35	4.00	5.13	5.54	4.77	4.67	5.32	5.16	5.16	4.95
07/11/22	4.01	4.59	4.25	4.04	4.25	4.11	4.37	4.08	5.09	5.54	4.73	4.92	5.35	5.17	5.16	4.90
07/12/22	4.05	4.62	4.24	4.07	4.24	4.14	4.37	4.06	5.14	7.09	4.72	5.02	5.33	5.20	5.18	4.93
07/13/22	4.33	4.60	4.27	4.03	4.24	4.13	4.37	4.06	5.23	6.03	4.73	5.04	5.29	5.17	5.17	4.99
07/14/22	4.40	4.57	4.28	4.05	4.23	4.07	4.33	4.05	5.15	6.13	4.67	5.00	5.32	5.20	5.15	4.98
07/15/22	4.39	4.63	4.26	4.01	4.22	4.11	4.32	4.01	5.10	5.64	4.69	4.99	5.29	5.16	5.12	4.93
07/16/22	4.44	4.57	4.20	4.00	4.07	4.07	4.34	4.01	5.09	5.53	4.65	4.98	5.30	5.14	5.10	4.90
07/17/22	4.39	4.56	4.21	4.02	4.29	4.05	4.34	4.00	5.09	NA *	5.02	4.98	5.29	5.08	5.10	4.87
07/18/22	4.37	4.52	4.17	4.04	4.30	4.20	4.32	4.10	5.10	5.14	4.98	4.96	5.29	5.12	5.07	4.85
07/19/22	4.41	4.52	4.26	4.18	4.31	4.23	4.33	4.16	5.07	5.13	4.91	4.95	5.30	5.08	5.07	5.13
07/20/22	4.37	4.53	4.31	4.16	4.28	4.15	4.28	4.13	5.02	5.07	4.94	4.91	5.28	5.25	5.08	5.17
07/21/22	4.35	4.44	4.32	4.10	4.27	4.13	4.43	4.10	5.04	5.11	4.92	4.91	5.21	5.33	5.08	5.12
07/22/22	4.27	4.41	4.28	4.05	4.20	4.14	4.39	4.03	4.97	5.13	4.92	4.91	5.18	5.31	5.07	5.09
07/23/22	4.32	4.34	4.23	4.05	4.18	4.08	4.39	4.02	4.95	5.11	4.90	4.91	5.16	5.31	4.97	5.09
07/24/22	4.27	4.61	4.24	4.03	4.15	4.08	4.38	4.01	5.24	5.14	4.90	4.91	5.16	5.29	4.96	5.07
07/25/22	4.28	4.62	4.24	4.02	4.15	4.07	4.34	4.01	5.31	5.15	4.88	4.87	5.16	5.33	4.99	5.08
07/26/22	4.25	4.57	4.21	4.01	4.14	4.03	4.34	4.07	5.33	5.07	4.88	4.87	5.16	5.29	5.19	5.07
07/27/22	4.38	4.57	4.14	4.37	4.07	4.02	4.31	4.19	5.31	5.05	4.84	4.84	5.15	5.24	5.22	5.02
07/28/22	4.38	4.45	4.05	4.25	4.05	4.03	4.29	4.19	5.31	5.01	4.81	4.81	5.05	5.26	5.25	5.02
07/29/22	4.31	4.48	4.06	4.21	4.21	4.03	4.25	4.18	5.28	5.04	4.77	4.78	5.00	5.27	5.23	5.01
07/30/22	4.36	4.44	4.01	4.24	4.15	4.21	4.26	4.10	5.19	5.01	4.76	4.76	5.02	5.25	5.22	4.99
07/31/22	4.32	4.39	4.21	4.23	4.18	4.15	4.24	4.14	5.24	4.99	4.75	4.75	5.02	5.21	5.17	4.95

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell offline for repairs.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results															
	Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
07/01/22	4.82	4.64	4.97	4.62	4.95	4.85	4.73	4.94	4.26	4.05	4.06	4.07	4.06	4.15	4.25	4.14
07/02/22	4.79	4.64	4.91	4.60	4.90	4.83	4.73	4.87	4.23	4.15	4.05	4.03	4.03	4.12	4.19	4.07
07/03/22	4.74	4.65	4.86	4.55	4.86	4.79	4.74	4.88	4.24	4.15	4.06	4.02	4.19	4.11	4.15	4.03
07/04/22	4.70	4.65	4.83	4.52	4.84	4.76	4.70	4.86	4.21	4.09	4.07	4.11	4.25	4.08	4.13	4.03
07/05/22	4.68	5.03	4.86	4.45	4.81	4.74	4.66	4.85	4.20	4.07	4.04	4.29	4.21	4.01	4.12	4.03
07/06/22	4.63	5.18	4.77	4.41	4.73	4.74	4.62	4.85	4.18	4.07	4.01	4.25	4.15	4.04	4.12	4.02
07/07/22	4.59	5.19	4.72	4.37	4.71	4.69	4.57	4.77	4.11	4.00	4.00	4.29	4.12	4.14	4.03	4.13
07/08/22	4.60	5.21	4.71	4.47	4.71	4.62	4.55	4.73	4.08	4.02	4.23	4.27	4.06	4.23	4.16	4.27
07/09/22	4.59	5.15	4.72	4.47	4.68	4.58	4.87	4.73	4.08	4.01	4.15	4.25	4.07	4.23	4.25	4.26
07/10/22	4.59	5.16	4.72	4.42	4.65	4.59	5.04	4.69	4.07	4.00	4.16	4.25	4.07	4.19	4.27	4.27
07/11/22	4.57	5.14	4.68	4.38	4.63	4.60	5.03	4.68	4.09	4.01	4.17	4.20	4.02	4.22	4.27	4.24
07/12/22	4.54	5.15	4.62	4.32	5.00	4.95	5.07	4.64	4.10	4.30	4.21	4.21	4.01	4.24	4.29	4.22
07/13/22	4.97	5.17	5.21	4.31	5.28	5.11	5.07	4.59	4.10	4.34	4.21	4.26	4.03	4.24	4.31	4.27
07/14/22	5.17	5.20	5.37	4.33	5.15	5.10	5.09	4.57	4.20	4.31	4.19	4.26	4.01	4.25	4.33	4.27
07/15/22	5.12	5.12	5.29	4.31	5.19	5.07	5.02	4.76	4.25	4.28	4.16	4.20	4.05	4.23	4.30	4.27
07/16/22	5.05	5.14	5.27	4.30	5.21	5.07	4.99	5.18	4.22	4.26	4.13	4.14	4.21	4.21	4.27	4.22
07/17/22	5.08	5.14	5.26	4.29	5.18	5.08	4.99	5.18	4.18	4.25	4.11	4.19	4.32	4.16	4.24	4.20
07/18/22	5.09	5.10	5.27	4.57	5.19	5.05	4.97	5.14	4.16	4.21	4.09	4.31	4.34	4.13	4.20	4.19
07/19/22	5.08	5.11	5.28	4.85	5.17	5.02	5.00	5.16	4.17	4.18	4.11	4.29	4.37	4.14	4.19	4.17
07/20/22	5.05	5.09	5.23	4.87	5.14	5.02	4.97	5.14	4.13	4.20	4.09	4.31	4.33	4.18	4.19	4.24
07/21/22	5.03	5.02	5.14	4.84	5.10	5.00	4.94	5.10	4.10	4.16	4.08	4.26	4.28	4.29	4.21	4.39
07/22/22	5.01	4.97	5.13	4.87	5.09	5.01	4.94	5.09	4.10	4.11	4.15	4.18	4.28	4.26	4.32	4.30
07/23/22	4.97	4.96	5.17	4.83	5.10	4.97	4.92	5.07	4.06	4.08	4.15	4.19	4.28	4.24	4.27	4.28
07/24/22	5.00	4.89	5.24	4.79	5.10	4.95	4.92	5.06	4.01	4.11	4.11	4.20	4.26	4.24	4.26	4.26
07/25/22	5.00	4.89	5.20	4.79	5.07	4.96	4.91	5.06	4.02	4.30	4.11	4.18	4.26	4.22	4.30	4.24
07/26/22	4.99	4.87	5.18	4.78	5.05	4.92	4.88	5.07	4.15	4.28	4.13	4.15	4.23	4.22	4.30	4.24
07/27/22	4.95	4.85	5.12	4.77	5.01	4.90	4.82	5.05	4.18	4.24	4.07	4.04	4.16	4.17	4.23	4.18
07/28/22	4.91	4.83	5.11	4.76	4.98	4.87	4.81	5.03	4.10	4.21	4.04	4.04	4.13	4.12	4.17	4.13
07/29/22	4.85	4.78	5.12	4.76	4.97	4.84	4.81	4.98	4.06	4.19	4.02	4.01	4.21	4.10	4.15	4.11
07/30/22	4.85	4.74	5.03	4.73	4.94	4.85	4.78	4.94	4.07	4.15	4.00	4.29	4.28	4.10	4.15	4.09
07/31/22	4.84	4.72	4.95	4.65	4.92	4.83	4.75	4.95	4.08	4.11	4.21	4.26	4.27	4.10	4.10	4.09

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

MicroFiltration Process online monitoring results

Log Removal Value

Date	E01 LRV	E02 LRV	E03 LRV	E04 LRV
07/01/22	4.05	4.11	4.31	4.56
07/02/22	4.11	4.07	4.37	4.42
07/03/22	4.07	4.04	4.46	4.51
07/04/22	4.05	4.05	4.39	4.46
07/05/22	4.03	4.04	4.35	4.54
07/06/22	4.02	4.05	4.01	4.66
07/07/22	4.01	4.05	4.42	4.57
07/08/22	4.24	4.05	4.28	4.48
07/09/22	4.22	4.03	4.21	4.60
07/10/22	4.18	4.04	4.36	4.44
07/11/22	4.17	4.01	4.40	4.47
07/12/22	4.18	4.02	4.51	4.51
07/13/22	4.21	4.01	4.38	4.60
07/14/22	4.20	4.00	4.42	4.60
07/15/22	4.18	4.20	4.50	4.64
07/16/22	4.15	4.15	4.45	4.73
07/17/22	4.14	4.11	4.46	4.65
07/18/22	4.12	4.14	4.55	4.69
07/19/22	4.09	4.09	4.42	4.62
07/20/22	4.04	4.07	4.35	4.64
07/21/22	4.13	4.05	4.53	4.68
07/22/22	4.23	4.00	4.40	4.55
07/23/22	4.21	4.28	4.43	4.45
07/24/22	4.20	4.22	4.52	4.66
07/25/22	4.18	4.24	4.40	4.55
07/26/22	4.17	4.26	4.39	4.51
07/27/22	4.11	4.19	4.32	4.58
07/28/22	4.04	4.21	4.43	4.66
07/29/22	4.04	4.17	4.31	4.54
07/30/22	4.04	4.15	4.33	4.53
07/31/22	4.01	4.12	4.48	4.58

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	MicroFiltration Process online monitoring results Effluent Turbidity - NTU A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		MFE
	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
07/01/22	0.031	0.035	0.022	0.028	0.024	0.026	0.040	0.042	0.033	0.035	0.037	0.038	0.033	0.035	0.040	0.042	0.032	0.034	0.032
07/02/22	0.030	0.034	0.022	0.036	0.024	0.025	0.039	0.042	0.033	0.035	0.039	0.041	0.032	0.034	0.040	0.043	0.033	0.037	0.033
07/03/22	0.031	0.033	0.023	0.027	0.024	0.025	0.039	0.042	0.033	0.035	0.041	0.046	0.033	0.034	0.041	0.042	0.036	0.039	0.033
07/04/22	0.031	0.040	0.022	0.027	0.023	0.025	0.039	0.042	0.034	0.036	0.048	0.055	0.034	0.037	0.041	0.043	0.038	0.043	0.035
07/05/22	0.032	0.036	0.023	0.025	0.024	0.026	0.041	0.050	0.035	0.040	0.058	0.068	0.035	0.038	0.041	0.052	0.043	0.049	0.037
07/06/22	0.031	0.047	0.027	0.029	0.024	0.026	0.041	0.049	0.034	0.050	0.048	0.080	0.034	0.045	0.043	0.046	0.035	0.051	0.035
07/07/22	0.030	0.040	0.028	0.031	0.024	0.027	0.041	0.046	0.033	0.038	0.035	0.041	0.034	0.038	0.044	0.047	0.030	0.059	0.033
07/08/22	0.030	0.036	0.027	0.030	0.025	0.028	0.041	0.044	0.033	0.046	0.035	0.042	0.034	0.038	0.044	0.055	0.029	0.032	0.033
07/09/22	0.030	0.033	0.027	0.029	0.025	0.027	0.040	0.042	0.032	0.037	0.035	0.046	0.034	0.035	0.044	0.046	0.030	0.036	0.033
07/10/22	0.030	0.036	0.026	0.030	0.025	0.027	0.040	0.043	0.032	0.034	0.035	0.045	0.033	0.036	0.044	0.047	0.030	0.037	0.033
07/11/22	0.030	0.037	0.027	0.030	0.025	0.026	0.040	0.044	0.033	0.035	0.036	0.093	0.034	0.039	0.044	0.046	0.031	0.033	0.033
07/12/22	0.031	0.039	0.028	0.048	0.026	0.035	0.041	0.045	0.035	0.048	0.038	0.047	0.036	0.041	0.047	0.050	0.033	0.039	0.035
07/13/22	0.031	0.040	0.027	0.043	0.024	0.029	0.040	0.044	0.034	0.041	0.036	0.041	0.034	0.038	0.044	0.046	0.033	0.038	0.034
07/14/22	0.029	0.033	0.028	0.030	0.025	0.032	0.040	0.042	0.035	0.058	0.038	0.046	0.035	0.038	0.045	0.059	0.036	0.057	0.034
07/15/22	0.029	0.033	0.026	0.030	0.024	0.026	0.040	0.044	0.033	0.040	0.036	0.080	0.034	0.040	0.043	0.046	0.038	0.042	0.034
07/16/22	0.029	0.033	0.027	0.031	0.024	0.026	0.040	0.042	0.033	0.039	0.033	0.036	0.033	0.035	0.042	0.051	0.041	0.043	0.034
07/17/22	0.029	0.037	0.027	0.031	0.026	0.030	0.040	0.046	0.033	0.036	0.036	0.040	0.034	0.036	0.042	0.045	0.043	0.047	0.035
07/18/22	0.030	0.040	0.027	0.034	0.025	0.038	0.040	0.042	0.034	0.037	0.041	0.044	0.034	0.035	0.042	0.043	0.048	0.052	0.036
07/19/22	0.030	0.033	0.027	0.032	0.026	0.028	0.042	0.044	0.035	0.036	0.046	0.052	0.036	0.050	0.043	0.046	0.052	0.055	0.037
07/20/22	0.029	0.032	0.027	0.030	0.025	0.027	0.042	0.045	0.033	0.035	0.038	0.054	0.034	0.039	0.043	0.045	0.055	0.059	0.036
07/21/22	0.031	0.032	0.028	0.031	0.026	0.028	0.043	0.046	0.035	0.038	0.028	0.036	0.037	0.041	0.046	0.052	0.059	0.062	0.037
07/22/22	0.030	0.032	0.027	0.030	0.025	0.027	0.042	0.045	0.035	0.038	0.029	0.033	0.035	0.038	0.044	0.046	0.061	0.064	0.036
07/23/22	0.031	0.056	0.028	0.031	0.026	0.028	0.042	0.044	0.035	0.037	0.028	0.032	0.037	0.041	0.045	0.046	0.064	0.067	0.037
07/24/22	0.031	0.040	0.028	0.032	0.027	0.030	0.043	0.046	0.037	0.040	0.030	0.035	0.037	0.040	0.045	0.049	0.068	0.073	0.038
07/25/22	0.031	0.034	0.028	0.030	0.026	0.028	0.043	0.047	0.036	0.039	0.029	0.033	0.038	0.044	0.046	0.055	0.070	0.074	0.037
07/26/22	0.030	0.034	0.027	0.037	0.026	0.040	0.043	0.047	0.036	0.044	0.030	0.050	0.036	0.038	0.045	0.050	0.055	0.080	0.036
07/27/22	0.030	0.032	0.027	0.029	0.025	0.026	0.042	0.046	0.035	0.037	0.027	0.032	0.035	0.037	0.042	0.044	0.030	0.033	0.032
07/28/22	0.030	0.032	0.028	0.032	0.025	0.026	0.043	0.044	0.036	0.041	0.029	0.030	0.037	0.046	0.043	0.047	0.030	0.033	0.033
07/29/22	0.031	0.032	0.028	0.034	0.027	0.027	0.044	0.046	0.038	0.049	0.032	0.035	0.038	0.039	0.045	0.046	0.032	0.033	0.035
07/30/22	0.031	0.036	0.027	0.031	0.026	0.028	0.043	0.046	0.037	0.040	0.030	0.034	0.039	0.042	0.045	0.048	0.034	0.039	0.035
07/31/22	0.030	0.035	0.027	0.029	0.026	0.027	0.043	0.048	0.038	0.040	0.031	0.034	0.039	0.045	0.046	0.048	0.036	0.040	0.035

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Reverse Osmosis Process online monitoring results																
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
07/01/22	0.016	0.016	8.539	7.878	9.317	0.062	0.054	0.073	1,651	1,568	1,765	37	33	42	99.27	2.14	97.74	1.65
07/02/22	0.016	0.016	8.632	8.008	9.369	0.057	0.054	0.067	1,641	1,573	1,724	36	32	42	99.33	2.18	97.79	1.66
07/03/22	0.016	0.016	8.445	7.776	9.302	0.051	0.048	0.056	1,576	1,524	1,637	34	31	38	99.39	2.22	97.86	1.67
07/04/22	0.016	0.016	8.398	7.626	9.263	0.049	0.045	0.053	1,525	1,469	1,588	33	29	37	99.41	2.23	97.86	1.67
07/05/22	0.016	0.016	8.450	7.632	9.870	0.051	0.045	0.062	1,526	1,463	1,642	34	29	42	99.39	2.22	97.75	1.65
07/06/22	0.016	0.016	8.953	8.231	9.867	0.057	0.051	0.063	1,607	1,516	1,738	37	32	43	99.36	2.19	97.71	1.64
07/07/22	0.016	0.016	8.894	8.318	9.612	0.055	0.049	0.063	1,644	1,559	1,737	35	31	41	99.38	2.21	97.84	1.67
07/08/22	0.016	0.016	8.790	8.089	9.589	0.053	0.046	0.058	1,651	1,576	1,739	36	31	42	99.40	2.22	97.80	1.66
07/09/22	0.016	0.016	8.664	7.905	9.543	0.051	0.046	0.057	1,638	1,573	1,718	35	31	40	99.41	2.23	97.84	1.67
07/10/22	0.016	0.016	8.601	7.860	9.577	0.047	0.044	0.052	1,583	1,531	1,639	34	30	38	99.45	2.26	97.88	1.67
07/11/22	0.016	0.016	8.922	8.192	10.379	0.055	0.046	0.066	1,552	1,472	1,654	38	31	44	99.39	2.21	97.56	1.61
07/12/22	0.016	0.016	9.339	8.689	10.175	0.063	0.056	0.074	1,616	1,533	1,752	41	35	46	99.33	2.17	97.45	1.59
07/13/22	0.016	0.016	8.910	8.122	10.175	0.066	0.055	0.077	1,690	1,616	1,779	40	34	47	99.26	2.13	97.62	1.62
07/14/22	0.020	0.024	8.738	8.048	9.561	0.072	0.063	0.081	1,681	1,606	1,774	47	38	51	99.18	2.08	97.23	1.56
07/15/22	0.016	0.018	8.363	7.714	9.270	0.060	0.052	0.069	1,696	1,624	1,789	46	36	53	99.29	2.15	97.27	1.56
07/16/22	0.016	0.016	8.397	7.717	9.090	0.057	0.051	0.066	1,653	1,588	1,756	46	41	50	99.32	2.17	97.22	1.56
07/17/22	0.019	0.022	8.298	7.682	9.103	0.054	0.049	0.066	1,573	1,498	1,661	46	42	52	99.35	2.18	97.09	1.54
07/18/22	0.016	0.017	8.231	7.552	9.249	0.053	0.046	0.062	1,538	1,459	1,634	44	39	53	99.36	2.19	97.11	1.54
07/19/22	0.016	0.016	8.517	7.716	9.295	0.057	0.051	0.065	1,621	1,517	1,774	46	40	52	99.33	2.18	97.19	1.55
07/20/22	0.016	0.016	8.467	7.780	9.404	0.062	0.052	0.074	1,662	1,597	1,749	46	41	50	99.27	2.14	97.25	1.56
07/21/22	0.017	0.018	8.409	7.791	8.959	0.061	0.054	0.072	1,655	1,596	1,734	45	40	51	99.27	2.14	97.26	1.56
07/22/22	0.015	0.020	8.262	7.646	9.015	0.059	0.047	0.073	1,666	1,593	1,774	46	42	52	99.29	2.15	97.23	1.56
07/23/22	0.014	0.014	8.362	7.754	9.170	0.056	0.051	0.070	1,630	1,558	1,711	45	41	50	99.33	2.18	97.27	1.56
07/24/22	0.014	0.014	8.423	7.726	9.167	0.055	0.051	0.067	1,574	1,511	1,653	45	40	52	99.35	2.19	97.17	1.55
07/25/22	0.014	0.014	8.270	7.724	9.161	0.055	0.046	0.062	1,514	1,454	1,587	43	38	48	99.34	2.18	97.19	1.55
07/26/22	0.014	0.014	8.145	7.607	8.714	0.062	0.051	0.076	1,594	1,505	1,738	44	38	52	99.24	2.12	97.26	1.56
07/27/22	0.015	0.015	8.270	7.675	9.089	0.057	0.049	0.073	1,642	1,548	1,783	45	38	53	99.31	2.16	97.26	1.56
07/28/22	0.015	0.020	8.369	7.755	9.012	0.057	0.049	0.062	1,666	1,584	1,756	45	40	50	99.32	2.17	97.28	1.56
07/29/22	0.014	0.014	8.184	7.562	8.927	0.057	0.050	0.064	1,652	1,569	1,751	44	39	51	99.31	2.16	97.32	1.57
07/30/22	0.014	0.014	8.092	7.497	8.818	0.056	0.051	0.068	1,637	1,581	1,715	44	39	50	99.31	2.16	97.32	1.57
07/31/22	0.014	0.014	7.994	7.353	8.821	0.053	0.050	0.058	1,580	1,514	1,647	44	39	50	99.33	2.18	97.22	1.56

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	UltraViolet / AOP Process online monitoring results					
	UVT %	FLOW	POWER	EED	Peroxide Dose	Log
Date	avg	MG	kW	kWh/kgal	mg/L	Removal
07/01/22	97.64	95.521	23,178.2	0.26	3	6
07/02/22	97.81	94.835	23,860.0	0.25	3	6
07/03/22	97.95	90.928	24,048.0	0.25	3	6
07/04/22	98.28	90.166	23,849.7	0.26	3	6
07/05/22	98.35	90.288	23,780.3	0.26	3	6
07/06/22	98.32	90.638	23,792.1	0.26	3	6
07/07/22	98.08	87.954	23,414.7	0.26	3	6
07/08/22	97.80	88.705	22,728.4	0.26	3	6
07/09/22	97.70	91.621	22,460.0	0.26	3	6
07/10/22	97.75	90.049	23,764.8	0.26	3	6
07/11/22	97.68	84.690	23,780.7	0.26	3	6
07/12/22	97.97	60.982	22,112.7	0.26	3	6
07/13/22	97.46	58.384	17,118.5	0.28	3	6
07/14/22	97.46	57.603	16,429.6	0.28	3	6
07/15/22	97.31	80.016	17,490.8	0.28	3	6
07/16/22	97.42	80.032	21,804.9	0.27	3	6
07/17/22	97.44	84.179	21,315.0	0.27	3	6
07/18/22	97.51	82.568	22,220.7	0.26	3	6
07/19/22	97.55	82.569	21,694.4	0.26	3	6
07/20/22	97.66	85.801	21,275.6	0.26	3	6
07/21/22	97.59	91.811	22,299.0	0.26	3	6
07/22/22	97.67	94.610	23,743.2	0.26	3	6
07/23/22	97.90	95.018	23,719.9	0.25	3	6
07/24/22	98.08	92.209	23,713.5	0.25	3	6
07/25/22	98.62	80.803	23,722.5	0.26	3	6
07/26/22	98.46	87.604	21,502.3	0.27	3	6
07/27/22	98.22	92.718	23,101.1	0.26	3	6
07/28/22	98.03	94.099	23,935.8	0.26	3	6
07/29/22	97.96	95.056	23,874.2	0.25	3	6
07/30/22	98.13	93.916	23,868.5	0.25	3	6
07/31/22	98.27	94.587	23,883.3	0.25	3	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
							MFE		ROP		
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	NTU		NTU		TOC
Date	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
08/01/22	12.16	12.16	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/02/22	12.19	12.19	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/03/22	12.14	12.14	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/04/22	12.10	12.10	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/05/22	12.13	12.13	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/06/22	12.16	12.16	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/07/22	12.22	12.22	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/08/22	12.18	12.18	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/09/22	12.11	12.11	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/10/22	12.14	12.14	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/11/22	12.16	12.16	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/12/22	12.17	12.17	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/13/22	12.16	12.16	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/14/22	12.21	12.21	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/15/22	12.18	12.18	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/16/22	12.13	12.13	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/17/22	12.10	12.10	12.06	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/18/22	12.12	12.12	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/19/22	12.10	12.10	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/20/22	12.13	12.13	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/21/22	12.20	12.20	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/22/22	12.18	12.18	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/23/22	12.13	12.13	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/24/22	12.11	12.11	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/25/22	12.09	12.09	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/26/22	12.15	12.15	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/27/22	12.15	12.15	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/28/22	12.19	12.19	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/29/22	12.17	12.17	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/30/22	12.14	12.14	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/31/22	12.15	12.15	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
08/01/22	0.00	4.00	2.16	6.00	0.00	12.16
08/02/22	0.00	4.05	2.14	6.00	0.00	12.19
08/03/22	0.00	4.03	2.11	6.00	0.00	12.14
08/04/22	0.00	4.00	2.10	6.00	0.00	12.10
08/05/22	0.00	4.01	2.12	6.00	0.00	12.13
08/06/22	0.00	4.03	2.13	6.00	0.00	12.16
08/07/22	0.00	4.04	2.17	6.00	0.00	12.22
08/08/22	0.00	4.02	2.16	6.00	0.00	12.18
08/09/22	0.00	4.00	2.12	6.00	0.00	12.11
08/10/22	0.00	4.02	2.13	6.00	0.00	12.14
08/11/22	0.00	4.00	2.16	6.00	0.00	12.16
08/12/22	0.00	4.00	2.17	6.00	0.00	12.17
08/13/22	0.00	4.00	2.16	6.00	0.00	12.16
08/14/22	0.00	4.01	2.20	6.00	0.00	12.21
08/15/22	0.00	4.00	2.18	6.00	0.00	12.18
08/16/22	0.00	4.01	2.12	6.00	0.00	12.13
08/17/22	0.00	4.04	2.06	6.00	0.00	12.10
08/18/22	0.00	4.02	2.10	6.00	0.00	12.12
08/19/22	0.00	4.00	2.10	6.00	0.00	12.10
08/20/22	0.00	4.01	2.12	6.00	0.00	12.13
08/21/22	0.00	4.06	2.14	6.00	0.00	12.20
08/22/22	0.00	4.05	2.13	6.00	0.00	12.18
08/23/22	0.00	4.03	2.10	6.00	0.00	12.13
08/24/22	0.00	4.03	2.08	6.00	0.00	12.11
08/25/22	0.00	4.01	2.08	6.00	0.00	12.09
08/26/22	0.00	4.05	2.10	6.00	0.00	12.15
08/27/22	0.00	4.03	2.12	6.00	0.00	12.15
08/28/22	0.00	4.03	2.16	6.00	0.00	12.19
08/29/22	0.00	4.02	2.15	6.00	0.00	12.17
08/30/22	0.00	4.01	2.13	6.00	0.00	12.14
08/31/22	0.00	4.04	2.11	6.00	0.00	12.15

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
	LRV	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
08/01/22	0.00	0.00	2.16	6.00	4.00	12.16
08/02/22	0.00	0.00	2.14	6.00	4.00	12.14
08/03/22	0.00	0.00	2.11	6.00	4.00	12.11
08/04/22	0.00	0.00	2.10	6.00	4.00	12.10
08/05/22	0.00	0.00	2.12	6.00	4.00	12.12
08/06/22	0.00	0.00	2.13	6.00	4.00	12.13
08/07/22	0.00	0.00	2.17	6.00	4.00	12.17
08/08/22	0.00	0.00	2.16	6.00	4.00	12.16
08/09/22	0.00	0.00	2.12	6.00	4.00	12.12
08/10/22	0.00	0.00	2.13	6.00	4.00	12.13
08/11/22	0.00	0.00	2.16	6.00	4.00	12.16
08/12/22	0.00	0.00	2.17	6.00	4.00	12.17
08/13/22	0.00	0.00	2.16	6.00	4.00	12.16
08/14/22	0.00	0.00	2.20	6.00	4.00	12.20
08/15/22	0.00	0.00	2.18	6.00	4.00	12.18
08/16/22	0.00	0.00	2.12	6.00	4.00	12.12
08/17/22	0.00	0.00	2.06	6.00	4.00	12.06
08/18/22	0.00	0.00	2.10	6.00	4.00	12.10
08/19/22	0.00	0.00	2.10	6.00	4.00	12.10
08/20/22	0.00	0.00	2.12	6.00	4.00	12.12
08/21/22	0.00	0.00	2.14	6.00	4.00	12.14
08/22/22	0.00	0.00	2.13	6.00	4.00	12.13
08/23/22	0.00	0.00	2.10	6.00	4.00	12.10
08/24/22	0.00	0.00	2.08	6.00	4.00	12.08
08/25/22	0.00	0.00	2.08	6.00	4.00	12.08
08/26/22	0.00	0.00	2.10	6.00	4.00	12.10
08/27/22	0.00	0.00	2.12	6.00	4.00	12.12
08/28/22	0.00	0.00	2.16	6.00	4.00	12.16
08/29/22	0.00	0.00	2.15	6.00	4.00	12.15
08/30/22	0.00	0.00	2.13	6.00	4.00	12.13
08/31/22	0.00	0.00	2.11	6.00	4.00	12.11

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value															
	A01	A02	A03	A04	A05	A06	A07	A08	B01	B02	B03	B04	B05	B06	B07	B08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
08/01/22	4.25	4.39	4.10	4.17	4.16	4.15	4.18	4.14	5.25	4.97	4.76	4.72	5.31	5.27	5.20	5.02
08/02/22	4.28	4.40	4.29	4.19	4.14	4.15	4.21	4.13	5.33	4.99	4.78	4.74	5.38	5.26	5.23	5.00
08/03/22	4.29	4.37	4.31	4.22	4.11	4.12	4.29	4.12	5.27	4.95	4.75	4.72	5.38	5.21	5.20	4.98
08/04/22	4.26	4.39	4.33	4.23	4.14	4.13	4.36	4.12	5.32	4.96	4.75	4.72	5.42	5.25	5.24	4.98
08/05/22	4.22	4.59	4.31	4.19	4.07	4.10	4.33	4.11	5.25	4.94	4.75	4.69	5.40	5.21	5.22	4.97
08/06/22	4.25	4.60	4.23	4.18	4.04	4.03	4.32	4.08	5.21	5.25	4.73	4.96	5.35	5.19	5.21	4.93
08/07/22	4.19	4.54	4.22	4.12	4.05	4.04	4.34	4.06	5.21	5.25	4.72	5.00	5.37	5.19	5.21	4.90
08/08/22	4.18	4.55	4.18	4.10	4.02	4.04	4.29	4.06	5.18	5.23	4.72	4.99	5.34	5.18	5.15	4.86
08/09/22	4.30	4.46	4.14	4.18	4.09	4.02	4.28	4.15	5.15	5.20	4.68	4.99	5.30	5.18	5.15	4.89
08/10/22	4.43	4.47	4.10	4.24	4.32	4.02	4.24	4.17	5.13	5.24	4.64	4.98	5.29	5.16	5.15	4.85
08/11/22	4.35	4.37	4.04	4.24	4.28	4.11	4.23	4.12	5.12	5.21	4.64	4.92	5.28	5.12	5.11	4.81
08/12/22	4.36	4.34	4.00	4.23	4.29	4.20	4.20	4.13	5.11	5.24	4.60	4.94	5.26	5.09	5.10	4.81
08/13/22	4.39	4.33	N/A *	4.19	4.31	4.20	4.17	4.09	5.10	5.20	4.86	4.94	5.23	5.04	5.12	4.79
08/14/22	4.39	4.28	N/A *	4.16	4.31	4.19	4.16	4.09	5.02	5.18	4.95	4.93	5.25	5.05	5.11	4.78
08/15/22	4.37	4.28	4.27	4.16	4.30	4.19	4.15	4.10	4.98	5.20	4.88	4.90	5.23	5.05	5.11	4.94
08/16/22	4.32	4.18	4.28	4.11	4.24	4.15	4.33	4.04	5.00	5.25	4.88	4.92	5.21	5.26	5.12	5.01
08/17/22	4.33	4.41	4.33	4.11	4.25	4.14	4.37	4.04	4.93	5.17	4.87	4.91	5.25	5.27	5.07	4.97
08/18/22	4.28	4.59	4.26	4.08	4.21	4.11	4.37	4.02	4.88	5.08	4.85	4.89	5.21	5.27	5.04	4.94
08/19/22	4.26	4.62	4.27	N/A *	4.19	4.10	4.35	4.00	5.07	5.09	4.81	4.87	5.18	5.27	5.04	4.94
08/20/22	4.22	4.59	4.27	N/A *	4.18	4.05	4.32	4.01	5.22	5.10	4.79	4.86	5.21	5.23	5.01	4.94
08/21/22	4.21	4.58	4.20	N/A *	4.15	4.06	4.32	4.11	5.17	5.08	4.80	4.86	5.20	5.21	4.99	4.95
08/22/22	4.06	4.57	4.26	N/A *	4.27	4.08	4.31	4.16	5.17	5.09	4.80	4.82	5.15	5.26	4.98	4.93
08/23/22	4.33	4.57	4.21	N/A *	4.31	4.03	4.29	4.15	5.16	5.08	4.79	4.83	5.14	5.24	4.95	4.91
08/24/22	4.34	4.55	4.22	N/A *	4.29	4.23	4.30	4.13	5.17	5.08	4.78	4.82	5.13	5.20	4.94	4.91
08/25/22	4.31	4.52	4.11	N/A *	4.22	4.20	4.29	4.10	5.12	5.04	4.75	4.78	5.07	5.19	4.95	4.87
08/26/22	4.34	4.46	4.15	4.37	4.24	4.18	4.27	4.08	5.15	5.03	4.74	4.79	5.07	5.19	5.19	4.87
08/27/22	4.26	4.45	4.13	4.29	4.20	4.16	4.23	4.03	5.16	5.02	4.74	4.75	5.34	5.19	5.22	4.86
08/28/22	4.27	4.49	4.07	4.20	4.20	4.13	4.15	4.04	5.18	4.99	4.72	4.74	5.42	5.16	5.22	4.87
08/29/22	4.26	4.41	4.29	4.18	4.15	4.14	4.35	4.03	5.16	4.96	4.71	4.75	5.44	5.15	5.23	4.88
08/30/22	4.19	4.65	4.27	4.27	4.09	4.11	4.34	4.01	5.14	4.97	4.67	4.70	5.39	5.13	5.19	4.83
08/31/22	4.21	4.61	4.30	4.25	4.13	4.05	4.34	4.11	5.14	4.91	4.69	4.66	5.37	5.14	5.19	4.79

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell down for maintenance activity.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	MicroFiltration Process online monitoring results Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
08/01/22	4.90	5.26	5.00	4.69	4.93	4.84	4.77	4.92	4.05	4.08	4.17	4.27	4.23	4.09	4.10	4.07
08/02/22	4.87	5.30	4.98	4.69	4.89	4.85	4.76	4.94	4.05	4.07	4.18	4.25	4.24	4.13	4.09	4.15
08/03/22	4.84	5.22	4.96	4.66	4.83	4.83	4.72	4.91	4.03	4.05	4.17	4.19	4.23	4.25	4.19	4.33
08/04/22	4.81	5.21	4.94	4.66	4.85	4.80	4.69	4.86	4.00	4.03	4.15	4.19	4.19	4.26	4.32	4.27
08/05/22	4.77	5.24	4.91	4.64	4.82	4.79	4.95	4.89	4.35	4.01	4.11	4.16	4.19	4.24	4.29	4.25
08/06/22	4.76	5.22	4.90	4.61	4.77	4.78	5.10	4.86	4.34	4.06	4.09	4.12	4.17	4.25	4.27	4.22
08/07/22	4.74	5.21	4.90	4.58	4.76	4.94	5.08	4.83	4.30	4.19	4.05	4.10	4.18	4.24	4.24	4.21
08/08/22	4.74	5.14	4.88	4.58	5.04	5.11	5.07	4.80	4.28	4.19	4.04	4.04	4.13	4.17	4.24	4.16
08/09/22	4.94	5.14	5.18	4.52	5.15	5.11	5.06	4.75	4.27	4.15	4.00	4.01	4.06	4.16	4.21	4.11
08/10/22	5.11	5.16	5.23	4.48	5.14	5.09	5.04	4.97	4.24	4.11	4.21	4.02	4.09	4.11	4.17	4.08
08/11/22	5.07	5.11	5.29	4.46	5.16	5.07	5.02	5.19	4.24	4.08	4.20	4.36	4.17	4.06	4.13	4.03
08/12/22	5.06	5.03	5.25	4.44	5.13	5.07	5.01	5.16	4.19	4.03	4.19	4.30	4.19	4.03	4.11	4.02
08/13/22	5.05	5.03	5.20	4.61	5.12	5.08	5.01	5.16	4.17	4.01	4.17	4.31	4.16	4.03	4.08	4.00
08/14/22	5.05	5.04	5.19	4.87	5.10	5.07	5.00	5.17	4.21	4.01	4.16	4.30	4.13	4.17	4.01	4.36
08/15/22	5.07	5.03	5.18	4.93	5.08	5.05	4.98	5.19	4.17	4.00	4.13	4.27	4.12	4.25	4.09	4.36
08/16/22	5.06	5.05	5.13	4.88	5.09	5.05	4.94	5.11	4.12	4.22	4.16	4.25	4.07	4.25	4.32	4.28
08/17/22	5.03	5.02	5.20	4.84	5.03	5.04	4.94	5.12	4.22	4.22	4.15	4.23	4.06	4.29	4.33	4.27
08/18/22	5.03	5.01	5.21	4.84	4.99	4.99	4.94	5.12	4.29	4.22	4.12	4.20	4.03	4.29	4.37	4.24
08/19/22	5.00	4.89	5.13	4.83	4.97	4.96	4.90	5.06	4.18	4.19	4.10	4.15	4.02	4.26	4.34	4.21
08/20/22	4.95	4.88	5.10	4.79	4.97	4.93	4.88	5.06	4.17	4.22	4.07	4.15	N/A *	4.24	4.32	4.21
08/21/22	4.95	4.91	5.11	4.81	4.96	4.93	4.86	5.05	4.18	4.19	4.07	4.14	N/A *	4.23	4.26	4.19
08/22/22	4.95	4.84	5.09	4.75	4.95	4.93	4.83	5.00	4.15	4.15	4.05	4.08	N/A *	4.23	4.25	4.13
08/23/22	4.91	4.82	5.05	4.76	4.94	4.89	4.83	5.00	4.12	4.12	4.12	4.22	4.38	4.21	4.24	4.12
08/24/22	4.92	4.85	5.10	4.76	4.90	4.88	4.83	5.00	4.10	4.11	4.17	4.35	4.35	4.16	4.22	4.10
08/25/22	4.90	4.88	5.02	4.76	4.85	4.87	4.81	4.96	4.08	4.08	4.20	4.27	4.31	4.16	4.23	4.09
08/26/22	4.87	4.75	5.02	4.74	4.81	4.85	4.77	4.95	4.05	4.05	4.22	4.23	4.26	4.22	4.20	4.13
08/27/22	4.84	4.77	4.95	4.72	4.80	4.85	4.77	4.97	4.03	4.04	4.18	4.19	4.28	4.31	4.18	4.31
08/28/22	4.85	5.12	4.95	4.70	4.79	4.84	4.75	4.94	4.03	4.04	4.17	4.19	4.28	4.32	4.24	4.27
08/29/22	4.84	5.26	4.94	4.65	4.77	4.83	4.74	4.93	4.02	4.22	4.14	4.17	4.27	4.26	4.35	4.25
08/30/22	4.83	5.26	4.96	4.62	4.74	4.78	4.71	4.87	4.08	4.23	4.11	4.13	4.25	4.24	4.35	4.19
08/31/22	4.86	5.26	4.91	4.60	4.72	4.75	4.88	4.84	4.15	4.23	4.10	4.11	4.23	4.23	4.34	4.20

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell down for maintenance activity.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	MicroFiltration Process online monitoring results Log Removal Value			
	E01 LRV	**E02** LRV	**E03** LRV	**E04** LRV
08/01/22	4.00	4.14	4.48	4.62
08/02/22	4.23	4.13	4.57	4.87
08/03/22	4.23	4.14	4.50	4.68
08/04/22	4.19	4.11	4.47	4.69
08/05/22	4.15	4.15	4.49	4.82
08/06/22	4.15	4.27	4.58	4.69
08/07/22	4.15	4.20	4.55	4.66
08/08/22	4.10	4.08	4.53	4.72
08/09/22	4.02	4.15	4.62	4.62
08/10/22	4.02	4.17	4.64	4.64
08/11/22	4.00	4.12	4.72	4.63
08/12/22	4.32	4.09	4.56	4.53
08/13/22	4.29	4.08	4.56	4.54
08/14/22	4.23	4.05	4.61	4.68
08/15/22	4.24	4.01	4.52	4.55
08/16/22	4.23	4.01	4.56	4.59
08/17/22	4.19	4.06	4.66	4.71
08/18/22	4.20	4.09	4.53	4.59
08/19/22	4.17	4.06	4.56	4.56
08/20/22	4.15	4.11	4.67	4.61
08/21/22	4.15	4.07	4.52	4.55
08/22/22	4.10	4.06	4.50	4.62
08/23/22	4.06	4.05	4.56	4.67
08/24/22	4.03	4.06	4.48	4.60
08/25/22	4.08	4.01	4.49	4.66
08/26/22	4.29	4.14	4.55	4.69
08/27/22	4.24	4.21	4.53	4.63
08/28/22	4.25	4.20	4.58	4.61
08/29/22	4.24	4.10	4.62	4.64
08/30/22	4.15	4.02	4.53	4.54
08/31/22	4.11	4.04	4.58	4.51

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	MicroFiltration Process online monitoring results Effluent Turbidity - NTU																		
	A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		MFE
	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
08/01/22	0.031	0.034	0.028	0.037	0.026	0.064	0.045	0.048	0.038	0.048	0.032	0.037	0.040	0.056	0.049	0.088	0.038	0.043	0.036
08/02/22	0.030	0.039	0.027	0.033	0.026	0.031	0.044	0.047	0.038	0.042	0.033	0.035	0.039	0.040	0.047	0.049	0.041	0.044	0.036
08/03/22	0.030	0.031	0.026	0.029	0.025	0.026	0.043	0.046	0.037	0.039	0.030	0.032	0.038	0.047	0.046	0.049	0.041	0.044	0.035
08/04/22	0.031	0.033	0.027	0.030	0.026	0.028	0.054	0.061	0.038	0.040	0.031	0.050	0.040	0.048	0.046	0.048	0.044	0.070	0.037
08/05/22	0.029	0.032	0.026	0.029	0.025	0.031	0.058	0.062	0.037	0.041	0.031	0.043	0.039	0.043	0.046	0.050	0.046	0.052	0.037
08/06/22	0.030	0.033	0.027	0.063	0.027	0.032	0.058	0.061	0.038	0.042	0.032	0.036	0.040	0.065	0.046	0.048	0.049	0.051	0.038
08/07/22	0.031	0.039	0.028	0.136	0.026	0.028	0.058	0.061	0.038	0.040	0.034	0.045	0.041	0.043	0.047	0.051	0.053	0.056	0.040
08/08/22	0.030	0.034	0.026	0.032	0.026	0.075	0.058	0.063	0.038	0.043	0.037	0.044	0.041	0.044	0.048	0.050	0.056	0.061	0.040
08/09/22	0.032	0.035	0.030	0.177	0.026	0.030	0.060	0.062	0.041	0.048	0.043	0.048	0.043	0.051	0.049	0.052	0.060	0.062	0.043
08/10/22	0.030	0.034	0.024	0.030	0.026	0.027	0.055	0.061	0.037	0.041	0.036	0.048	0.041	0.048	0.046	0.051	0.042	0.063	0.037
08/11/22	0.030	0.035	0.024	0.026	0.026	0.029	0.054	0.056	0.037	0.039	0.030	0.035	0.039	0.044	0.044	0.045	0.030	0.032	0.035
08/12/22	0.031	0.041	0.025	0.029	0.027	0.034	0.055	0.060	0.038	0.069	0.032	0.037	0.040	0.044	0.045	0.059	0.032	0.035	0.036
08/13/22	0.030	0.034	0.024	0.026	0.026	0.029	0.054	0.057	0.037	0.040	0.031	0.035	0.040	0.054	0.044	0.054	0.033	0.038	0.035
08/14/22	0.031	0.035	0.024	0.028	0.026	0.028	0.054	0.061	0.038	0.042	0.032	0.036	0.041	0.044	0.045	0.052	0.036	0.039	0.036
08/15/22	0.031	0.033	0.024	0.027	0.026	0.027	0.056	0.061	0.037	0.039	0.031	0.034	0.040	0.044	0.044	0.047	0.038	0.041	0.036
08/16/22	0.031	0.033	0.025	0.026	0.026	0.028	0.056	0.059	0.038	0.041	0.032	0.034	0.043	0.047	0.045	0.050	0.042	0.047	0.038
08/17/22	0.032	0.041	0.025	0.028	0.028	0.031	0.056	0.063	0.039	0.042	0.033	0.039	0.043	0.050	0.045	0.048	0.047	0.051	0.039
08/18/22	0.032	0.049	0.024	0.030	0.025	0.028	0.055	0.060	0.037	0.040	0.033	0.040	0.041	0.045	0.045	0.065	0.042	0.060	0.037
08/19/22	0.032	0.034	0.025	0.036	0.025	0.032	0.055	0.057	0.037	0.041	0.031	0.035	0.038	0.040	0.043	0.045	0.032	0.035	0.035
08/20/22	0.031	0.034	0.024	0.029	0.025	0.027	0.053	0.059	0.036	0.041	0.030	0.033	0.039	0.053	0.044	0.048	0.033	0.038	0.035
08/21/22	0.032	0.034	0.024	0.028	0.026	0.028	0.054	0.057	0.037	0.042	0.030	0.032	0.039	0.042	0.044	0.044	0.036	0.038	0.036
08/22/22	0.031	0.040	0.024	0.035	0.025	0.026	0.053	0.055	0.036	0.039	0.029	0.035	0.040	0.041	0.044	0.047	0.038	0.043	0.035
08/23/22	0.031	0.033	0.024	0.026	0.025	0.026	0.053	0.056	0.037	0.040	0.030	0.035	0.040	0.043	0.044	0.048	0.041	0.045	0.036
08/24/22	0.031	0.038	0.024	0.027	0.025	0.030	0.058	0.064	0.036	0.040	0.029	0.034	0.042	0.051	0.044	0.050	0.043	0.054	0.037
08/25/22	0.030	0.033	0.023	0.033	0.024	0.025	0.058	0.070	0.035	0.039	0.028	0.030	0.040	0.043	0.042	0.043	0.045	0.050	0.036
08/26/22	0.031	0.079	0.024	0.029	0.025	0.028	0.060	0.067	0.037	0.040	0.028	0.030	0.042	0.046	0.044	0.050	0.049	0.055	0.038
08/27/22	0.031	0.034	0.023	0.026	0.024	0.026	0.059	0.066	0.036	0.039	0.028	0.032	0.041	0.044	0.043	0.046	0.050	0.057	0.037
08/28/22	0.031	0.045	0.024	0.028	0.025	0.027	0.060	0.064	0.038	0.045	0.029	0.035	0.042	0.044	0.044	0.049	0.053	0.058	0.039
08/29/22	0.031	0.033	0.022	0.026	0.024	0.032	0.058	0.061	0.036	0.039	0.028	0.037	0.041	0.044	0.043	0.045	0.054	0.056	0.037
08/30/22	0.032	0.034	0.024	0.028	0.025	0.033	0.060	0.064	0.038	0.041	0.030	0.034	0.043	0.061	0.045	0.047	0.057	0.059	0.039
08/31/22	0.032	0.034	0.025	0.027	0.026	0.030	0.059	0.062	0.038	0.048	0.031	0.034	0.042	0.044	0.045	0.051	0.059	0.070	0.039

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Reverse Osmosis Process online monitoring results																
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
08/01/22	0.015	0.030	8.220	7.597	8.957	0.057	0.047	0.074	1,550	1,467	1,654	45	39	60	99.31	2.16	97.08	1.53
08/02/22	0.014	0.015	8.325	7.636	9.015	0.060	0.053	0.070	1,622	1,539	1,729	45	40	52	99.27	2.14	97.22	1.56
08/03/22	0.014	0.014	8.176	7.562	8.908	0.064	0.059	0.072	1,674	1,604	1,782	50	44	58	99.22	2.11	97.00	1.52
08/04/22	0.014	0.014	8.337	7.490	9.489	0.066	0.055	0.088	1,674	1,612	1,751	49	45	55	99.21	2.10	97.06	1.53
08/05/22	0.015	0.020	8.128	7.487	8.875	0.062	0.056	0.073	1,670	1,592	1,763	48	42	54	99.24	2.12	97.11	1.54
08/06/22	0.014	0.014	8.002	7.366	8.676	0.059	0.052	0.071	1,651	1,606	1,721	49	43	55	99.26	2.13	97.03	1.53
08/07/22	0.014	0.014	7.835	7.204	9.127	0.053	0.047	0.060	1,591	1,538	1,646	48	45	53	99.33	2.17	96.96	1.52
08/08/22	0.014	0.014	7.885	7.193	8.832	0.055	0.047	0.068	1,578	1,516	1,668	47	42	53	99.30	2.16	97.00	1.52
08/09/22	0.014	0.014	8.069	7.388	8.855	0.062	0.050	0.071	1,636	1,550	1,773	49	42	60	99.24	2.12	96.99	1.52
08/10/22	0.014	0.014	8.247	7.335	9.499	0.062	0.056	0.072	1,677	1,599	1,790	52	46	60	99.25	2.13	96.90	1.51
08/11/22	0.015	0.020	8.636	7.846	9.571	0.060	0.052	0.072	1,703	1,629	1,796	53	42	60	99.31	2.16	96.91	1.51
08/12/22	0.014	0.014	8.394	7.687	9.357	0.057	0.047	0.066	1,737	1,631	1,841	55	48	63	99.32	2.17	96.86	1.50
08/13/22	0.014	0.014	8.264	7.484	9.101	0.057	0.051	0.065	1,758	1,696	1,829	56	51	64	99.31	2.16	96.81	1.50
08/14/22	0.014	0.014	8.123	7.289	9.081	0.051	0.046	0.056	1,689	1,626	1,757	51	47	57	99.37	2.20	96.98	1.52
08/15/22	0.015	0.015	8.350	7.575	9.475	0.055	0.048	0.069	1,647	1,554	1,777	52	46	61	99.34	2.18	96.83	1.50
08/16/22	0.014	0.015	8.561	7.728	9.549	0.065	0.050	0.080	1,725	1,634	1,859	55	46	63	99.24	2.12	96.83	1.50
08/17/22	0.014	0.014	8.345	7.724	9.398	0.073	0.067	0.080	1,773	1,688	1,885	55	49	63	99.13	2.06	96.90	1.51
08/18/22	0.014	0.014	8.461	7.429	8.969	0.067	0.060	0.076	1,773	1,696	1,839	54	49	61	99.21	2.10	96.94	1.51
08/19/22	0.015	0.015	8.292	7.606	9.052	0.066	0.060	0.074	1,764	1,690	1,871	57	53	62	99.20	2.10	96.79	1.49
08/20/22	0.015	0.015	8.282	7.515	9.131	0.063	0.058	0.072	1,767	1,702	1,853	56	50	62	99.24	2.12	96.85	1.50
08/21/22	0.015	0.015	8.206	7.588	9.078	0.059	0.056	0.077	1,694	1,624	1,778	52	46	60	99.28	2.14	96.93	1.51
08/22/22	0.015	0.015	8.314	7.625	9.312	0.061	0.053	0.076	1,644	1,555	1,771	52	46	59	99.26	2.13	96.84	1.50
08/23/22	0.015	0.015	8.505	7.583	9.386	0.067	0.058	0.086	1,717	1,636	1,830	54	48	82	99.21	2.10	96.84	1.50
08/24/22	0.015	0.015	8.415	7.928	9.266	0.071	0.063	0.089	1,769	1,700	1,873	55	47	66	99.16	2.08	96.89	1.51
08/25/22	0.015	0.015	8.286	7.642	9.177	0.069	0.059	0.089	1,782	1,680	1,905	55	48	63	99.17	2.08	96.92	1.51
08/26/22	0.015	0.015	8.263	7.527	9.565	0.066	0.058	0.075	1,780	1,695	1,881	55	48	63	99.20	2.10	96.90	1.51
08/27/22	0.015	0.015	8.596	7.747	9.434	0.066	0.059	0.074	1,699	1,637	1,819	51	47	57	99.24	2.12	96.99	1.52
08/28/22	0.015	0.015	8.395	7.682	9.405	0.058	0.054	0.066	1,612	1,559	1,674	49	44	55	99.31	2.16	96.99	1.52
08/29/22	0.015	0.015	8.459	7.564	9.551	0.060	0.052	0.072	1,603	1,508	1,719	50	43	58	99.29	2.15	96.89	1.51
08/30/22	0.015	0.015	8.678	7.933	9.742	0.064	0.057	0.075	1,701	1,619	1,848	53	47	61	99.26	2.13	96.89	1.51
08/31/22	0.015	0.015	8.650	8.019	9.695	0.067	0.060	0.080	1,771	1,675	1,925	55	47	82	99.22	2.11	96.87	1.50

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	UltraViolet / AOP Process online monitoring results					
	UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/L	Log Removal
08/01/22	98.40	72.151	23,475.1	0.25	3	6
08/02/22	97.86	80.178	19,275.5	0.27	3	6
08/03/22	97.21	80.774	21,435.7	0.27	3	6
08/04/22	97.13	77.262	20,766.7	0.26	3	6
08/05/22	97.03	80.314	21,057.6	0.27	3	6
08/06/22	97.16	85.350	21,469.6	0.26	3	6
08/07/22	96.59	85.338	21,474.4	0.25	3	6
08/08/22	97.07	86.962	21,489.8	0.25	3	6
08/09/22	97.12	88.854	22,140.0	0.26	3	6
08/10/22	97.18	88.072	22,808.6	0.25	3	6
08/11/22	96.98	92.609	22,318.8	0.25	3	6
08/12/22	96.99	93.430	23,194.9	0.25	3	6
08/13/22	97.09	90.498	23,285.6	0.25	3	6
08/14/22	97.23	89.919	23,241.9	0.26	3	6
08/15/22	97.00	89.885	23,305.5	0.26	3	6
08/16/22	97.07	89.336	23,866.9	0.26	3	6
08/17/22	96.96	91.669	23,015.7	0.26	3	6
08/18/22	97.06	94.434	23,353.8	0.25	3	6
08/19/22	97.00	91.787	25,830.4	0.27	3	6
08/20/22	97.13	92.540	27,118.4	0.30	3	6
08/21/22	97.17	90.265	27,158.2	0.29	3	6
08/22/22	97.24	88.851	26,623.0	0.30	3	6
08/23/22	97.37	89.149	25,470.4	0.29	3	6
08/24/22	97.19	90.233	25,119.0	0.28	3	6
08/25/22	97.16	91.083	28,469.8	0.29	3	6
08/26/22	97.34	91.290	27,495.8	0.29	3	6
08/27/22	97.44	92.694	25,780.6	0.28	3	6
08/28/22	97.63	91.671	25,512.5	0.28	3	6
08/29/22	97.53	92.199	25,222.3	0.27	3	6
08/30/22	97.66	94.613	25,352.6	0.27	3	6
08/31/22	97.55	84.275	25,117.4	0.27	3	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
							MFE		ROP		
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	NTU		NTU		TOC
	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
09/01/22	12.15	12.15	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/02/22	12.12	12.12	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/03/22	12.11	12.11	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/04/22	12.13	12.13	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/05/22	12.12	12.12	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/06/22	12.11	12.11	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/07/22	12.07	12.07	12.06	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/08/22	12.06	12.06	12.05	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/09/22	12.07	12.07	12.05	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/10/22	12.11	12.11	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/11/22	12.17	12.17	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/12/22	12.16	12.16	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/13/22	12.13	12.13	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/14/22	12.10	12.10	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/15/22	12.13	12.13	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/16/22	12.12	12.12	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/17/22	12.15	12.15	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/18/22	12.18	12.18	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/19/22	12.16	12.16	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/20/22	12.05	12.05	12.04	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/21/22	12.11	12.11	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/22/22	12.06	12.06	12.06	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/23/22	12.09	12.09	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/24/22	12.13	12.13	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/25/22	12.17	12.17	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/26/22	12.24	12.24	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/27/22	12.26	12.26	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/28/22	12.22	12.22	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/29/22	12.15	12.15	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/30/22	12.17	12.17	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
09/01/22	0.00	4.06	2.09	6.00	0.00	12.15
09/02/22	0.00	4.04	2.08	6.00	0.00	12.12
09/03/22	0.00	4.02	2.09	6.00	0.00	12.11
09/04/22	0.00	4.03	2.10	6.00	0.00	12.13
09/05/22	0.00	4.01	2.10	6.00	0.00	12.12
09/06/22	0.00	4.02	2.09	6.00	0.00	12.11
09/07/22	0.00	4.01	2.06	6.00	0.00	12.07
09/08/22	0.00	4.01	2.05	6.00	0.00	12.06
09/09/22	0.00	4.02	2.05	6.00	0.00	12.07
09/10/22	0.00	4.01	2.10	6.00	0.00	12.11
09/11/22	0.00	4.03	2.13	6.00	0.00	12.17
09/12/22	0.00	4.03	2.13	6.00	0.00	12.16
09/13/22	0.00	4.03	2.11	6.00	0.00	12.13
09/14/22	0.00	4.02	2.08	6.00	0.00	12.10
09/15/22	0.00	4.00	2.12	6.00	0.00	12.13
09/16/22	0.00	4.00	2.12	6.00	0.00	12.12
09/17/22	0.00	4.01	2.14	6.00	0.00	12.15
09/18/22	0.00	4.01	2.18	6.00	0.00	12.18
09/19/22	0.00	4.01	2.15	6.00	0.00	12.16
09/20/22	0.00	4.01	2.04	6.00	0.00	12.05
09/21/22	0.00	4.01	2.10	6.00	0.00	12.11
09/22/22	0.00	4.00	2.06	6.00	0.00	12.06
09/23/22	0.00	4.00	2.09	6.00	0.00	12.09
09/24/22	0.00	4.00	2.13	6.00	0.00	12.13
09/25/22	0.00	4.01	2.16	6.00	0.00	12.17
09/26/22	0.00	4.10	2.15	6.00	0.00	12.24
09/27/22	0.00	4.08	2.18	6.00	0.00	12.26
09/28/22	0.00	4.05	2.17	6.00	0.00	12.22
09/29/22	0.00	4.01	2.14	6.00	0.00	12.15
09/30/22	0.00	4.01	2.16	6.00	0.00	12.17

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Documented Virus Reduction Achieved					
	OC San	MF+Cl_2	RO	UV/AOP	Underground travel time (1)	Total
	LRV	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
09/01/22	0.00	0.00	2.09	6.00	4.00	12.09
09/02/22	0.00	0.00	2.08	6.00	4.00	12.08
09/03/22	0.00	0.00	2.09	6.00	4.00	12.09
09/04/22	0.00	0.00	2.10	6.00	4.00	12.10
09/05/22	0.00	0.00	2.10	6.00	4.00	12.10
09/06/22	0.00	0.00	2.09	6.00	4.00	12.09
09/07/22	0.00	0.00	2.06	6.00	4.00	12.06
09/08/22	0.00	0.00	2.05	6.00	4.00	12.05
09/09/22	0.00	0.00	2.05	6.00	4.00	12.05
09/10/22	0.00	0.00	2.10	6.00	4.00	12.10
09/11/22	0.00	0.00	2.13	6.00	4.00	12.13
09/12/22	0.00	0.00	2.13	6.00	4.00	12.13
09/13/22	0.00	0.00	2.11	6.00	4.00	12.11
09/14/22	0.00	0.00	2.08	6.00	4.00	12.08
09/15/22	0.00	0.00	2.12	6.00	4.00	12.12
09/16/22	0.00	0.00	2.12	6.00	4.00	12.12
09/17/22	0.00	0.00	2.14	6.00	4.00	12.14
09/18/22	0.00	0.00	2.18	6.00	4.00	12.18
09/19/22	0.00	0.00	2.15	6.00	4.00	12.15
09/20/22	0.00	0.00	2.04	6.00	4.00	12.04
09/21/22	0.00	0.00	2.10	6.00	4.00	12.10
09/22/22	0.00	0.00	2.06	6.00	4.00	12.06
09/23/22	0.00	0.00	2.09	6.00	4.00	12.09
09/24/22	0.00	0.00	2.13	6.00	4.00	12.13
09/25/22	0.00	0.00	2.16	6.00	4.00	12.16
09/26/22	0.00	0.00	2.15	6.00	4.00	12.15
09/27/22	0.00	0.00	2.18	6.00	4.00	12.18
09/28/22	0.00	0.00	2.17	6.00	4.00	12.17
09/29/22	0.00	0.00	2.14	6.00	4.00	12.14
09/30/22	0.00	0.00	2.16	6.00	4.00	12.16

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value															
	A01	A02	A03	A04	A05	A06	A07	A08	B01	B02	B03	B04	B05	B06	B07	B08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
09/01/22	4.15	4.59	4.24	4.27	4.07	4.06	4.32	4.14	5.07	5.26	4.67	4.88	5.34	5.11	5.16	4.76
09/02/22	4.12	4.55	4.18	4.22	4.08	4.05	4.29	4.15	5.09	5.26	4.64	4.97	5.36	5.14	5.14	4.76
09/03/22	4.15	4.57	4.21	4.27	4.02	4.04	4.29	4.17	5.05	5.30	4.61	4.99	5.36	5.16	5.18	4.76
09/04/22	4.28	4.57	4.17	4.21	4.23	4.03	4.28	4.16	5.06	5.27	4.66	4.99	5.36	5.10	5.20	4.78
09/05/22	4.30	4.55	4.13	4.20	4.22	4.13	4.29	4.16	5.08	5.25	4.64	4.97	5.37	5.07	5.18	4.80
09/06/22	4.32	4.53	4.14	4.22	4.20	4.22	4.29	4.16	5.06	5.29	4.64	4.94	5.39	5.06	5.18	4.78
09/07/22	4.30	4.51	4.13	4.21	4.25	4.26	4.28	4.18	5.09	5.32	4.95	5.00	5.40	5.09	5.15	4.77
09/08/22	4.30	4.54	4.11	4.16	4.20	4.21	4.24	4.14	5.08	5.24	4.90	4.98	5.37	5.08	5.13	4.76
09/09/22	4.28	4.45	4.08	4.07	4.15	4.16	4.25	4.12	5.04	5.23	5.06	4.92	5.37	5.06	5.15	4.72
09/10/22	4.18	4.42	4.04	4.04	4.12	4.11	4.25	4.11	5.01	5.18	5.11	4.92	5.32	5.06	5.12	4.84
09/11/22	4.18	4.35	4.24	4.04	4.04	4.09	N/A *	4.09	5.02	5.22	5.14	4.91	5.31	5.21	5.11	4.93
09/12/22	4.13	4.64	4.23	4.26	4.03	4.08	4.43	4.05	4.97	5.20	5.12	4.90	5.30	5.25	5.13	4.94
09/13/22	4.08	4.56	4.25	4.24	4.03	4.06	4.34	4.05	4.94	5.21	5.09	4.88	5.21	5.22	5.12	4.95
09/14/22	4.10	4.57	4.20	4.28	4.02	4.04	4.35	4.16	4.87	5.21	5.06	4.87	5.21	5.22	5.12	4.89
09/15/22	4.04	4.51	4.15	4.24	4.00	4.05	4.32	4.13	5.15	5.14	5.08	4.84	5.19	5.25	5.09	4.87
09/16/22	4.03	4.50	4.12	4.25	4.00	4.01	4.30	4.13	5.22	5.14	5.08	4.84	5.17	5.21	5.05	4.87
09/17/22	4.29	4.44	4.01	4.21	4.21	4.01	4.28	4.12	5.17	5.14	5.09	4.83	5.15	5.21	5.03	4.86
09/18/22	4.40	4.37	4.01	4.15	4.30	4.21	4.26	4.11	5.16	5.12	5.04	4.82	5.13	5.19	5.04	4.84
09/19/22	4.40	4.37	4.01	4.17	4.32	4.21	4.24	4.05	5.14	5.13	5.04	4.82	5.13	5.20	5.03	4.84
09/20/22	4.35	4.37	4.01	4.20	4.33	4.21	4.23	4.05	5.13	5.17	5.01	4.83	5.21	5.22	5.09	4.85
09/21/22	4.35	4.34	N/A *	4.13	4.28	4.18	4.20	4.02	5.15	5.12	5.01	4.78	5.10	5.19	5.02	4.83
09/22/22	4.37	4.35	4.21	4.16	4.24	4.15	4.18	4.00	5.15	5.08	5.00	4.76	5.05	5.15	4.96	4.81
09/23/22	4.30	4.25	4.13	4.13	4.22	4.12	4.14	4.00	5.09	5.04	4.98	4.74	5.14	5.14	4.93	4.77
09/24/22	4.30	4.24	4.24	4.10	4.20	4.10	4.11	4.00	5.10	5.02	4.95	4.75	5.28	5.11	4.94	4.77
09/25/22	4.25	4.21	4.22	4.09	4.17	4.09	4.09	4.01	5.05	5.01	4.95	4.71	5.32	5.11	4.93	4.76
09/26/22	4.27	4.61	4.25	4.23	4.18	4.10	4.12	4.10	5.05	5.00	4.96	4.66	5.32	5.09	4.95	4.73
09/27/22	4.28	4.59	4.23	4.24	4.17	4.08	4.31	4.09	5.10	4.98	4.95	4.66	5.30	5.10	5.11	4.69
09/28/22	4.26	4.59	4.21	4.22	4.19	4.11	4.29	4.09	5.03	5.31	4.95	4.83	5.25	5.07	5.19	4.72
09/29/22	4.25	4.59	4.22	4.18	4.16	4.09	4.29	4.07	5.05	5.32	4.96	4.89	5.29	5.04	5.16	4.71
09/30/22	4.19	4.56	4.17	4.15	4.13	4.07	4.26	4.04	5.02	5.27	4.92	4.91	5.29	5.03	5.17	4.70

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell offline for maintenance.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

Date	MicroFiltration Process online monitoring results Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
09/01/22	4.84	5.26	4.89	4.56	4.68	4.74	5.07	4.78	4.13	4.18	4.08	4.10	4.22	4.23	4.34	4.19
09/02/22	4.85	5.24	4.88	4.54	4.68	4.97	5.01	4.77	4.10	4.14	4.04	4.08	4.18	4.21	4.30	4.18
09/03/22	4.83	5.23	4.91	4.54	4.64	5.07	5.03	4.76	4.05	4.15	4.04	4.06	4.19	4.21	4.31	4.17
09/04/22	5.03	5.24	4.95	4.56	4.88	5.09	5.04	4.75	4.05	4.12	4.04	4.03	4.15	4.22	4.25	4.13
09/05/22	5.28	5.24	5.15	4.54	5.17	5.12	5.02	4.93	4.07	4.10	4.01	4.18	4.16	4.20	4.22	4.11
09/06/22	5.32	5.22	5.37	4.50	5.17	5.10	5.01	5.13	4.04	4.11	4.08	4.25	4.22	4.19	4.25	4.10
09/07/22	5.31	5.27	5.37	4.52	5.15	5.05	5.01	5.12	4.02	4.10	4.18	4.23	4.31	4.18	4.24	4.06
09/08/22	5.28	5.29	5.34	4.51	5.11	5.04	4.98	5.12	4.01	4.07	4.13	4.21	4.30	4.20	4.22	4.06
09/09/22	5.24	5.22	5.35	4.83	5.10	5.04	4.99	5.12	4.02	4.02	4.10	4.16	4.28	4.27	4.21	4.10
09/10/22	5.22	5.12	5.35	4.90	5.10	5.04	5.01	5.10	4.01	4.03	4.10	4.16	4.27	4.28	4.25	4.23
09/11/22	5.21	5.09	5.28	4.89	5.07	5.02	4.94	5.08	4.03	4.11	4.10	4.15	4.26	4.26	4.44	4.21
09/12/22	5.21	5.11	5.28	4.87	5.10	5.02	4.92	5.09	4.32	4.17	4.06	4.14	4.22	4.26	4.31	4.21
09/13/22	5.19	5.14	5.33	4.86	5.07	4.99	4.93	5.10	4.27	4.16	4.03	4.10	4.22	4.21	4.33	4.21
09/14/22	5.17	5.06	5.26	4.84	5.04	5.00	4.92	5.11	4.25	4.14	4.04	4.09	4.20	4.21	4.31	4.12
09/15/22	5.16	5.02	5.16	4.82	5.01	4.99	4.89	5.09	4.26	4.13	4.03	4.06	4.12	4.20	4.27	4.09
09/16/22	5.13	5.02	5.19	4.83	4.98	4.95	4.90	5.04	4.26	4.07	4.25	4.03	4.08	4.15	4.23	4.04
09/17/22	5.11	4.96	5.21	4.77	4.95	4.95	4.90	5.00	4.25	4.05	4.24	4.01	4.05	4.12	4.22	4.01
09/18/22	5.11	4.96	5.15	4.77	4.98	4.94	4.89	4.97	4.25	4.03	4.24	4.05	4.09	4.09	4.19	4.01
09/19/22	5.10	4.97	5.10	4.78	4.95	4.92	4.87	4.96	4.20	4.01	4.21	4.29	4.27	4.03	4.14	4.01
09/20/22	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	4.15	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
09/21/22	5.08	4.97	5.14	4.74	4.86	4.88	4.84	4.95	4.15	4.01	4.20	4.27	4.27	4.02	4.10	N/A**
09/22/22	5.07	4.87	4.21	4.70	4.78	4.82	4.75	4.91	4.15	N/A**	4.18	4.23	4.23	4.06	4.07	4.18
09/23/22	4.96	4.84	4.99	4.68	4.75	4.81	4.72	4.85	4.10	4.23	4.12	4.21	4.18	4.17	4.05	4.22
09/24/22	4.94	5.00	5.05	4.68	4.78	4.79	4.73	4.83	4.07	4.16	4.10	4.21	4.14	4.23	4.00	4.20
09/25/22	4.92	5.27	4.97	4.69	4.81	4.79	4.72	4.84	4.14	4.15	4.12	4.16	4.17	4.23	4.36	4.23
09/26/22	4.93	5.25	5.01	4.66	4.79	4.80	4.76	4.86	4.27	4.13	4.11	4.18	4.15	4.23	4.36	4.25
09/27/22	4.87	5.24	5.02	4.63	4.76	4.80	4.75	4.85	4.23	4.12	4.10	4.18	4.11	4.24	4.35	4.23
09/28/22	4.88	5.24	4.97	4.61	4.74	4.78	4.83	4.85	4.20	4.17	4.05	4.15	4.07	4.19	4.33	4.21
09/29/22	4.90	5.23	4.98	4.59	4.69	4.72	4.96	4.84	4.19	4.11	4.01	4.12	4.06	4.18	4.32	4.18
09/30/22	4.88	5.22	4.97	4.57	4.64	4.95	4.98	4.83	4.17	4.01	4.25	4.11	4.03	4.18	4.28	4.18

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell offline for planned construction outage event..

** Cell offline for maintenance.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

MicroFiltration Process online monitoring results

Log Removal Value

Date	E01 LRV	E02 LRV	E03 LRV	E04 LRV
09/01/22	4.09	4.19	4.64	4.66
09/02/22	4.10	4.21	4.55	4.61
09/03/22	4.08	4.22	4.50	4.63
09/04/22	4.04	4.17	4.61	4.68
09/05/22	4.02	4.18	4.59	4.59
09/06/22	4.02	4.15	4.48	4.62
09/07/22	4.01	4.14	4.56	4.78
09/08/22	4.26	4.16	4.54	4.66
09/09/22	4.21	4.14	4.52	4.59
09/10/22	4.18	4.24	4.55	4.63
09/11/22	4.11	4.21	4.65	4.71
09/12/22	4.08	4.23	4.49	4.57
09/13/22	4.07	4.22	4.44	4.54
09/14/22	N/A *	4.18	4.38	4.64
09/15/22	N/A *	4.13	4.49	4.60
09/16/22	N/A *	4.13	4.47	4.48
09/17/22	N/A *	4.12	4.49	4.47
09/18/22	N/A *	4.08	4.56	4.56
09/19/22	N/A *	4.02	4.47	4.54
09/20/22	N/A *	N/A *	N/A**	N/A**
09/21/22	N/A *	N/A *	N/A**	N/A**
09/22/22	N/A *	N/A *	N/A**	N/A**
09/23/22	N/A *	N/A *	N/A**	N/A**
09/24/22	N/A *	N/A *	N/A**	N/A**
09/25/22	N/A *	N/A *	N/A**	N/A**
09/26/22	N/A *	N/A *	N/A**	N/A**
09/27/22	N/A *	N/A *	N/A**	N/A**
09/28/22	N/A *	N/A *	N/A**	N/A**
09/29/22	N/A *	N/A *	N/A**	N/A**
09/30/22	5.58	N/A *	N/A**	4.60

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell offline for installation of new membranes.

** Cell offline for maintenance.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

MicroFiltration Process online monitoring results

Effluent Turbidity - NTU

Date	A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		MFE
	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
09/01/22	0.031	0.035	0.024	0.028	0.027	0.033	0.057	0.062	0.037	0.040	0.030	0.034	0.043	0.064	0.046	0.060	0.060	0.061	0.039
09/02/22	0.032	0.034	0.023	0.030	0.025	0.027	0.055	0.061	0.037	0.041	0.030	0.045	0.042	0.053	0.045	0.048	0.061	0.065	0.039
09/03/22	0.032	0.034	0.024	0.037	0.025	0.028	0.056	0.059	0.038	0.049	0.030	0.034	0.043	0.124	0.047	0.049	0.063	0.065	0.040
09/04/22	0.032	0.034	0.024	0.028	0.026	0.031	0.056	0.061	0.038	0.045	0.032	0.037	0.044	0.103	0.047	0.050	0.067	0.082	0.041
09/05/22	0.033	0.035	0.025	0.029	0.027	0.032	0.057	0.060	0.040	0.048	0.033	0.039	0.044	0.056	0.051	0.056	0.067	0.071	0.042
09/06/22	0.033	0.038	0.026	0.031	0.027	0.032	0.057	0.062	0.040	0.045	0.034	0.039	0.046	0.056	0.052	0.073	0.070	0.089	0.043
09/07/22	0.033	0.058	0.026	0.034	0.026	0.030	0.057	0.064	0.040	0.049	0.035	0.041	0.045	0.049	0.053	0.057	0.072	0.081	0.041
09/08/22	0.033	0.041	0.027	0.032	0.027	0.029	0.057	0.060	0.040	0.042	0.035	0.040	0.046	0.048	0.054	0.067	0.075	0.079	0.044
09/09/22	0.035	0.037	0.026	0.030	0.028	0.033	0.057	0.064	0.041	0.047	0.035	0.049	0.044	0.049	0.052	0.060	0.067	0.915	0.043
09/10/22	0.034	0.043	0.026	0.030	0.028	0.032	0.057	0.064	0.039	0.044	0.032	0.039	0.042	0.064	0.046	0.051	0.037	0.045	0.038
09/11/22	0.035	0.042	0.025	0.034	0.028	0.034	0.059	0.068	0.040	0.047	0.032	0.043	0.042	0.046	0.047	0.053	0.038	0.043	0.038
09/12/22	0.033	0.036	0.024	0.027	0.026	0.027	0.055	0.060	0.038	0.040	0.029	0.035	0.041	0.042	0.044	0.070	0.038	0.041	0.036
09/13/22	0.033	0.035	0.025	0.029	0.026	0.028	0.055	0.058	0.040	0.047	0.031	0.035	0.041	0.067	0.045	0.047	0.039	0.041	0.037
09/14/22	0.034	0.036	0.025	0.031	0.027	0.032	0.056	0.060	0.040	0.043	0.031	0.036	0.043	0.056	0.046	0.054	0.041	0.047	0.038
09/15/22	0.031	0.038	0.024	0.034	0.028	0.038	0.047	0.064	0.038	0.047	0.029	0.041	0.039	0.061	0.069	0.100	0.038	0.046	0.038
09/16/22	0.028	0.068	0.021	0.032	0.024	0.026	0.040	0.043	0.034	0.037	0.024	0.026	0.033	0.040	0.088	0.092	0.035	0.041	0.036
09/17/22	0.027	0.030	0.020	0.025	0.024	0.025	0.039	0.042	0.034	0.035	0.024	0.026	0.032	0.033	0.085	0.120	0.034	0.035	0.036
09/18/22	0.027	0.029	0.020	0.024	0.024	0.024	0.040	0.042	0.034	0.035	0.024	0.027	0.032	0.033	0.083	0.089	0.035	0.038	0.035
09/19/22	0.027	0.030	0.020	0.023	0.024	0.027	0.039	0.042	0.034	0.036	0.025	0.027	0.033	0.036	0.081	0.085	0.035	0.037	0.035
09/20/22	0.044	0.143	0.023	0.028	0.027	0.033	0.046	0.066	N/A *	N/A *	N/A *	N/A *	0.036	0.038	N/A *	N/A *	N/A *	N/A *	0.043
09/21/22	0.030	0.039	0.022	0.026	0.025	0.029	0.041	0.049	0.037	0.068	0.032	0.040	0.034	0.043	0.081	0.089	N/A**	N/A**	0.038
09/22/22	0.029	0.033	0.022	0.025	0.025	0.027	0.042	0.044	0.037	0.038	0.035	0.037	0.035	0.036	0.080	0.099	N/A**	N/A**	0.038
09/23/22	0.029	0.032	0.022	0.026	0.025	0.030	0.042	0.051	0.035	0.042	0.031	0.039	0.034	0.040	0.064	0.079	N/A**	N/A**	0.035
09/24/22	0.028	0.030	0.021	0.023	0.024	0.025	0.041	0.044	0.034	0.038	0.026	0.029	0.033	0.035	0.050	0.052	N/A**	N/A**	0.033
09/25/22	0.027	0.037	0.020	0.023	0.024	0.026	0.040	0.042	0.034	0.036	0.030	0.036	0.032	0.037	0.050	0.051	N/A**	N/A**	0.033
09/26/22	0.028	0.030	0.021	0.027	0.024	0.026	0.041	0.049	0.035	0.037	0.042	0.055	0.032	0.034	0.051	0.052	N/A**	N/A**	0.035
09/27/22	0.028	0.030	0.022	0.025	0.026	0.030	0.043	0.047	0.036	0.040	0.071	0.095	0.033	0.034	0.052	0.053	N/A**	N/A**	0.039
09/28/22	0.028	0.033	0.022	0.029	0.028	0.035	0.044	0.049	0.036	0.040	0.116	0.140	0.033	0.038	0.053	0.056	N/A**	N/A**	0.045
09/29/22	0.029	0.030	0.022	0.025	0.027	0.030	0.045	0.050	0.037	0.039	0.076	0.148	0.034	0.040	0.049	0.054	N/A**	N/A**	0.042
09/30/22	0.029	0.031	0.023	0.028	0.027	0.030	0.042	0.046	0.037	0.041	0.027	0.030	0.033	0.039	0.048	0.051	0.083	0.104	0.038

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

* Cell offline for planned construction outage event..

** Cell offline for maintenance.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Reverse Osmosis Process online monitoring results																
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
09/01/22	0.015	0.015	8.670	7.938	9.259	0.071	0.061	0.085	1,822	1,739	1,921	55	47	82	99.18	2.09	96.96	1.52
09/02/22	0.015	0.015	8.432	7.414	9.264	0.070	0.062	0.077	1,794	1,708	1,899	59	53	68	99.17	2.08	96.69	1.48
09/03/22	0.015	0.015	8.783	7.881	9.864	0.072	0.065	0.079	1,726	1,672	1,849	55	48	60	99.18	2.09	96.84	1.50
09/04/22	0.015	0.015	8.245	6.880	9.187	0.066	0.061	0.073	1,618	1,566	1,671	53	47	60	99.21	2.10	96.73	1.48
09/05/22	0.016	0.027	8.079	7.286	8.975	0.064	0.053	0.088	1,581	1,532	1,628	54	44	84	99.21	2.10	96.59	1.47
09/06/22	0.016	0.017	8.238	7.570	9.291	0.067	0.054	0.098	1,566	1,492	1,714	57	45	88	99.19	2.09	96.39	1.44
09/07/22	0.018	0.019	8.452	7.779	9.512	0.074	0.056	0.135 *	1,710	1,598	1,828	67	50	102	99.12	2.06	96.08	1.41
09/08/22	0.016	0.018	8.772	8.098	10.388	0.079	0.057	0.116 *	1,771	1,683	1,856	59	52	67	99.10	2.05	96.68	1.48
09/09/22	0.015	0.015	8.321	7.663	9.159	0.074	0.062	0.087	1,786	1,694	1,879	59	51	66	99.11	2.05	96.69	1.48
09/10/22	0.015	0.015	8.758	8.075	9.462	0.069	0.062	0.081	1,728	1,664	1,845	56	49	64	99.21	2.10	96.76	1.49
09/11/22	0.015	0.015	8.237	7.612	9.176	0.061	0.057	0.071	1,728	1,664	1,845	56	49	64	99.26	2.13	96.76	1.49
09/12/22	0.015	0.015	7.965	7.426	8.751	0.060	0.053	0.072	1,580	1,514	1,680	48	43	56	99.25	2.13	96.93	1.51
09/13/22	0.015	0.015	8.129	7.578	8.816	0.064	0.049	0.081	1,685	1,587	1,847	52	47	60	99.22	2.11	96.89	1.51
09/14/22	0.015	0.015	8.414	5.950	9.690	0.069	0.062	0.081	1,771	1,684	1,887	55	49	62	99.17	2.08	96.91	1.51
09/15/22	0.015	0.015	8.794	8.131	9.763	0.067	0.059	0.077	1,758	1,679	1,863	54	48	60	99.24	2.12	96.95	1.52
09/16/22	0.015	0.015	8.481	7.864	9.204	0.065	0.059	0.075	1,704	1,618	1,809	53	47	61	99.24	2.12	96.88	1.51
09/17/22	0.015	0.015	8.528	7.872	9.241	0.062	0.058	0.068	1,694	1,645	1,769	52	46	58	99.27	2.14	96.92	1.51
09/18/22	0.015	0.015	8.411	7.769	9.413	0.056	0.053	0.062	1,609	1,542	1,674	48	43	53	99.33	2.18	97.03	1.53
09/19/22	0.015	0.017	8.573	7.891	9.449	0.061	0.051	0.094	1,602	1,508	1,740	49	44	65	99.29	2.15	96.92	1.51
09/20/22	0.024	0.024	9.547	9.136	9.775	0.087	0.087	0.087	1,743	1,734	1,770	58	58	58	99.08	2.04	96.68	1.48
09/21/22	0.019	0.111	8.743	8.382	9.251	0.069	0.050	0.099	1,726	1,635	1,822	42	36	58	99.21	2.10	97.58	1.62
09/22/22	0.015	0.015	9.129	8.246	10.963	0.080	0.057	0.144 *	1,761	1,689	1,838	48	36	75	99.13	2.06	97.27	1.56
09/23/22	0.015	0.016	8.397	7.854	8.945	0.068	0.064	0.081	1,779	1,705	1,874	53	46	60	99.19	2.09	97.00	1.52
09/24/22	0.015	0.015	8.312	7.702	8.963	0.062	0.057	0.072	1,735	1,688	1,847	48	43	56	99.26	2.13	97.23	1.56
09/25/22	0.015	0.015	8.258	7.585	8.994	0.057	0.054	0.060	1,630	1,565	1,691	44	39	51	99.31	2.16	97.32	1.57
09/26/22	0.015	0.015	8.396	7.683	9.208	0.060	0.053	0.076	1,621	1,522	1,764	43	37	48	99.29	2.15	97.35	1.58
09/27/22	0.015	0.015	8.560	7.800	9.287	0.057	0.047	0.065	1,735	1,626	1,873	43	37	50	99.34	2.18	97.50	1.60
09/28/22	0.015	0.015	8.360	7.769	9.182	0.057	0.048	0.075	1,785	1,715	1,856	44	37	50	99.32	2.17	97.56	1.61
09/29/22	0.015	0.015	8.128	7.711	8.672	0.059	0.047	0.087	1,767	1,695	1,848	44	35	50	99.27	2.14	97.51	1.60
09/30/22	0.015	0.016	8.193	7.673	8.685	0.056	0.048	0.078	1,743	1,682	1,806	44	37	54	99.31	2.16	97.46	1.60

Notes:

∗ Value affected by a short term TOC spike.

Date	UltraViolet / AOP Process online monitoring results					
	UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/L	Log Removal
09/01/22	96.94	88.032	24,103.9	0.28	3	6
09/02/22	96.37	89.408	26,729.1	0.30	3	6
09/03/22	96.40	89.290	28,538.7	0.32	3	6
09/04/22	96.50	88.478	28,036.5	0.32	3	6
09/05/22	96.67	74.371	26,851.9	0.31	3	6
09/06/22	97.06	68.904	23,217.8	0.32	3	6
09/07/22	96.54	56.764	20,608.7	0.31	3	6
09/08/22	96.12	82.930	19,378.6	0.34	3	6
09/09/22	96.37	88.725	27,179.6	0.33	3	6
09/10/22	96.58	90.648	28,348.6	0.32	3	6
09/11/22	96.57	90.255	27,947.2	0.31	3	6
09/12/22	96.22	91.281	28,245.9	0.31	3	6
09/13/22	96.51	91.908	28,997.8	0.32	3	6
09/14/22	96.48	89.821	28,706.4	0.31	3	6
09/15/22	96.67	91.929	28,509.6	0.31	3	6
09/16/22	96.51	93.662	28,459.6	0.31	3	6
09/17/22	96.59	93.308	28,832.8	0.31	3	6
09/18/22	96.76	90.802	28,450.5	0.31	3	6
09/19/22	96.90	84.627	27,250.0	0.30	3	6
09/20/22	99.30	2.934	20,736.1	0.30	3	6
09/21/22	97.42	66.054	3,973.2	0.29	3	6
09/22/22	97.74	73.286	19,655.8	0.29	3	6
09/23/22	97.58	80.394	20,803.4	0.28	3	6
09/24/22	97.60	83.633	21,925.6	0.27	3	6
09/25/22	97.43	83.856	22,349.0	0.27	3	6
09/26/22	97.67	83.577	22,856.6	0.27	3	6
09/27/22	98.04	81.723	22,308.8	0.27	3	6
09/28/22	97.94	82.288	22,337.0	0.27	3	6
09/29/22	98.15	84.479	21,299.0	0.26	3	6
09/30/22	98.35	86.471	21,133.2	0.25	3	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	MFE NTU		ROP NTU		TOC
	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
10/01/22	12.14	12.14	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/02/22	12.16	12.16	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/03/22	12.18	12.18	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/04/22	12.13	12.13	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/05/22	12.15	12.15	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/06/22	12.03	12.03	12.97 (2)	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/07/22	12.16	12.16	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/08/22	12.13	12.13	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/09/22	12.24	12.24	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/10/22	12.21	12.21	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/11/22	12.16	12.16	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/12/22	12.20	12.20	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/13/22	12.21	12.21	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/14/22	12.19	12.19	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/15/22	12.20	12.20	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/16/22	12.26	12.26	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/17/22	12.27	12.27	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/18/22	12.11	12.11	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/19/22	12.14	12.14	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/20/22	12.18	12.18	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/21/22	12.20	12.20	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/22/22	12.20	12.20	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/23/22	12.23	12.23	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/24/22	12.26	12.26	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/25/22	12.21	12.21	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/26/22	12.19	12.19	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/27/22	12.15	12.15	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/28/22	12.20	12.20	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/29/22	12.23	12.23	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/30/22	12.23	12.23	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/31/22	12.22	12.22	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.
2. Two additional log-virus credit taken for 1 month between the primary and secondary project boundary plus 1 month beyond secondary boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
10/01/22	0.00	4.01	2.13	6.00	0.00	12.14
10/02/22	0.00	4.01	2.15	6.00	0.00	12.16
10/03/22	0.00	4.01	2.17	6.00	0.00	12.18
10/04/22	0.00	4.00	2.13	6.00	0.00	12.13
10/05/22	0.00	4.07	2.08	6.00	0.00	12.15
10/06/22	0.00	4.06	1.97	6.00	0.00	12.03
10/07/22	0.00	4.03	2.12	6.00	0.00	12.16
10/08/22	0.00	4.05	2.08	6.00	0.00	12.13
10/09/22	0.00	4.06	2.18	6.00	0.00	12.24
10/10/22	0.00	4.02	2.19	6.00	0.00	12.21
10/11/22	0.00	4.02	2.14	6.00	0.00	12.16
10/12/22	0.00	4.02	2.17	6.00	0.00	12.20
10/13/22	0.00	4.02	2.19	6.00	0.00	12.21
10/14/22	0.00	4.00	2.19	6.00	0.00	12.19
10/15/22	0.00	4.00	2.20	6.00	0.00	12.20
10/16/22	0.00	4.02	2.24	6.00	0.00	12.26
10/17/22	0.00	4.02	2.25	6.00	0.00	12.27
10/18/22	0.00	4.00	2.11	6.00	0.00	12.11
10/19/22	0.00	4.02	2.12	6.00	0.00	12.14
10/20/22	0.00	4.03	2.15	6.00	0.00	12.18
10/21/22	0.00	4.03	2.17	6.00	0.00	12.20
10/22/22	0.00	4.02	2.18	6.00	0.00	12.20
10/23/22	0.00	4.01	2.22	6.00	0.00	12.23
10/24/22	0.00	4.01	2.25	6.00	0.00	12.26
10/25/22	0.00	4.00	2.21	6.00	0.00	12.21
10/26/22	0.00	4.03	2.16	6.00	0.00	12.19
10/27/22	0.00	4.02	2.13	6.00	0.00	12.15
10/28/22	0.00	4.01	2.19	6.00	0.00	12.20
10/29/22	0.00	4.04	2.19	6.00	0.00	12.23
10/30/22	0.00	4.01	2.22	6.00	0.00	12.23
10/31/22	0.00	4.00	2.22	6.00	0.00	12.22

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

Date	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
	LRV	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
10/01/22	0.00	0.00	2.13	6.00	4.00	12.13
10/02/22	0.00	0.00	2.15	6.00	4.00	12.15
10/03/22	0.00	0.00	2.17	6.00	4.00	12.17
10/04/22	0.00	0.00	2.13	6.00	4.00	12.13
10/05/22	0.00	0.00	2.08	6.00	4.00	12.08
10/06/22	0.00	0.00	1.97	6.00	5.00 (2)	12.97
10/07/22	0.00	0.00	2.12	6.00	4.00	12.12
10/08/22	0.00	0.00	2.08	6.00	4.00	12.08
10/09/22	0.00	0.00	2.18	6.00	4.00	12.18
10/10/22	0.00	0.00	2.19	6.00	4.00	12.19
10/11/22	0.00	0.00	2.14	6.00	4.00	12.14
10/12/22	0.00	0.00	2.17	6.00	4.00	12.17
10/13/22	0.00	0.00	2.19	6.00	4.00	12.19
10/14/22	0.00	0.00	2.19	6.00	4.00	12.19
10/15/22	0.00	0.00	2.20	6.00	4.00	12.20
10/16/22	0.00	0.00	2.24	6.00	4.00	12.24
10/17/22	0.00	0.00	2.25	6.00	4.00	12.25
10/18/22	0.00	0.00	2.11	6.00	4.00	12.11
10/19/22	0.00	0.00	2.12	6.00	4.00	12.12
10/20/22	0.00	0.00	2.15	6.00	4.00	12.15
10/21/22	0.00	0.00	2.17	6.00	4.00	12.17
10/22/22	0.00	0.00	2.18	6.00	4.00	12.18
10/23/22	0.00	0.00	2.22	6.00	4.00	12.22
10/24/22	0.00	0.00	2.25	6.00	4.00	12.25
10/25/22	0.00	0.00	2.21	6.00	4.00	12.21
10/26/22	0.00	0.00	2.16	6.00	4.00	12.16
10/27/22	0.00	0.00	2.13	6.00	4.00	12.13
10/28/22	0.00	0.00	2.19	6.00	4.00	12.19
10/29/22	0.00	0.00	2.19	6.00	4.00	12.19
10/30/22	0.00	0.00	2.22	6.00	4.00	12.22
10/31/22	0.00	0.00	2.22	6.00	4.00	12.22

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.
2. Two additional log-virus credit taken for 1 month between the primary and secondary project boundary plus 1 month beyond secondary boundary where no drinking water wells operate .

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results															
	Log Removal Value															
	A01	A02	A03	A04	A05	A06	A07	A08	B01	B02	B03	B04	B05	B06	B07	B08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
10/01/22	4.34	4.53	4.17	4.20	4.21	4.04	4.26	4.03	5.04	5.28	4.91	4.88	5.29	5.02	5.14	4.75
10/02/22	4.34	4.55	4.16	4.15	4.24	4.16	4.28	4.02	5.02	5.29	4.93	4.86	5.30	5.05	5.13	4.79
10/03/22	4.31	4.46	4.11	4.12	4.22	4.14	4.24	4.01	5.00	5.29	4.90	4.85	5.25	5.02	5.19	4.76
10/04/22	4.32	4.45	4.12	4.14	4.25	4.10	4.26	4.00	4.97	5.27	4.87	4.82	5.23	4.99	5.20	4.76
10/05/22	4.29	4.47	4.09	4.07	4.23	4.11	4.24	4.10	4.98	5.25	4.87	4.82	5.24	4.98	5.14	4.73
10/06/22	4.32	4.46	4.14	4.06	4.21	4.13	4.22	4.10	4.94	5.25	5.02	4.83	5.26	4.94	5.11	4.70
10/07/22	4.30	4.42	4.18	4.03	4.21	4.09	4.19	4.09	4.96	5.27	5.08	4.81	5.20	5.15	5.09	4.69
10/08/22	4.28	4.55	4.21	4.21	4.18	4.05	4.19	4.08	4.92	5.27	5.11	4.81	5.20	5.17	5.10	4.87
10/09/22	4.22	4.59	4.24	4.23	4.16	4.07	4.22	4.06	4.89	5.19	5.12	4.80	5.22	5.15	5.10	4.97
10/10/22	4.26	4.59	4.20	4.18	4.15	4.07	4.29	4.06	4.93	5.19	5.10	4.80	5.25	5.14	5.11	4.93
10/11/22	4.19	4.46	4.08	4.15	4.04	4.02	4.23	4.03	4.84	5.17	5.07	4.78	5.18	5.11	5.09	4.89
10/12/22	4.19	4.52	4.10	4.14	4.08	4.09	4.25	4.02	5.07	5.19	5.08	4.76	5.14	5.12	5.09	4.89
10/13/22	4.21	4.47	4.08	4.11	4.06	4.12	4.22	4.02	5.12	5.22	5.08	4.76	5.15	5.14	5.08	4.88
10/14/22	4.34	4.43	4.06	4.07	4.06	4.10	4.23	4.00	5.09	5.16	5.07	4.74	5.12	5.07	5.05	4.81
10/15/22	4.32	4.47	4.04	4.05	4.18	4.07	4.22	4.00	5.12	5.18	5.06	4.72	5.10	5.08	5.02	4.81
10/16/22	4.30	4.39	4.02	4.03	4.19	4.05	4.15	4.05	5.08	5.12	5.03	4.72	5.06	5.04	5.01	4.81
10/17/22	4.23	4.35	4.02	4.03	4.12	4.02	4.14	4.11	5.08	5.13	5.01	4.68	5.02	5.01	5.03	4.77
10/18/22	4.29	4.31	4.13	4.00	4.12	4.00	4.12	4.06	5.06	5.08	4.99	4.68	5.02	4.99	5.02	4.77
10/19/22	4.23	4.28	4.16	4.08	4.17	4.03	4.13	4.06	5.04	5.06	5.02	4.66	5.30	5.02	4.98	4.85
10/20/22	4.25	4.45	4.13	4.13	4.14	4.03	4.13	4.07	5.00	5.04	5.00	4.65	5.37	5.02	5.01	4.90
10/21/22	4.21	4.55	4.15	4.22	4.14	4.04	4.25	4.05	5.01	5.04	4.98	4.63	5.34	5.04	5.00	4.93
10/22/22	4.19	4.57	4.20	4.23	4.13	4.02	4.26	4.03	5.02	5.04	4.96	4.60	5.31	5.00	5.01	4.91
10/23/22	4.14	4.54	4.14	4.23	4.08	4.01	4.22	4.02	5.01	5.00	4.93	4.86	5.27	4.95	4.99	4.90
10/24/22	4.12	4.45	4.15	4.21	4.01	4.08	4.23	4.03	4.94	5.34	4.90	4.83	5.26	4.92	4.98	4.87
10/25/22	4.10	4.44	4.06	4.15	4.00	4.07	4.17	4.04	4.91	5.34	4.85	4.82	5.21	4.89	4.94	4.80
10/26/22	4.22	4.41	4.03	4.09	4.19	4.13	4.18	4.03	4.96	5.44	4.84	4.85	5.20	4.90	4.93	4.83
10/27/22	4.31	4.39	4.03	4.07	4.24	4.10	4.19	4.04	4.95	5.38	4.83	4.84	5.20	4.84	4.92	4.84
10/28/22	4.32	4.35	4.01	4.03	4.23	4.08	4.17	4.02	4.88	5.43	4.81	4.84	5.07	4.81	5.10	4.82
10/29/22	4.28	4.29	N/A *	4.09	4.24	4.06	4.17	4.06	4.89	5.45	4.81	4.84	5.20	4.82	5.19	4.80
10/30/22	4.29	4.28	N/A *	4.01	4.18	4.08	4.14	4.03	4.86	5.50	4.78	4.81	5.27	4.84	5.17	4.77
10/31/22	4.32	4.29	4.20	4.00	4.19	4.07	4.10	4.02	4.80	5.40	4.72	4.80	5.22	4.82	5.12	4.78

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell offline for maintenance.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	MicroFiltration Process online monitoring results Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
10/01/22	4.82	5.22	4.92	4.56	4.64	5.04	4.98	4.82	4.17	4.01	4.21	4.10	4.01	4.16	4.27	4.19
10/02/22	5.04	5.21	4.85	4.53	4.68	5.02	5.01	4.81	4.18	4.20	4.17	4.16	4.01	4.14	4.28	4.17
10/03/22	5.23	5.22	5.21	4.53	5.04	5.03	4.97	4.93	4.16	4.19	4.14	4.23	4.07	4.12	4.24	4.14
10/04/22	5.36	5.28	5.38	4.54	5.10	5.07	4.98	5.10	4.11	4.22	4.17	4.20	4.24	4.15	4.21	4.12
10/05/22	5.27	5.19	5.35	4.51	5.12	5.03	5.00	5.11	4.10	4.18	4.16	4.20	4.28	4.14	4.19	4.12
10/06/22	5.13	5.13	5.26	4.76	5.04	4.98	4.94	5.06	4.10	4.18	4.12	4.18	4.27	4.19	4.14	4.40
10/07/22	5.13	5.13	5.24	4.79	5.04	4.96	4.89	5.05	4.04	4.17	4.10	4.18	4.29	4.26	4.19	4.20
10/08/22	5.13	5.13	5.18	4.79	5.04	5.00	4.94	5.05	4.14	4.15	4.09	4.15	4.27	4.23	4.29	4.18
10/09/22	5.14	5.10	5.26	4.81	5.02	4.99	4.95	5.07	4.21	4.28	4.08	4.15	4.23	4.20	4.28	4.19
10/10/22	5.13	5.08	5.22	4.80	4.97	4.92	4.93	5.06	4.16	4.20	4.02	4.11	4.21	4.20	4.19	4.17
10/11/22	5.09	5.07	5.13	4.80	4.97	4.93	4.90	5.02	4.16	4.06	4.02	4.04	4.18	4.19	4.17	4.16
10/12/22	5.09	5.06	5.19	4.79	4.94	4.93	4.89	4.98	4.14	4.05	4.05	4.03	4.19	4.17	4.19	4.14
10/13/22	5.12	5.07	5.26	4.79	4.92	4.92	4.90	5.02	4.11	4.04	4.19	4.04	4.15	4.13	4.20	4.12
10/14/22	5.06	4.98	5.18	4.74	4.91	4.91	4.87	5.02	4.10	4.08	4.17	4.05	4.12	4.15	4.16	4.09
10/15/22	5.06	4.92	5.12	4.71	4.89	4.87	4.84	5.00	4.08	4.13	4.16	4.17	4.11	4.14	4.13	4.05
10/16/22	5.03	4.92	5.06	4.70	4.86	4.88	4.82	5.02	4.06	4.24	4.16	4.20	4.09	4.10	4.15	4.02
10/17/22	4.99	4.87	5.09	4.69	4.84	4.88	N/A *	4.97	4.05	4.30	4.09	4.14	4.21	4.10	4.08	4.03
10/18/22	4.96	4.84	5.04	4.68	4.83	4.84	4.86	4.94	4.03	4.29	4.06	4.11	4.23	4.11	4.06	4.24
10/19/22	4.93	4.78	5.04	4.65	4.80	4.79	4.81	4.95	4.02	4.23	4.07	4.10	4.20	4.16	4.25	4.21
10/20/22	4.90	4.75	5.03	4.64	4.80	4.76	4.83	4.94	4.13	4.08	4.06	4.09	4.24	4.19	4.33	4.18
10/21/22	4.90	5.18	5.00	4.64	4.77	4.76	4.85	4.93	4.29	4.11	4.03	4.08	4.22	4.19	4.28	4.16
10/22/22	4.92	5.27	5.03	4.64	4.74	4.75	4.84	4.90	4.25	4.07	4.03	4.04	4.20	4.21	4.25	4.12
10/23/22	4.85	5.24	4.99	4.60	4.71	4.74	4.80	4.90	4.23	4.04	4.04	4.04	4.20	4.18	4.21	4.09
10/24/22	4.83	5.24	4.95	4.56	4.67	4.68	4.75	4.90	4.22	4.05	4.23	4.22	4.16	4.14	4.21	4.07
10/25/22	4.75	5.21	4.93	4.53	4.64	4.59	4.72	4.86	4.19	4.03	4.17	4.17	4.13	4.14	4.19	4.06
10/26/22	4.70	5.21	4.83	4.47	4.62	4.85	4.69	4.80	4.15	4.15	4.19	4.19	4.06	4.12	4.09	4.03
10/27/22	4.72	5.21	4.83	4.48	4.56	4.98	4.65	4.80	4.19	4.26	4.20	4.19	4.07	4.08	4.11	4.02
10/28/22	4.70	5.15	4.80	4.46	4.85	4.95	4.85	4.75	4.20	4.12	4.17	4.15	4.03	4.05	4.08	4.18
10/29/22	5.01	5.17	4.81	4.42	4.95	4.95	5.01	4.75	4.16	4.35	4.14	4.12	4.17	4.04	4.05	4.26
10/30/22	5.17	5.21	5.15	4.42	5.04	4.98	5.00	4.96	4.13	4.56	4.13	4.12	4.18	4.14	4.07	4.22
10/31/22	5.14	5.11	5.25	4.39	4.99	4.98	4.96	5.11	4.11	4.08	4.12	4.08	4.17	4.26	4.16	4.20

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell offline for maintenance.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value															
	E01	E02	E03	E04	E05	E06	E07	E08	F01	F02	F03	F04	F05	F06	F07	F08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
10/01/22	5.44	5.60	4.41	4.48	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/02/22	5.15	5.52	4.43	4.43	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/03/22	5.12	5.45	4.34	4.53	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/04/22	5.14	5.38	4.36	4.54	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/05/22	5.13	5.39	4.41	4.52	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/06/22	5.06	5.40	4.41	4.55	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/07/22	5.11	5.30	4.38	4.43	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/08/22	5.08	5.37	4.41	4.42	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/09/22	5.06	5.40	4.38	4.62	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/10/22	5.05	5.37	4.42	4.52	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/11/22	4.99	5.32	4.40	4.37	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/12/22	4.97	5.37	4.34	4.38	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/13/22	5.00	5.39	4.29	4.38	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/14/22	4.96	5.38	4.41	4.36	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/15/22	5.03	5.37	4.37	4.34	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/16/22	5.09	5.38	4.32	4.30	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/17/22	4.99	5.46	4.43	N/A *	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/18/22	5.05	5.34	4.34	N/A *	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/19/22	5.07	5.42	4.35	4.58	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/20/22	5.04	5.40	4.46	4.55	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/21/22	5.00	5.36	4.41	4.56	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/22/22	4.98	5.36	4.36	4.56	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/23/22	5.02	5.32	4.36	4.55	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/24/22	4.94	5.29	4.30	4.46	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/25/22	5.02	5.29	4.31	4.44	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/26/22	5.04	5.23	4.39	4.79	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/27/22	4.99	5.29	4.27	5.05	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/28/22	4.88	5.21	4.25	5.09	5.48	5.50	5.35	5.48	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/29/22	5.10	5.32	4.29	5.07	5.41	5.38	5.35	5.49	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/30/22	5.05	5.28	4.26	5.17	5.42	5.50	5.46	5.55	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
10/31/22	4.97	5.26	4.39	5.07	5.40	5.53	5.40	5.47	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell offline for membrane replacement.

** Cell not yet in service.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

MicroFiltration Process online monitoring results

Effluent Turbidity - NTU

Date	A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		E05-E08		F01-F04		F05-F08		MFE
	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
10/01/22	0.029	0.032	0.023	0.027	0.027	0.032	0.042	0.046	0.037	0.042	0.028	0.034	0.034	0.043	0.047	0.053	0.102	0.122	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.041
10/02/22	0.029	0.030	0.022	0.025	0.026	0.028	0.042	0.044	0.037	0.054	0.027	0.030	0.035	0.040	0.046	0.051	0.117	0.139	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.042
10/03/22	0.029	0.032	0.022	0.026	0.027	0.030	0.042	0.047	0.037	0.042	0.029	0.034	0.035	0.038	0.048	0.053	0.143	0.177	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.046
10/04/22	0.032	0.040	0.025	0.028	0.030	0.034	0.045	0.049	0.040	0.046	0.033	0.037	0.038	0.045	0.052	0.093	0.102	0.191	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.041
10/05/22	0.031	0.093	0.024	0.028	0.030	0.035	0.044	0.047	0.039	0.049	0.037	0.044	0.036	0.040	0.050	0.059	0.056	0.074	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.038
10/06/22	0.031	0.037	0.025	0.033	0.032	0.037	0.045	0.051	0.041	0.049	0.045	0.050	0.038	0.047	0.052	0.058	0.063	0.100	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.041
10/07/22	0.031	0.037	0.024	0.031	0.031	0.035	0.047	0.058	0.040	0.046	0.054	0.061	0.037	0.043	0.050	0.057	0.065	0.082	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.042
10/08/22	0.031	0.051	0.025	0.031	0.031	0.037	0.047	0.059	0.040	0.049	0.062	0.068	0.038	0.048	0.050	0.072	0.075	0.084	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.044
10/09/22	0.029	0.032	0.023	0.029	0.028	0.033	0.044	0.047	0.037	0.042	0.068	0.073	0.036	0.047	0.048	0.053	0.077	0.089	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.043
10/10/22	0.031	0.047	0.024	0.031	0.030	0.034	0.046	0.049	0.040	0.056	0.071	0.079	0.037	0.040	0.050	0.055	0.086	0.108	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.046
10/11/22	0.032	0.035	0.025	0.032	0.031	0.034	0.047	0.051	0.041	0.056	0.048	0.079	0.039	0.041	0.051	0.054	0.095	0.112	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.045
10/12/22	0.033	0.037	0.028	0.031	0.031	0.035	0.049	0.052	0.043	0.046	0.029	0.032	0.041	0.066	0.053	0.064	0.111	0.128	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.046
10/13/22	0.033	0.082	0.025	0.030	0.030	0.054	0.047	0.050	0.042	0.045	0.028	0.033	0.038	0.044	0.052	0.058	0.126	0.154	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.047
10/14/22	0.031	0.037	0.024	0.028	0.028	0.032	0.046	0.049	0.041	0.046	0.028	0.032	0.039	0.056	0.049	0.054	0.134	0.152	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.047
10/15/22	0.031	0.035	0.024	0.032	0.028	0.032	0.046	0.051	0.041	0.047	0.028	0.032	0.039	0.043	0.053	0.307**	0.096	0.157	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.043
10/16/22	0.030	0.037	0.024	0.028	0.027	0.032	0.045	0.049	0.041	0.046	0.027	0.034	0.038	0.041	0.050	0.060	0.107	0.147	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.043
10/17/22	0.030	0.045	0.024	0.028	0.027	0.031	0.045	0.047	0.041	0.043	0.028	0.031	0.038	0.039	0.050	0.060	0.123	0.132	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.045
10/18/22	0.029	0.037	0.022	0.031	0.026	0.031	0.043	0.052	0.037	0.043	0.031	0.037	0.035	0.039	0.047	0.054	0.086	0.140	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.039
10/19/22	0.029	0.031	0.021	0.027	0.026	0.028	0.044	0.051	0.039	0.231	0.035	0.038	0.034	0.042	0.046	0.067	0.053	0.078	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.036
10/20/22	0.030	0.034	0.023	0.027	0.027	0.031	0.044	0.047	0.037	0.041	0.042	0.047	0.035	0.055	0.047	0.049	0.056	0.074	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.038
10/21/22	0.029	0.032	0.023	0.030	0.026	0.031	0.045	0.050	0.038	0.044	0.053	0.066	0.035	0.037	0.047	0.050	0.058	0.073	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.039
10/22/22	0.030	0.032	0.023	0.027	0.027	0.030	0.045	0.050	0.038	0.042	0.080	0.092	0.036	0.038	0.048	0.051	0.065	0.092	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.044
10/23/22	0.029	0.034	0.022	0.028	0.028	0.032	0.045	0.051	0.038	0.048	0.108	0.127	0.035	0.056	0.047	0.050	0.068	0.086	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.046
10/24/22	0.029	0.035	0.022	0.028	0.027	0.030	0.043	0.046	0.037	0.039	0.133	0.153	0.036	0.040	0.046	0.051	0.069	0.074	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.049
10/25/22	0.029	0.034	0.022	0.036	0.026	0.030	0.042	0.046	0.036	0.044	0.078	0.154	0.036	0.037	0.048	0.054	0.079	0.116	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.044
10/26/22	0.028	0.031	0.021	0.022	0.024	0.026	0.040	0.044	0.033	0.036	0.025	0.029	0.034	0.040	0.046	0.052	0.065	0.117	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.035
10/27/22	0.028	0.030	0.021	0.023	0.024	0.025	0.041	0.044	0.034	0.040	0.026	0.036	0.032	0.034	0.045	0.047	0.049	0.057	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	0.033
10/28/22	0.027	0.042	0.020	0.022	0.023	0.025	0.041	0.046	0.034	0.036	0.026	0.032	0.032	0.045	0.045	0.079	0.054	0.071	0.151	0.362**	N/A *	N/A *	N/A *	N/A *	0.034
10/29/22	0.028	0.033	0.021	0.027	0.024	0.026	0.041	0.044	0.035	0.038	0.027	0.030	0.032	0.033	0.046	0.051	0.064	0.076	0.104	0.416**	N/A *	N/A *	N/A *	N/A *	0.035
10/30/22	0.027	0.030	0.021	0.022	0.024	0.025	0.041	0.044	0.035	0.039	0.028	0.031	0.032	0.036	0.045	0.049	0.069	0.073	0.100	0.100	N/A *	N/A *	N/A *	N/A *	0.036
10/31/22	0.028	0.034	0.021	0.023	0.025	0.028	0.041	0.043	0.035	0.046	0.031	0.036	0.032	0.036	0.046	0.051	0.081	0.105	0.122	1.326**	N/A *	N/A *	N/A *	N/A *	0.038

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

* Cell not yet in service.

** Value affected by short term turbidity spike.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Reverse Osmosis Process online monitoring results																	
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
10/01/22	0.015	0.015	8.322	7.905	8.785	0.061	0.050	0.106 *	1,696	1,643	1,777	47	42	54	99.26	2.13	97.20	1.55
10/02/22	0.015	0.015	8.440	7.927	9.273	0.060	0.048	0.095	1,619	1,563	1,671	46	42	51	99.29	2.15	97.15	1.55
10/03/22	0.015	0.015	8.534	7.965	9.381	0.058	0.048	0.090	1,592	1,512	1,717	43	39	48	99.32	2.17	97.27	1.56
10/04/22	0.015	0.015	8.857	8.442	9.353	0.066	0.048	0.111 *	1,712	1,631	1,802	41	25	51	99.26	2.13	97.59	1.62
10/05/22	0.015	0.015	8.610	7.956	9.545	0.072	0.052	0.121 *	1,741	1,665	1,851	45	40	52	99.16	2.08	97.40	1.58
10/06/22	0.015	0.015	9.174	8.505	11.288	0.097	0.064	0.209 *	1,755	1,692	1,826	45	38	82	98.94	1.97 *	97.46	1.59
10/07/22	0.015	0.016	8.452	7.853	9.039	0.064	0.057	0.085	1,729	1,652	1,813	42	33	50	99.25	2.12	97.58	1.62
10/08/22	0.015	0.015	8.828	8.073	9.989	0.074	0.055	0.132 *	1,680	1,634	1,764	37	33	41	99.16	2.08	97.79	1.66
10/09/22	0.015	0.015	8.648	7.777	9.339	0.058	0.052	0.085	1,603	1,564	1,651	36	32	42	99.33	2.18	97.74	1.65
10/10/22	0.015	0.015	8.878	8.035	10.111	0.058	0.047	0.071	1,602	1,526	1,748	41	32	51	99.35	2.19	97.43	1.59
10/11/22	0.015	0.015	9.026	8.433	10.111	0.065	0.057	0.089	1,715	1,620	1,835	45	38	52	99.28	2.14	97.39	1.58
10/12/22	0.015	0.015	9.197	8.170	19.994	0.062	0.056	0.073	1,760	1,679	1,864	45	38	50	99.33	2.17	97.46	1.59
10/13/22	0.015	0.015	8.908	8.335	9.838	0.057	0.049	0.073	1,766	1,697	1,833	40	25	49	99.35	2.19	97.75	1.65
10/14/22	0.015	0.016	8.560	8.066	9.353	0.055	0.052	0.066	1,750	1,701	1,804	38	33	43	99.35	2.19	97.80	1.66
10/15/22	0.015	0.015	8.539	7.825	9.504	0.054	0.051	0.083	1,695	1,651	1,786	36	31	41	99.37	2.20	97.89	1.68
10/16/22	0.014	0.014	8.746	7.996	9.618	0.050	0.047	0.059	1,586	1,512	1,651	32	28	37	99.42	2.24	97.97	1.69
10/17/22	0.014	0.014	8.838	7.966	9.801	0.049	0.045	0.064	1,574	1,483	1,704	33	28	48	99.44	2.25	97.88	1.67
10/18/22	0.014	0.014	8.842	8.016	9.977	0.068	0.054	0.117 *	1,685	1,574	1,802	40	33	48	99.23	2.11	97.60	1.62
10/19/22	0.014	0.014	8.674	7.989	9.712	0.066	0.054	0.112 *	1,751	1,687	1,834	41	33	48	99.24	2.12	97.64	1.63
10/20/22	0.014	0.014	8.606	7.881	9.476	0.061	0.056	0.074	1,757	1,697	1,812	43	37	50	99.30	2.15	97.57	1.62
10/21/22	0.014	0.016	8.588	7.841	9.377	0.058	0.054	0.067	1,759	1,694	1,844	43	36	52	99.32	2.17	97.54	1.61
10/22/22	0.014	0.014	8.499	7.784	9.267	0.056	0.052	0.067	1,735	1,674	1,808	44	39	49	99.34	2.18	97.48	1.60
10/23/22	0.014	0.015	8.478	7.676	9.362	0.051	0.047	0.059	1,653	1,591	1,714	37	30	45	99.40	2.22	97.76	1.65
10/24/22	0.015	0.015	8.651	7.765	9.751	0.049	0.044	0.061	1,623	1,538	1,753	34	29	39	99.44	2.25	97.93	1.68
10/25/22	0.014	0.014	8.924	8.030	9.902	0.055	0.047	0.066	1,737	1,656	1,861	37	32	45	99.39	2.21	97.86	1.67
10/26/22	0.014	0.014	8.603	7.852	9.727	0.059	0.053	0.068	1,814	1,712	1,943	40	33	46	99.31	2.16	97.80	1.66
10/27/22	0.014	0.014	8.379	7.691	8.924	0.061	0.051	0.070	1,803	1,721	1,899	40	31	46	99.27	2.13	97.78	1.65
10/28/22	0.015	0.016	8.410	7.752	9.222	0.055	0.052	0.062	1,811	1,755	1,878	42	36	46	99.35	2.19	97.70	1.64
10/29/22	0.015	0.015	8.577	7.948	9.516	0.055	0.052	0.060	1,780	1,722	1,837	41	36	45	99.36	2.19	97.71	1.64
10/30/22	0.015	0.015	8.419	7.802	9.156	0.051	0.047	0.056	1,723	1,661	1,779	39	34	44	99.40	2.22	97.76	1.65
10/31/22	0.015	0.015	8.653	7.886	9.499	0.052	0.046	0.064	1,672	1,577	1,791	39	35	48	99.40	2.22	97.66	1.63

Notes:

* Value affected by short term TOC spike.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	UltraViolet / AOP Process online monitoring results					
	UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/L	Log Removal
10/01/22	98.16	88.255	21,452.3	0.25	3	6
10/02/22	98.10	90.342	22,175.3	0.25	3	6
10/03/22	98.28	89.142	22,754.2	0.25	3	6
10/04/22	98.57	66.715	22,516.0	0.25	3	6
10/05/22	98.23	87.813	17,809.9	0.27	3	6
10/06/22	98.06	88.368	22,177.0	0.25	3	6
10/07/22	98.23	89.991	22,824.5	0.26	3	6
10/08/22	98.08	90.495	22,987.4	0.26	3	6
10/09/22	97.95	90.592	23,161.0	0.26	3	6
10/10/22	97.92	90.728	23,224.9	0.26	3	6
10/11/22	97.71	91.142	23,484.6	0.26	3	6
10/12/22	97.62	91.014	22,713.6	0.26	3	6
10/13/22	97.64	80.203	23,988.1	0.27	3	6
10/14/22	97.16	95.958	22,470.1	0.27	3	6
10/15/22	96.93	94.698	26,730.7	0.28	3	6
10/16/22	96.70	93.432	27,479.9	0.29	3	6
10/17/22	96.83	93.294	27,870.6	0.30	3	6
10/18/22	96.82	90.011	27,062.5	0.29	3	6
10/19/22	96.69	92.475	27,709.7	0.30	3	6
10/20/22	96.69	93.354	27,830.4	0.30	3	6
10/21/22	96.48	95.727	28,278.2	0.30	3	6
10/22/22	96.84	93.653	28,760.4	0.30	3	6
10/23/22	96.47	93.779	27,677.6	0.29	3	6
10/24/22	96.67	95.090	28,328.7	0.30	3	6
10/25/22	96.63	92.149	28,504.9	0.30	3	6
10/26/22	96.67	93.820	28,230.5	0.31	3	6
10/27/22	96.67	97.024	28,550.0	0.30	3	6
10/28/22	96.70	97.399	29,456.6	0.30	3	6
10/29/22	96.96	92.543	29,294.7	0.30	3	6
10/30/22	96.99	92.880	27,094.1	0.29	3	6
10/31/22	96.95	97.661	26,999.2	0.29	3	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
							MFE		ROP		
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	NTU		NTU		TOC
	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
11/01/22	12.19	12.19	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/02/22	12.21	12.21	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/03/22	12.19	12.19	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/04/22	12.21	12.21	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/05/22	12.22	12.22	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/06/22	12.27	12.27	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/07/22	12.25	12.25	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/08/22	12.20	12.20	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/09/22	12.22	12.22	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/10/22	12.19	12.19	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/11/22	12.19	12.19	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/12/22	12.23	12.23	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/13/22	12.24	12.24	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/14/22	12.25	12.25	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/15/22	12.24	12.24	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/16/22	12.23	12.23	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/17/22	12.24	12.24	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/18/22	12.17	12.17	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/19/22	12.24	12.24	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/20/22	12.29	12.29	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/21/22	12.26	12.26	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/22/22	12.19	12.19	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/23/22	12.19	12.19	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/24/22	12.23	12.23	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/25/22	12.24	12.24	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/26/22	12.27	12.27	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/27/22	12.25	12.25	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/28/22	12.23	12.23	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/29/22	12.19	12.19	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/30/22	12.29	12.29	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
11/01/22	0.00	4.01	2.18	6.00	0.00	12.19
11/02/22	0.00	4.04	2.17	6.00	0.00	12.21
11/03/22	0.00	4.00	2.18	6.00	0.00	12.19
11/04/22	0.00	4.01	2.19	6.00	0.00	12.21
11/05/22	0.00	4.03	2.19	6.00	0.00	12.22
11/06/22	0.00	4.06	2.21	6.00	0.00	12.27
11/07/22	0.00	4.04	2.21	6.00	0.00	12.25
11/08/22	0.00	4.03	2.16	6.00	0.00	12.20
11/09/22	0.00	4.03	2.19	6.00	0.00	12.22
11/10/22	0.00	4.01	2.17	6.00	0.00	12.19
11/11/22	0.00	4.00	2.19	6.00	0.00	12.19
11/12/22	0.00	4.02	2.21	6.00	0.00	12.23
11/13/22	0.00	4.02	2.22	6.00	0.00	12.24
11/14/22	0.00	4.01	2.24	6.00	0.00	12.25
11/15/22	0.00	4.03	2.21	6.00	0.00	12.24
11/16/22	0.00	4.03	2.20	6.00	0.00	12.23
11/17/22	0.00	4.07	2.17	6.00	0.00	12.24
11/18/22	0.00	4.05	2.11	6.00	0.00	12.17
11/19/22	0.00	4.06	2.18	6.00	0.00	12.24
11/20/22	0.00	4.07	2.22	6.00	0.00	12.29
11/21/22	0.00	4.06	2.20	6.00	0.00	12.26
11/22/22	0.00	4.04	2.15	6.00	0.00	12.19
11/23/22	0.00	4.05	2.14	6.00	0.00	12.19
11/24/22	0.00	4.05	2.18	6.00	0.00	12.23
11/25/22	0.00	4.03	2.21	6.00	0.00	12.24
11/26/22	0.00	4.03	2.24	6.00	0.00	12.27
11/27/22	0.00	4.01	2.24	6.00	0.00	12.25
11/28/22	0.00	4.00	2.22	6.00	0.00	12.23
11/29/22	0.00	4.02	2.17	6.00	0.00	12.19
11/30/22	0.00	4.12	2.17	6.00	0.00	12.29

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
	LRV	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
11/01/22	0.00	0.00	2.18	6.00	4.00	12.18
11/02/22	0.00	0.00	2.17	6.00	4.00	12.17
11/03/22	0.00	0.00	2.18	6.00	4.00	12.18
11/04/22	0.00	0.00	2.19	6.00	4.00	12.19
11/05/22	0.00	0.00	2.19	6.00	4.00	12.19
11/06/22	0.00	0.00	2.21	6.00	4.00	12.21
11/07/22	0.00	0.00	2.21	6.00	4.00	12.21
11/08/22	0.00	0.00	2.16	6.00	4.00	12.16
11/09/22	0.00	0.00	2.19	6.00	4.00	12.19
11/10/22	0.00	0.00	2.17	6.00	4.00	12.17
11/11/22	0.00	0.00	2.19	6.00	4.00	12.19
11/12/22	0.00	0.00	2.21	6.00	4.00	12.21
11/13/22	0.00	0.00	2.22	6.00	4.00	12.22
11/14/22	0.00	0.00	2.24	6.00	4.00	12.24
11/15/22	0.00	0.00	2.21	6.00	4.00	12.21
11/16/22	0.00	0.00	2.20	6.00	4.00	12.20
11/17/22	0.00	0.00	2.17	6.00	4.00	12.17
11/18/22	0.00	0.00	2.11	6.00	4.00	12.11
11/19/22	0.00	0.00	2.18	6.00	4.00	12.18
11/20/22	0.00	0.00	2.22	6.00	4.00	12.22
11/21/22	0.00	0.00	2.20	6.00	4.00	12.20
11/22/22	0.00	0.00	2.15	6.00	4.00	12.15
11/23/22	0.00	0.00	2.14	6.00	4.00	12.14
11/24/22	0.00	0.00	2.18	6.00	4.00	12.18
11/25/22	0.00	0.00	2.21	6.00	4.00	12.21
11/26/22	0.00	0.00	2.24	6.00	4.00	12.24
11/27/22	0.00	0.00	2.24	6.00	4.00	12.24
11/28/22	0.00	0.00	2.22	6.00	4.00	12.22
11/29/22	0.00	0.00	2.17	6.00	4.00	12.17
11/30/22	0.00	0.00	2.17	6.00	4.00	12.17

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

MicroFiltration Process online monitoring results

Log Removal Value

Date	A01 LRV	A02 LRV	A03 LRV	A04 LRV	A05 LRV	A06 LRV	A07 LRV	A08 LRV	B01 LRV	B02 LRV	B03 LRV	B04 LRV	B05 LRV	B06 LRV	B07 LRV	B08 LRV
11/01/22	4.29	4.15	4.17	N/A *	4.17	4.05	4.04	4.01	4.91	5.37	4.93	4.78	5.19	4.83	5.11	4.77
11/02/22	4.21	4.44	4.07	N/A *	4.17	4.05	4.24	4.10	4.87	5.39	5.05	4.78	5.14	5.01	5.08	5.02
11/03/22	4.26	4.56	4.20	N/A *	4.16	4.04	4.28	4.11	4.79	5.28	4.99	4.81	5.17	5.08	5.09	5.04
11/04/22	4.20	4.49	4.17	5.12	4.09	4.01	4.24	4.04	4.75	5.20	5.01	4.78	5.12	5.03	5.08	4.99
11/05/22	4.21	4.46	4.13	5.16	4.08	4.23	4.23	4.07	4.72	5.22	5.00	4.74	5.11	5.00	5.07	5.01
11/06/22	4.24	4.53	4.19	5.20	4.13	4.16	4.28	4.06	4.98	5.41	5.02	4.78	5.14	5.00	5.06	5.03
11/07/22	4.24	4.51	4.19	5.20	4.24	4.11	4.26	4.04	5.12	5.37	5.04	4.77	5.16	5.02	5.10	5.03
11/08/22	4.11	4.51	4.22	5.22	4.27	4.14	4.26	4.03	5.11	5.45	5.02	4.79	5.21	5.03	5.13	5.02
11/09/22	4.34	4.53	4.25	5.20	4.26	4.12	4.24	4.03	5.13	5.45	5.04	4.79	5.21	5.02	5.09	4.99
11/10/22	4.32	4.52	4.22	5.14	4.27	4.10	4.25	4.01	5.06	5.40	5.00	4.76	5.17	4.99	5.08	4.99
11/11/22	4.31	4.51	4.18	5.19	4.26	4.08	4.24	4.00	5.06	5.52	5.02	4.74	5.17	5.02	5.05	5.04
11/12/22	4.31	4.53	4.16	5.15	4.23	4.07	4.25	4.02	5.06	5.51	5.01	4.76	5.04	5.04	5.04	5.00
11/13/22	4.31	4.49	4.08	5.13	4.20	4.07	4.21	4.02	5.07	5.50	5.00	4.77	5.24	5.01	5.03	4.97
11/14/22	4.31	4.51	4.22	5.16	4.23	4.08	4.20	4.01	5.03	5.41	4.96	4.72	5.38	4.96	5.03	4.98
11/15/22	4.24	4.56	N/A *	5.12	4.15	4.19	4.26	4.08	5.01	5.28	4.92	4.71	5.36	4.99	5.01	4.97
11/16/22	4.27	4.59	N/A *	5.14	4.19	4.14	4.28	4.12	4.97	5.36	4.93	4.71	5.36	4.99	5.01	4.95
11/17/22	4.27	4.53	N/A *	5.13	4.16	4.11	4.27	4.07	4.96	5.27	4.94	4.83	5.34	4.92	5.00	4.97
11/18/22	4.22	4.54	N/A *	5.09	4.15	4.06	4.24	4.10	4.99	6.00	4.89	4.87	5.30	4.91	4.97	4.92
11/19/22	4.26	4.55	N/A *	5.18	4.18	4.09	4.25	4.08	4.98	5.50	4.87	4.87	5.35	4.92	5.02	4.92
11/20/22	4.22	4.50	4.61	5.08	4.19	4.09	4.25	4.07	5.00	5.16	4.85	4.87	5.23	4.90	5.07	4.94
11/21/22	4.25	4.58	5.07	5.15	4.20	4.10	4.32	4.06	4.97	5.14	4.83	4.88	5.26	4.88	5.03	4.90
11/22/22	4.26	4.56	5.23	5.08	4.20	4.09	4.29	4.04	4.97	5.18	4.79	4.85	5.34	4.89	5.00	4.87
11/23/22	4.25	4.52	5.31	5.15	4.21	4.05	4.23	4.07	4.93	5.25	4.79	4.90	5.29	4.90	5.02	4.87
11/24/22	4.28	4.49	5.38	5.16	4.19	4.08	4.24	4.05	4.95	5.21	4.77	4.88	5.31	4.87	4.98	4.87
11/25/22	4.26	4.50	5.33	5.10	4.17	4.07	4.24	4.03	4.92	5.21	4.72	4.86	5.12	4.91	5.01	4.87
11/26/22	4.24	4.51	5.40	5.11	4.19	4.03	4.23	4.04	4.94	5.29	4.88	4.84	5.35	4.91	4.97	4.82
11/27/22	4.26	4.62	5.34	5.07	4.17	4.02	4.23	4.01	4.93	5.26	4.93	4.83	5.09	4.90	4.76	4.83
11/28/22	4.21	4.62	5.37	5.09	4.19	4.05	4.21	4.00	4.91	5.27	4.90	4.84	5.25	4.99	4.96	4.98
11/29/22	4.19	4.66	5.42	5.08	4.13	4.16	4.28	4.13	4.89	5.30	4.85	4.83	5.38	5.03	5.19	4.99
11/30/22	4.20	4.65	5.28	5.16	4.14	4.17	4.25	4.13	4.90	5.26	4.84	4.81	5.20	5.01	5.18	4.96

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell offline for installation of new membranes.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results															
	Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
11/01/22	5.17	5.06	5.23	4.67	4.98	4.95	4.96	5.15	4.08	4.10	4.12	4.04	4.16	4.19	4.39	4.19
11/02/22	5.16	5.06	5.23	4.80	4.98	4.94	4.96	5.11	4.12	4.06	4.08	4.04	4.16	4.24	4.30	4.20
11/03/22	5.10	5.03	5.18	4.80	4.95	4.93	4.92	5.07	4.21	4.00	4.08	4.02	4.17	4.20	4.28	4.15
11/04/22	5.06	5.02	5.19	4.79	4.91	4.88	4.91	5.07	4.22	4.01	4.06	4.02	4.13	4.19	4.30	4.13
11/05/22	5.09	5.05	5.23	4.79	4.93	4.92	4.90	5.08	4.20	4.03	4.13	4.11	4.14	4.18	4.30	4.17
11/06/22	5.13	5.06	5.26	4.81	4.98	4.92	4.93	5.07	4.19	4.16	4.24	4.20	4.09	4.20	4.28	4.13
11/07/22	5.14	5.07	5.25	4.80	5.01	4.86	4.91	5.08	4.19	4.21	4.18	4.15	4.09	4.17	4.24	4.13
11/08/22	5.14	5.09	5.25	4.80	4.95	4.86	4.90	5.09	4.19	4.22	4.16	4.13	4.14	4.15	4.22	4.16
11/09/22	5.13	5.04	5.26	4.81	4.93	4.87	4.89	5.06	4.18	4.19	4.17	4.11	4.13	4.18	4.25	4.23
11/10/22	5.08	5.02	5.18	4.78	4.96	4.87	4.87	5.02	4.13	4.14	4.16	4.10	4.14	4.16	4.21	4.28
11/11/22	5.06	5.02	5.14	4.76	4.95	4.85	4.86	5.08	4.15	4.13	4.15	4.09	4.26	4.12	4.21	4.27
11/12/22	5.12	5.03	5.16	4.77	4.91	4.85	4.90	5.13	4.17	4.19	4.17	4.09	4.36	4.25	4.23	4.31
11/13/22	5.18	5.05	5.17	4.79	4.92	4.85	4.93	5.08	4.15	4.21	4.15	4.08	4.39	4.30	4.29	4.31
11/14/22	5.12	4.98	5.18	4.73	4.92	4.85	4.88	5.02	4.10	4.16	4.13	4.06	4.35	4.28	4.35	4.28
11/15/22	5.05	4.94	5.20	4.72	4.87	4.86	4.82	4.98	4.19	4.10	4.12	4.03	4.30	4.25	4.29	4.24
11/16/22	5.03	5.24	5.18	4.70	4.87	4.81	4.81	4.99	4.29	4.10	4.10	4.03	4.32	4.23	4.26	4.21
11/17/22	5.01	5.34	5.10	4.68	4.87	4.77	4.83	4.99	4.27	4.10	4.09	4.08	4.30	4.24	4.30	4.19
11/18/22	4.93	5.27	5.04	4.67	4.82	4.78	4.79	4.96	4.23	4.16	4.09	4.05	4.29	4.21	4.27	4.19
11/19/22	5.02	5.34	5.13	4.67	4.78	4.78	4.82	4.98	4.20	4.26	4.15	4.06	4.30	4.23	4.28	4.19
11/20/22	5.01	5.34	5.08	4.66	4.80	4.93	4.84	5.00	4.21	4.24	4.16	4.07	4.30	4.23	4.29	4.22
11/21/22	4.95	5.24	5.00	4.64	4.83	5.02	4.84	4.94	4.20	4.21	4.14	4.06	4.27	4.18	4.24	4.20
11/22/22	4.97	5.24	5.03	4.64	4.78	4.96	4.82	4.93	4.15	4.17	4.11	4.10	4.25	4.18	4.22	4.19
11/23/22	4.96	5.26	5.04	4.66	4.74	4.98	4.78	4.94	4.17	4.11	4.09	4.09	4.23	4.17	4.24	4.24
11/24/22	4.95	5.28	5.08	4.65	4.95	4.97	4.93	4.92	4.16	4.14	4.09	4.08	4.27	4.25	4.24	4.23
11/25/22	5.17	5.30	5.10	4.64	5.05	4.96	5.05	5.03	4.15	4.13	4.07	4.08	4.34	4.32	4.29	4.23
11/26/22	5.32	5.32	5.34	4.64	5.01	4.99	5.04	5.21	4.18	4.14	4.06	4.04	4.34	4.32	4.35	4.22
11/27/22	5.30	5.30	5.41	4.80	5.03	4.96	5.06	5.18	4.32	4.13	4.06	4.04	4.36	4.32	4.34	4.21
11/28/22	5.25	5.27	5.44	4.89	5.02	4.95	5.06	5.18	4.37	4.09	4.04	4.02	4.36	4.29	4.33	4.18
11/29/22	5.24	5.25	5.46	4.85	4.97	4.95	5.03	5.15	4.31	4.20	4.02	4.14	4.33	4.25	4.31	4.13
11/30/22	5.24	5.24	5.40	4.82	4.98	4.94	5.03	5.14	4.32	4.62	4.16	4.27	4.31	4.25	4.32	4.12

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value															
	E01	E02	E03	E04	E05	E06	E07	E08	F01	F02	F03	F04	F05	F06	F07	F08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
11/01/22	5.02	5.30	4.22	5.02	5.37	5.39	5.37	5.45	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
11/02/22	5.01	5.25	4.10	5.09	5.34	5.37	5.35	5.44	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
11/03/22	4.98	5.22	4.32	5.01	5.30	5.34	5.31	5.58	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
11/04/22	4.95	5.33	4.26	5.05	5.34	5.44	5.30	5.42	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
11/05/22	4.99	5.26	4.22	5.02	5.36	5.43	5.31	5.41	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
11/06/22	5.04	5.19	4.33	5.05	5.37	5.44	5.28	5.45	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **	N/A **
11/07/22	5.06	5.32	4.25	5.14	5.35	5.48	5.34	5.35	N/A **	N/A **	N/A **	N/A **	5.38	5.53	5.48	5.52
11/08/22	4.93	5.27	4.21	5.00	5.40	5.44	5.36	5.34	N/A **	N/A **	N/A **	N/A **	5.38	5.54	5.51	5.47
11/09/22	4.97	5.24	4.28	5.03	5.43	5.41	5.30	5.39	N/A **	N/A **	N/A **	N/A **	5.38	5.54	5.50	5.38
11/10/22	5.02	5.28	4.24	5.11	5.38	5.42	5.29	5.38	5.39	5.76	5.33	5.31	5.34	5.48	5.49	5.34
11/11/22	4.97	5.19	4.23	5.10	5.35	5.42	5.36	5.41	5.29	5.55	5.25	5.23	5.23	5.36	N/A *	5.45
11/12/22	5.00	5.19	4.26	5.06	5.36	5.42	5.32	5.40	5.29	5.38	5.17	5.20	5.24	5.33	N/A *	5.43
11/13/22	5.08	5.18	4.18	5.02	5.33	5.46	5.31	5.39	5.30	5.38	5.11	5.16	5.20	5.36	N/A *	5.38
11/14/22	4.98	5.18	4.19	5.01	5.30	5.42	5.31	5.46	5.35	N/A *	N/A *	5.20	5.20	5.33	N/A *	5.33
11/15/22	4.99	5.16	4.27	5.00	5.32	5.38	5.32	5.47	5.31	N/A *	N/A *	5.15	5.27	5.36	N/A *	5.33
11/16/22	5.06	5.12	4.14	4.99	5.33	N/A *	5.26	5.32	5.23	5.49	5.19	5.12	5.23	5.35	N/A *	5.27
11/17/22	5.00	5.10	4.09	5.06	5.31	5.25	5.25	5.28	5.22	5.48	5.20	5.18	N/A *	5.31	N/A *	5.23
11/18/22	4.96	5.14	4.19	5.02	5.43	5.40	5.31	5.33	5.28	5.40	5.17	5.13	N/A *	5.46	N/A *	5.35
11/19/22	5.00	5.27	4.23	4.97	5.44	5.39	5.30	5.36	5.28	5.37	5.13	5.09	N/A *	5.38	N/A *	5.39
11/20/22	4.97	5.31	4.22	5.00	5.38	5.36	5.29	5.34	5.26	5.33	5.23	5.11	N/A *	5.33	N/A *	5.35
11/21/22	4.95	5.26	4.16	5.06	5.39	5.36	5.28	5.38	5.23	N/A *	5.22	5.28	N/A *	5.18	N/A *	5.30
11/22/22	4.94	5.36	4.28	4.97	5.32	5.34	5.29	5.33	5.30	5.36	5.13	5.13	5.23	5.33	N/A *	5.29
11/23/22	5.00	5.45	4.23	4.98	5.42	5.42	5.55	5.35	5.26	5.31	5.14	5.13	5.23	5.34	N/A *	5.39
11/24/22	4.95	5.22	4.23	5.07	5.40	5.38	5.46	5.33	5.28	5.35	5.19	5.19	5.30	5.28	N/A *	5.37
11/25/22	4.93	5.19	4.27	4.98	5.35	5.32	5.38	5.27	5.34	5.34	5.16	5.19	5.27	5.24	N/A *	5.30
11/26/22	4.90	5.27	4.28	4.92	5.28	5.44	5.38	5.30	5.28	5.35	5.18	5.13	5.25	5.27	N/A *	5.35
11/27/22	4.96	5.20	4.28	4.99	5.28	5.41	5.38	5.30	5.22	5.34	5.19	5.12	5.26	5.23	N/A *	5.31
11/28/22	4.95	5.29	4.18	4.97	5.33	5.33	5.33	5.33	5.16	5.33	5.15	5.16	5.23	5.26	5.60	5.32
11/29/22	4.96	5.37	4.16	4.97	5.35	5.37	5.24	5.36	5.24	5.41	5.04	5.15	5.15	5.32	5.57	5.32
11/30/22	5.09	5.22	4.22	5.00	5.24	5.20	5.36	5.28	5.20	5.31	5.15	5.08	5.30	5.24	5.40	5.29

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell offline for maintenance.

** Cell not yet in service.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

MicroFiltration Process online monitoring results

Effluent Turbidity - NTU

Date	A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		E05-E08		F01-F04		F05-F08		MFE
	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
11/01/22	0.031	0.040	0.021	0.046	0.025	0.030	0.041	0.047	0.035	0.043	0.030	0.046	0.033	0.035	0.046	0.048	0.090	0.095	0.167	3.238*	N/A**	N/A**	N/A**	N/A**	0.052
11/02/22	0.037	0.039	0.022	0.039	0.025	0.026	0.043	0.051	0.035	0.038	0.025	0.029	0.034	0.051	0.046	0.047	0.098	0.103	0.121	0.260*	N/A**	N/A**	N/A**	N/A**	0.049
11/03/22	0.035	0.038	0.021	0.024	0.025	0.025	0.042	0.046	0.035	0.038	0.026	0.027	0.033	0.045	0.048	0.050	0.077	0.112	0.174	0.268*	N/A**	N/A**	N/A**	N/A**	0.052
11/04/22	0.037	0.062	0.021	0.023	0.024	0.025	0.042	0.045	0.034	0.037	0.026	0.028	0.032	0.034	0.047	0.049	0.050	0.063	0.134	0.476*	N/A**	N/A**	N/A**	N/A**	0.045
11/05/22	0.037	0.047	0.021	0.024	0.024	0.031	0.042	0.045	0.035	0.036	0.026	0.037	0.034	0.037	0.048	0.051	0.050	0.064	0.124	0.214*	N/A**	N/A**	N/A**	N/A**	0.044
11/06/22	0.034	0.042	0.022	0.026	0.025	0.028	0.041	0.043	0.034	0.036	0.026	0.029	0.033	0.035	0.048	0.049	0.056	0.070	0.121	1.482*	N/A**	N/A**	N/A**	N/A**	0.044
11/07/22	0.033	0.039	0.022	0.024	0.024	0.026	0.041	0.043	0.034	0.036	0.026	0.028	0.033	0.034	0.048	0.049	0.062	0.069	0.208*	2.559*	N/A**	N/A**	0.052	0.144	0.053
11/08/22	0.033	0.043	0.023	0.047	0.026	0.079	0.042	0.052	0.035	0.049	0.026	0.029	0.034	0.044	0.049	0.090	0.067	0.078	0.166	1.018*	N/A**	N/A**	0.027	0.082	0.048
11/09/22	0.031	0.034	0.022	0.024	0.023	0.026	0.039	0.042	0.035	0.036	0.025	0.030	0.032	0.034	0.056	0.064	0.056	0.079	0.453*	1.295*	N/A**	N/A**	0.026	0.033	0.073
11/10/22	0.030	0.034	0.021	0.025	0.023	0.024	0.039	0.041	0.034	0.036	0.025	0.028	0.032	0.033	0.060	0.066	0.046	0.058	0.148	0.165	0.059	0.100	0.030	0.071	0.046
11/11/22	0.031	0.034	0.022	0.026	0.024	0.026	0.040	0.042	0.035	0.037	0.026	0.032	0.033	0.034	0.061	0.066	0.046	0.048	0.111	0.227*	0.093	0.145	0.048	0.068	0.048
11/12/22	0.030	0.034	0.022	0.036	0.024	0.025	0.040	0.042	0.035	0.042	0.026	0.038	0.033	0.036	0.062	0.071	0.049	0.059	0.091	0.110	0.165	0.325*	0.052	0.061	0.052
11/13/22	0.030	0.034	0.022	0.027	0.024	0.027	0.041	0.046	0.035	0.039	0.025	0.029	0.033	0.036	0.063	0.067	0.052	0.056	0.107	0.155	0.301*	0.518*	0.057	0.066	0.066
11/14/22	0.031	0.035	0.022	0.024	0.023	0.025	0.040	0.044	0.035	0.038	0.025	0.031	0.033	0.038	0.062	0.065	0.056	0.059	0.158	0.434*	0.462*	0.666*	0.057	0.057	0.084
11/15/22	0.031	0.034	0.022	0.026	0.023	0.027	0.039	0.043	0.034	0.038	0.025	0.030	0.034	0.036	0.062	0.067	0.065	0.074	0.211*	0.262*	0.269*	0.576*	0.057	0.057	0.073
11/16/22	0.032	0.036	0.021	0.026	0.023	0.026	0.039	0.042	0.034	0.040	0.025	0.027	0.035	0.044	0.063	0.067	0.074	0.084	0.212*	0.748*	0.189	1.506*	-0.095*	0.057	0.054
11/17/22	0.032	0.036	0.022	0.024	0.024	0.028	0.039	0.043	0.034	0.037	0.025	0.029	0.036	0.049	0.056	0.063	0.071	0.076	0.158	0.681*	0.061	0.146	0.038	0.041	0.050
11/18/22	0.032	0.042	0.022	0.032	0.025	0.032	0.039	0.043	0.034	0.037	0.026	0.029	0.038	0.041	0.049	0.051	0.068	0.077	0.070	0.088	0.069	0.102	0.067	0.074	0.045
11/19/22	0.032	0.035	0.021	0.026	0.024	0.052	0.039	0.045	0.034	0.055	0.025	0.027	0.038	0.054	0.049	0.094	0.067	0.072	0.081	0.087	0.120	0.162	0.087	0.096	0.052
11/20/22	0.033	0.057	0.021	0.024	0.023	0.027	0.038	0.042	0.033	0.038	0.025	0.036	0.037	0.046	0.048	0.050	0.068	0.079	0.096	0.097	0.181	0.234*	0.117	0.133	0.060
11/21/22	0.035	0.046	0.020	0.022	0.023	0.025	0.038	0.041	0.033	0.035	0.025	0.030	0.037	0.038	0.048	0.049	0.067	0.068	0.121	0.137	0.193	0.220*	0.142	0.151	0.065
11/22/22	0.033	0.039	0.021	0.025	0.023	0.024	0.038	0.041	0.033	0.040	0.025	0.029	0.038	0.062	0.049	0.052	0.070	0.096	0.151	0.175	0.208*	0.236*	0.183	0.227*	0.073
11/23/22	0.031	0.037	0.021	0.023	0.023	0.025	0.039	0.042	0.033	0.036	0.026	0.033	0.037	0.040	0.045	0.056	0.056	0.073	0.193	0.232*	0.259*	0.332*	0.230*	0.253*	0.083
11/24/22	0.032	0.062	0.022	0.025	0.024	0.032	0.039	0.043	0.035	0.037	0.029	0.034	0.037	0.039	0.040	0.044	0.037	0.040	0.229*	0.242*	0.312*	0.367*	0.353*	0.405*	0.099
11/25/22	0.030	0.035	0.021	0.032	0.023	0.030	0.038	0.043	0.035	0.040	0.028	0.032	0.036	0.040	0.038	0.045	0.037	0.063	0.270*	0.287*	0.266*	0.276*	0.274*	0.405*	0.091
11/26/22	0.031	0.037	0.022	0.028	0.026	0.035	0.040	0.045	0.037	0.044	0.029	0.036	0.038	0.040	0.040	0.057	0.039	0.049	0.309*	0.347*	0.283*	0.323*	0.033	0.041	0.077
11/27/22	0.031	0.035	0.021	0.023	0.023	0.026	0.042	0.054	0.036	0.039	0.027	0.030	0.037	0.041	0.037	0.047	0.037	0.039	0.376*	0.399*	0.307*	0.337*	0.035	0.036	0.084
11/28/22	0.031	0.034	0.024	0.029	0.025	0.027	0.047	0.054	0.036	0.039	0.028	0.031	0.038	0.044	0.038	0.044	0.039	0.051	0.165	0.437*	0.123	0.325*	0.037	0.052	0.053
11/29/22	0.031	0.035	0.025	0.032	0.025	0.027	0.044	0.050	0.036	0.043	0.028	0.036	0.040	0.110	0.039	0.046	0.044	0.079	0.025	0.046	0.022	0.026	0.038	0.047	0.033
11/30/22	0.033	0.048	0.023	0.038	0.024	0.028	0.043	0.048	0.034	0.041	0.027	0.030	0.038	0.041	0.037	0.040	0.037	0.046	0.026	0.039	0.027	0.055	0.039	0.180	0.032

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

* Value affected by analyzer issue which was resolved on 11/28/22

** Cell not yet in service.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Reverse Osmosis Process online monitoring results

Date	Turbidity (ntu) ROP avg	Turbidity (ntu) ROP max	TOC - ppm ROF avg	TOC ROF min	TOC ROF max	TOC ROP avg	TOC ROP min	TOC ROP max	EC ROF avg	EC ROF min	EC ROF max	EC ROP avg	EC ROP min	EC ROP max	Calculated TOC removal based on Daily Avg %	Calculated TOC removal Log	Calculated EC removal based on Daily Avg %	Calculated EC removal Log
11/01/22	0.015	0.015	8.866	8.139	10.490	0.059	0.052	0.078	1,767	1,675	1,889	39	34	46	99.34	2.18	97.80	1.66
11/02/22	0.015	0.015	8.926	8.102	9.941	0.061	0.056	0.078	1,797	1,710	1,881	41	37	45	99.32	2.17	97.71	1.64
11/03/22	0.015	0.015	8.873	8.082	9.569	0.058	0.052	0.063	1,800	1,712	1,899	41	37	48	99.35	2.18	97.73	1.64
11/04/22	0.015	0.016	8.720	7.385	9.675	0.056	0.052	0.067	1,811	1,746	1,876	40	34	46	99.36	2.19	97.76	1.65
11/05/22	0.015	0.015	8.746	7.433	9.993	0.057	0.049	0.068	1,788	1,711	1,866	41	36	46	99.35	2.19	97.73	1.64
11/06/22	0.015	0.015	8.761	7.852	9.993	0.053	0.049	0.067	1,708	1,642	1,790	39	35	42	99.39	2.21	97.74	1.65
11/07/22	0.015	0.015	8.605	7.741	9.567	0.054	0.045	0.069	1,659	1,566	1,779	41	33	50	99.38	2.21	97.55	1.61
11/08/22	0.015	0.015	8.552	7.865	9.517	0.059	0.052	0.074	1,707	1,656	1,775	43	35	49	99.31	2.16	97.49	1.60
11/09/22	0.015	0.015	8.379	7.469	9.269	0.055	0.050	0.071	1,704	1,620	1,821	43	39	50	99.35	2.19	97.46	1.60
11/10/22	0.015	0.016	8.372	7.585	9.372	0.056	0.049	0.071	1,773	1,704	1,859	44	38	49	99.33	2.17	97.52	1.61
11/11/22	0.015	0.015	8.243	7.450	9.238	0.053	0.047	0.069	1,787	1,708	1,874	43	38	48	99.35	2.19	97.62	1.62
11/12/22	0.015	0.015	8.350	7.515	9.213	0.051	0.045	0.060	1,737	1,661	1,811	41	37	46	99.39	2.21	97.64	1.63
11/13/22	0.015	0.015	8.177	6.733	9.387	0.049	0.043	0.060	1,653	1,588	1,708	38	28	44	99.40	2.22	97.68	1.63
11/14/22	0.015	0.015	8.374	7.341	9.472	0.048	0.042	0.062	1,615	1,527	1,746	38	32	45	99.43	2.24	97.67	1.63
11/15/22	0.015	0.015	8.554	7.672	9.621	0.053	0.046	0.070	1,728	1,621	1,874	38	30	46	99.38	2.21	97.81	1.66
11/16/22	0.015	0.015	8.308	7.592	9.414	0.052	0.046	0.070	1,771	1,674	1,888	40	33	48	99.37	2.20	97.74	1.65
11/17/22	0.015	0.015	8.293	7.518	9.414	0.056	0.049	0.118 *	1,790	1,698	1,887	42	34	49	99.32	2.17	97.66	1.63
11/18/22	0.015	0.015	8.400	7.592	9.635	0.064	0.053	0.096	1,779	1,691	1,864	41	33	46	99.23	2.11	97.72	1.64
11/19/22	0.015	0.015	8.199	7.477	8.968	0.055	0.048	0.074	1,700	1,635	1,816	37	29	86	99.33	2.18	97.81	1.66
11/20/22	0.015	0.015	8.075	7.253	9.009	0.049	0.044	0.056	1,593	1,523	1,656	32	27	40	99.40	2.22	97.97	1.69
11/21/22	0.015	0.015	8.069	7.344	8.990	0.051	0.046	0.062	1,588	1,498	1,748	37	33	44	99.37	2.20	97.69	1.64
11/22/22	0.015	0.015	8.325	7.484	9.239	0.059	0.053	0.069	1,694	1,608	1,801	41	37	46	99.30	2.15	97.55	1.61
11/23/22	0.015	0.015	8.373	7.557	9.306	0.061	0.054	0.075	1,741	1,654	1,845	42	35	50	99.27	2.14	97.58	1.62
11/24/22	0.015	0.015	8.340	7.519	9.394	0.055	0.048	0.066	1,724	1,658	1,803	42	38	46	99.34	2.18	97.57	1.61
11/25/22	0.015	0.015	7.898	7.091	9.117	0.049	0.047	0.054	1,662	1,569	1,765	41	35	49	99.38	2.21	97.51	1.60
11/26/22	0.015	0.015	8.276	7.315	9.193	0.048	0.043	0.054	1,638	1,579	1,724	41	38	46	99.42	2.24	97.49	1.60
11/27/22	0.015	0.015	8.322	7.506	9.239	0.048	0.044	0.054	1,608	1,551	1,673	40	35	46	99.42	2.24	97.53	1.61
11/28/22	0.015	0.015	8.540	7.681	9.536	0.051	0.045	0.068	1,603	1,506	1,759	40	35	47	99.40	2.22	97.51	1.60
11/29/22	0.015	0.015	8.600	7.802	9.623	0.058	0.052	0.070	1,734	1,621	1,873	43	37	50	99.32	2.17	97.52	1.61
11/30/22	0.015	0.015	8.482	7.906	9.586	0.057	0.050	0.071	1,755	1,662	1,850	41	36	63	99.33	2.17	97.64	1.63

Notes:

* Value affected by short term TOC spike.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	UltraViolet / AOP Process online monitoring results					
	UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/L	Log Removal
11/01/22	96.93	92.679	28,268.3	0.29	3	6
11/02/22	96.88	95.903	27,314.2	0.29	3	6
11/03/22	96.76	95.450	28,174.6	0.30	3	6
11/04/22	96.61	95.305	29,207.6	0.31	3	6
11/05/22	96.87	93.970	29,149.8	0.30	3	6
11/06/22	97.11	90.137	27,951.9	0.30	3	6
11/07/22	97.10	97.708	27,058.9	0.29	3	6
11/08/22	97.19	77.763	26,606.2	0.29	3	6
11/09/22	96.92	100.306	24,003.7	0.29	3	6
11/10/22	96.99	99.988	29,357.6	0.29	3	6
11/11/22	97.27	93.572	28,768.9	0.29	3	6
11/12/22	97.44	94.937	26,145.0	0.28	3	6
11/13/22	97.55	94.516	25,878.5	0.27	3	6
11/14/22	97.80	99.118	26,490.2	0.27	3	6
11/15/22	97.98	92.388	24,533.2	0.26	3	6
11/16/22	98.07	94.660	23,654.0	0.26	3	6
11/17/22	98.09	93.959	23,336.1	0.25	3	6
11/18/22	98.17	97.457	23,008.5	0.25	3	6
11/19/22	98.42	74.166	22,488.7	0.26	3	6
11/20/22	98.10	92.545	19,678.3	0.26	3	6
11/21/22	98.06	97.503	23,584.7	0.25	3	6
11/22/22	98.21	94.209	23,663.8	0.25	3	6
11/23/22	98.25	92.571	23,732.7	0.25	3	6
11/24/22	98.25	92.799	22,715.9	0.24	3	6
11/25/22	98.29	86.472	22,164.7	0.25	3	6
11/26/22	98.22	87.878	21,873.4	0.25	3	6
11/27/22	98.25	90.247	22,535.2	0.25	3	6
11/28/22	98.27	90.810	23,003.5	0.25	3	6
11/29/22	97.95	90.812	23,369.0	0.26	3	6
11/30/22	97.37	94.057	24,265.2	0.26	3	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

Date	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
							MFE		ROP		
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	NTU		NTU		TOC
	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
12/01/22	12.26	12.26	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/02/22	12.29	12.29	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/03/22	12.23	12.23	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/04/22	12.26	12.26	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/05/22	12.24	12.24	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/06/22	12.13	12.13	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/07/22	12.23	12.23	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/08/22	12.24	12.24	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/09/22	12.25	12.25	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/10/22	12.28	12.28	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/11/22	12.29	12.29	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/12/22	12.34	12.34	12.26	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/13/22	12.23	12.23	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/14/22	12.19	12.19	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/15/22	12.20	12.20	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/16/22	12.20	12.20	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/17/22	12.19	12.19	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/18/22	12.26	12.26	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/19/22	12.25	12.25	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/20/22	12.09	12.09	12.06	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/21/22	12.04	12.04	12.02	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/22/22	12.14	12.14	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/23/22	12.13	12.13	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/24/22	12.19	12.19	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/25/22	12.16	12.16	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/26/22	12.17	12.17	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/27/22	12.16	12.16	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/28/22	12.23	12.23	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/29/22	12.25	12.25	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/30/22	12.34	12.34	12.30	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/31/22	12.35	12.35	12.33	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
12/01/22	0.00	4.07	2.19	6.00	0.00	12.26
12/02/22	0.00	4.08	2.21	6.00	0.00	12.29
12/03/22	0.00	4.03	2.20	6.00	0.00	12.23
12/04/22	0.00	4.04	2.22	6.00	0.00	12.26
12/05/22	0.00	4.02	2.22	6.00	0.00	12.24
12/06/22	0.00	4.01	2.12	6.00	0.00	12.13
12/07/22	0.00	4.03	2.20	6.00	0.00	12.23
12/08/22	0.00	4.03	2.21	6.00	0.00	12.24
12/09/22	0.00	4.04	2.21	6.00	0.00	12.25
12/10/22	0.00	4.06	2.22	6.00	0.00	12.28
12/11/22	0.00	4.04	2.25	6.00	0.00	12.29
12/12/22	0.00	4.08	2.26	6.00	0.00	12.34
12/13/22	0.00	4.05	2.18	6.00	0.00	12.23
12/14/22	0.00	4.02	2.17	6.00	0.00	12.19
12/15/22	0.00	4.02	2.18	6.00	0.00	12.20
12/16/22	0.00	4.01	2.20	6.00	0.00	12.20
12/17/22	0.00	4.00	2.19	6.00	0.00	12.19
12/18/22	0.00	4.03	2.24	6.00	0.00	12.26
12/19/22	0.00	4.00	2.25	6.00	0.00	12.25
12/20/22	0.00	4.02	2.06	6.00	0.00	12.09
12/21/22	0.00	4.02	2.02	6.00	0.00	12.04
12/22/22	0.00	4.01	2.13	6.00	0.00	12.14
12/23/22	0.00	4.01	2.12	6.00	0.00	12.13
12/24/22	0.00	4.03	2.15	6.00	0.00	12.19
12/25/22	0.00	4.01	2.15	6.00	0.00	12.16
12/26/22	0.00	4.01	2.16	6.00	0.00	12.17
12/27/22	0.00	4.05	2.11	6.00	0.00	12.16
12/28/22	0.00	4.00	2.23	6.00	0.00	12.23
12/29/22	0.00	4.01	2.23	6.00	0.00	12.25
12/30/22	0.00	4.03	2.30	6.00	0.00	12.34
12/31/22	0.00	4.01	2.33	6.00	0.00	12.35

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
Date	LRV	LRV	LRV	LRV	LRV	LRV
12/01/22	0.00	0.00	2.19	6.00	4.00	12.19
12/02/22	0.00	0.00	2.21	6.00	4.00	12.21
12/03/22	0.00	0.00	2.20	6.00	4.00	12.20
12/04/22	0.00	0.00	2.22	6.00	4.00	12.22
12/05/22	0.00	0.00	2.22	6.00	4.00	12.22
12/06/22	0.00	0.00	2.12	6.00	4.00	12.12
12/07/22	0.00	0.00	2.20	6.00	4.00	12.20
12/08/22	0.00	0.00	2.21	6.00	4.00	12.21
12/09/22	0.00	0.00	2.21	6.00	4.00	12.21
12/10/22	0.00	0.00	2.22	6.00	4.00	12.22
12/11/22	0.00	0.00	2.25	6.00	4.00	12.25
12/12/22	0.00	0.00	2.26	6.00	4.00	12.26
12/13/22	0.00	0.00	2.18	6.00	4.00	12.18
12/14/22	0.00	0.00	2.17	6.00	4.00	12.17
12/15/22	0.00	0.00	2.18	6.00	4.00	12.18
12/16/22	0.00	0.00	2.20	6.00	4.00	12.20
12/17/22	0.00	0.00	2.19	6.00	4.00	12.19
12/18/22	0.00	0.00	2.24	6.00	4.00	12.24
12/19/22	0.00	0.00	2.25	6.00	4.00	12.25
12/20/22	0.00	0.00	2.06	6.00	4.00	12.06
12/21/22	0.00	0.00	2.02	6.00	4.00	12.02
12/22/22	0.00	0.00	2.13	6.00	4.00	12.13
12/23/22	0.00	0.00	2.12	6.00	4.00	12.12
12/24/22	0.00	0.00	2.15	6.00	4.00	12.15
12/25/22	0.00	0.00	2.15	6.00	4.00	12.15
12/26/22	0.00	0.00	2.16	6.00	4.00	12.16
12/27/22	0.00	0.00	2.11	6.00	4.00	12.11
12/28/22	0.00	0.00	2.23	6.00	4.00	12.23
12/29/22	0.00	0.00	2.23	6.00	4.00	12.23
12/30/22	0.00	0.00	2.30	6.00	4.00	12.30
12/31/22	0.00	0.00	2.33	6.00	4.00	12.33

Notes:

Date	MicroFiltration Process online monitoring results Log Removal Value															
	A01	A02	A03	A04	A05	A06	A07	A08	B01	B02	B03	B04	B05	B06	B07	B08
	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
12/01/22	4.19	4.59	5.40	5.21	4.11	4.15	4.25	4.07	4.83	5.19	4.81	4.79	5.03	5.01	5.19	4.99
12/02/22	4.11	4.51	5.34	5.17	4.28	4.10	4.25	4.08	4.99	5.19	4.79	4.81	5.18	4.98	5.17	4.98
12/03/22	N/A **	4.53	5.29	5.20	4.23	4.09	4.25	4.03	5.01	5.10	4.83	4.80	5.10	4.90	5.12	4.97
12/04/22	4.32	4.50	5.35	5.18	4.27	4.05	4.25	4.04	5.00	5.13	4.80	4.79	4.61	4.94	5.12	4.95
12/05/22	4.34	N/A *	5.28	5.18	N/A ***	4.06	4.22	4.02	4.99	5.13	4.78	4.79	N/A ***	4.97	5.10	N/A **
12/06/22	4.31	N/A *	5.24	5.18	4.24	4.02	4.21	4.01	5.07	5.28	4.76	4.75	5.41	4.98	5.18	4.95
12/07/22	4.31	N/A *	5.31	5.20	4.24	4.06	4.21	4.09	5.04	5.16	4.74	4.76	4.66	4.92	5.16	4.95
12/08/22	4.45	N/A *	5.20	5.19	4.24	4.06	4.21	4.14	5.02	5.18	4.73	4.80	4.74	4.93	5.10	4.92
12/09/22	4.32	4.88	5.18	5.17	4.23	4.04	4.21	4.12	5.01	5.14	4.90	4.93	5.16	4.93	5.06	4.94
12/10/22	4.31	5.37	5.27	5.28	4.22	4.06	4.21	4.09	5.00	5.10	4.96	4.94	5.19	4.93	5.07	4.94
12/11/22	4.28	5.36	5.24	5.19	4.25	4.04	4.22	4.10	5.03	5.28	5.00	4.94	5.31	4.93	5.11	4.93
12/12/22	4.31	5.31	5.23	5.17	4.22	4.13	4.29	4.08	5.04	5.18	5.01	4.97	5.34	4.92	5.09	4.97
12/13/22	N/A *	5.23	5.20	5.13	4.23	4.12	4.29	4.05	5.05	5.07	5.00	4.93	5.34	4.85	5.06	4.97
12/14/22	N/A *	5.21	5.13	5.09	4.17	4.03	4.24	4.02	4.98	4.99	4.96	4.92	5.27	4.85	5.03	4.92
12/15/22	N/A *	5.14	5.05	5.15	4.28	4.04	4.24	4.02	4.93	5.35	4.94	5.01	5.22	4.81	5.01	4.88
12/16/22	4.99	5.17	5.04	5.10	4.22	4.07	4.22	4.01	4.92	5.29	4.91	5.07	5.27	4.82	5.03	4.89
12/17/22	5.24	5.17	5.17	5.10	4.26	4.06	4.25	4.00	4.86	5.27	4.90	5.05	5.25	4.79	5.02	4.89
12/18/22	5.17	5.19	5.31	5.06	4.22	4.03	4.21	4.10	4.87	5.29	4.90	5.03	5.25	4.81	4.98	4.88
12/19/22	5.16	5.14	5.27	4.99	4.23	4.03	4.19	4.09	4.83	5.31	4.90	5.03	5.21	4.79	4.94	4.89
12/20/22	5.14	5.13	5.31	4.98	4.21	4.10	4.16	4.05	4.85	5.31	4.85	5.04	5.20	4.73	4.92	4.86
12/21/22	5.03	5.01	5.26	5.03	4.17	4.07	4.14	4.02	4.84	5.25	4.79	5.00	5.20	4.71	4.95	4.88
12/22/22	5.15	5.07	5.26	5.05	4.16	4.04	4.17	4.02	4.79	5.24	4.81	4.98	5.19	4.72	4.94	4.86
12/23/22	5.10	5.06	5.19	5.00	4.10	4.07	4.12	4.12	4.82	5.25	4.81	4.97	5.18	4.67	4.90	4.89
12/24/22	5.13	5.05	5.30	4.91	4.11	4.04	4.32	4.07	4.80	5.29	4.94	5.00	5.16	4.68	4.90	4.90
12/25/22	5.07	5.03	5.26	4.92	4.07	4.02	4.26	4.01	4.77	5.25	4.98	4.98	5.12	4.68	4.90	5.08
12/26/22	5.10	4.94	5.25	4.97	4.09	4.01	4.26	4.03	4.77	5.26	5.01	4.97	5.13	4.85	4.88	5.10
12/27/22	5.12	5.08	5.26	5.22	4.22	N/A ***	4.25	4.05	4.78	5.27	5.02	4.96	5.10	4.92	4.90	5.08
12/28/22	5.09	5.14	5.27	5.24	4.27	4.19	4.25	4.05	4.92	5.26	5.03	5.00	5.21	4.94	5.02	5.05
12/29/22	5.04	4.99	5.18	5.16	4.26	4.11	4.23	4.06	4.93	5.30	5.03	4.95	5.16	5.01	5.00	5.06
12/30/22	5.11	4.99	5.11	5.20	4.21	4.04	4.20	4.05	4.97	5.33	5.01	4.95	5.11	5.10	4.96	5.07
12/31/22	5.04	4.94	5.14	5.15	4.09	4.02	4.16	4.02	4.98	5.27	4.99	4.96	5.09	5.09	5.00	5.05

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell offline for installation of new membranes.

** Cell offline for maintenance. *** Cell not in service.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results															
	Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
12/01/22	5.21	5.24	5.32	4.84	4.97	4.92	5.02	5.16	4.31	4.49	4.25	4.26	4.30	4.25	4.31	4.10
12/02/22	5.16	5.17	5.27	4.81	5.00	4.89	4.99	5.13	4.29	4.24	4.25	4.22	4.31	4.24	4.27	4.08
12/03/22	5.08	5.10	5.19	4.78	4.96	4.88	4.97	5.12	4.23	4.14	4.23	4.19	4.27	4.19	4.22	4.06
12/04/22	5.12	5.12	5.19	4.82	4.97	4.88	4.96	5.12	4.20	4.26	4.22	4.18	4.22	4.16	4.21	4.11
12/05/22	5.14	5.13	5.20	4.80	4.89	4.84	4.94	5.09	4.20	4.34	4.20	4.15	4.18	4.12	4.20	4.27
12/06/22	5.04	5.08	5.16	4.55	4.97	4.89	4.95	5.15	4.22	4.26	4.20	4.14	4.19	4.10	4.20	4.27
12/07/22	5.08	5.11	5.17	4.67	4.95	4.88	4.96	5.10	4.23	4.03	4.19	4.19	4.23	4.20	4.18	4.30
12/08/22	5.11	5.17	5.20	4.77	4.98	4.87	4.96	5.06	4.21	4.03	4.20	4.20	4.28	4.28	4.24	4.28
12/09/22	5.15	5.14	5.26	4.77	4.99	4.88	4.99	5.06	4.20	4.17	4.19	4.20	4.33	4.28	4.37	4.26
12/10/22	5.15	5.13	5.31	4.76	4.98	4.88	4.97	5.06	4.20	4.31	4.18	4.20	4.34	4.27	4.32	4.26
12/11/22	5.15	5.12	5.28	4.77	4.94	4.85	4.92	5.08	4.23	4.40	4.15	4.15	4.34	4.24	4.32	4.27
12/12/22	5.11	5.10	5.16	4.76	4.90	4.84	4.91	5.09	4.20	4.46	4.13	4.22	4.32	4.23	4.30	4.23
12/13/22	5.03	5.25	5.08	4.72	4.92	4.84	4.85	5.05	4.15	4.24	4.13	4.30	4.28	4.21	4.27	4.20
12/14/22	4.97	5.29	5.10	4.71	4.94	4.78	4.79	5.02	4.14	4.19	4.17	4.21	4.23	4.17	4.24	4.16
12/15/22	4.98	5.29	5.04	4.67	4.95	4.75	4.80	4.99	4.06	4.15	4.19	4.18	4.18	4.16	4.20	4.16
12/16/22	4.94	5.26	5.02	4.66	4.90	4.72	4.84	4.97	4.03	4.14	4.17	4.15	4.19	4.13	4.18	4.11
12/17/22	4.89	5.18	5.01	4.63	4.89	4.69	4.79	4.94	4.05	4.15	4.19	4.14	4.18	4.12	4.17	4.12
12/18/22	4.90	5.18	5.02	4.64	4.92	4.77	4.79	4.88	4.04	4.16	4.17	4.14	4.16	4.11	4.19	4.12
12/19/22	4.86	5.20	5.02	4.63	4.88	4.93	4.81	4.88	4.00	4.14	4.16	4.09	4.15	4.17	4.15	4.22
12/20/22	4.81	5.16	4.95	4.55	4.78	4.92	4.72	4.83	4.02	4.11	4.11	4.05	4.17	4.19	4.09	4.13
12/21/22	4.77	5.13	4.84	4.51	4.76	4.88	4.69	4.79	4.14	4.08	4.07	4.03	4.21	4.14	4.14	4.11
12/22/22	4.87	5.11	4.82	4.51	4.94	4.84	4.71	4.95	4.12	4.14	4.07	4.01	4.24	4.19	4.26	4.16
12/23/22	5.02	5.07	5.07	4.50	5.10	4.83	4.88	5.06	4.06	4.09	4.05	4.01	4.22	4.17	4.21	4.14
12/24/22	5.04	5.04	5.22	4.67	5.11	4.84	4.95	5.08	4.03	4.05	4.05	4.07	4.22	4.15	4.19	4.12
12/25/22	5.03	5.04	5.21	4.77	5.10	4.83	4.92	5.10	4.03	4.31	4.03	4.21	4.22	4.11	4.20	4.08
12/26/22	5.07	5.06	5.20	4.76	5.08	4.84	4.93	5.07	4.02	4.39	4.07	4.16	4.24	4.13	4.18	4.10
12/27/22	5.08	5.06	5.21	4.76	5.08	4.85	4.94	5.04	N/A***	4.24	N/A***	N/A***	N/A***	N/A***	N/A***	N/A***
12/28/22	5.20	4.70	5.24	4.80	5.17	4.91	4.89	5.11	4.00	4.26	4.19	4.21	4.30	4.12	4.19	4.07
12/29/22	5.11	4.88	5.14	4.78	5.15	4.91	4.90	5.08	4.25	4.21	4.16	4.19	4.28	4.10	4.18	4.01
12/30/22	5.00	5.00	5.11	4.75	5.09	4.86	4.93	5.03	4.23	4.10	4.13	4.07	4.17	4.03	4.06	4.12
12/31/22	4.99	4.97	5.10	4.71	5.04	4.86	4.92	5.04	4.20	4.07	4.13	4.03	4.08	4.01	4.06	4.26

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

*** Cell not in service.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value															
	E01	**E02**	**E03**	**E04**	**E05**	**E06**	**E07**	**E08**	**F01**	**F02**	**F03**	**F04**	**F05**	**F06**	**F07**	**F08**
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
12/01/22	4.98	5.07	4.14	5.01	5.39	N/A **	5.29	5.31	5.35	5.30	5.12	5.14	5.23	5.26	5.43	5.29
12/02/22	5.00	5.30	4.12	4.92	5.44	N/A **	5.28	5.37	5.33	5.36	5.07	5.14	5.25	5.31	5.47	5.34
12/03/22	5.06	5.28	4.18	5.01	N/A **	N/A **	5.47	5.38	5.31	5.39	5.01	5.12	5.33	5.29	5.40	5.31
12/04/22	4.99	5.12	4.15	5.05	N/A **	N/A **	5.29	5.31	5.28	5.42	5.21	5.20	5.28	5.24	5.37	5.33
12/05/22	N/A ***	N/A ***	4.02	4.94	N/A ***	N/A ***	N/A ***	5.32	5.23	N/A ***	5.21	5.06	5.21	5.21	5.36	5.31
12/06/22	4.94	5.23	4.10	5.02	5.41	5.30	5.32	N/A ***	5.14	N/A **	5.10	5.15	5.24	5.21	5.35	5.28
12/07/22	4.96	5.16	4.26	5.06	5.41	5.37	5.39	N/A **	5.14	N/A **	5.10	5.15	5.23	5.21	5.35	5.28
12/08/22	4.95	5.23	4.19	5.04	5.38	5.41	5.36	5.38	5.20	5.39	5.06	5.10	5.20	5.29	5.43	5.33
12/09/22	4.96	5.27	4.16	5.02	5.39	5.35	5.31	5.36	5.19	5.32	5.06	5.09	5.26	5.25	5.41	5.40
12/10/22	5.00	5.12	4.19	4.99	5.36	5.31	5.33	5.40	5.19	5.31	5.10	5.13	5.26	5.24	5.38	5.31
12/11/22	4.98	5.15	4.11	5.00	5.33	5.29	5.39	5.52	5.23	5.40	5.11	5.26	5.27	5.24	5.39	5.27
12/12/22	4.97	5.13	4.30	5.01	5.32	5.38	5.31	5.31	5.25	5.34	5.05	5.14	5.33	5.20	5.33	5.43
12/13/22	4.93	5.16	4.14	5.00	5.29	5.34	5.34	5.27	5.31	5.32	5.04	5.12	5.30	5.21	5.33	5.28
12/14/22	4.91	5.10	4.03	5.02	5.34	5.31	5.39	5.33	5.33	5.32	5.16	4.98	N/A **	5.25	5.33	5.23
12/15/22	4.91	5.08	4.17	5.00	5.45	5.33	5.30	5.35	5.19	5.31	5.23	5.09	N/A **	5.21	5.34	5.28
12/16/22	4.92	5.18	4.11	4.98	5.35	5.31	5.32	5.40	5.23	5.37	5.19	5.07	5.18	5.23	5.36	5.25
12/17/22	4.97	5.17	4.09	4.97	5.31	5.33	5.35	N/A **	5.33	5.40	N/A **	5.09	5.20	5.24	5.33	5.26
12/18/22	4.93	5.08	4.19	5.03	5.26	5.36	5.32	N/A **	5.23	5.37	N/A **	5.14	5.22	5.18	N/A **	5.24
12/19/22	4.92	5.10	4.08	5.03	5.24	5.34	5.24	N/A **	5.16	5.33	5.18	5.11	5.22	5.12	5.36	5.25
12/20/22	4.85	5.07	4.09	4.91	5.33	5.39	5.29	N/A **	5.17	5.28	5.14	5.05	5.20	5.22	5.34	5.31
12/21/22	4.89	5.12	4.24	5.00	5.37	5.39	5.25	N/A **	5.16	5.31	5.11	5.06	5.30	5.17	5.32	5.29
12/22/22	4.99	5.17	4.09	5.00	5.40	5.30	5.27	5.36	5.17	5.25	N/A **	5.04	5.25	5.13	5.30	5.30
12/23/22	4.95	5.15	4.01	4.99	5.35	5.22	5.31	5.36	5.16	5.23	N/A **	5.04	5.19	5.15	N/A **	N/A **
12/24/22	4.95	5.28	4.06	4.95	5.46	5.39	5.24	5.29	5.15	5.30	N/A **	5.07	5.27	5.13	N/A **	N/A **
12/25/22	4.96	5.19	4.15	5.06	5.45	5.33	5.22	5.30	5.09	5.19	N/A **	5.07	5.16	5.14	N/A **	N/A **
12/26/22	4.98	5.15	4.08	4.91	5.34	5.33	5.25	5.24	5.11	5.28	N/A **	5.07	5.17	5.19	N/A **	N/A **
12/27/22	N/A ***	N/A ***	N/A ***	N/A ***	N/A ***	N/A ***	N/A ***	N/A ***	N/A ***	N/A ***	N/A ***	N/A ***	N/A ***	N/A ***	N/A ***	N/A ***
12/28/22	4.87	5.10	4.17	5.01	5.31	5.31	5.30	5.28	5.24	5.38	N/A ***	5.11	5.36	5.16	N/A ***	N/A ***
12/29/22	4.83	5.12	4.09	5.01	5.24	5.27	5.36	5.16	5.23	5.31	N/A **	5.08	5.25	5.15	N/A **	N/A **
12/30/22	4.94	5.06	4.07	5.02	5.44	5.24	5.26	5.28	5.20	5.27	N/A **	5.02	5.22	5.14	N/A **	N/A **
12/31/22	4.87	5.08	4.17	5.07	5.44	5.30	5.17	5.30	5.09	5.29	N/A **	4.98	5.15	5.19	N/A **	N/A **

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

** Cell offline for maintenance.

*** Cell not in service

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

MicroFiltration Process online monitoring results

Effluent Turbidity - NTU

Date	A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		E05-E08		F01-F04		F05-F08		MFE
	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
12/01/22	0.030	0.041	0.022	0.028	0.025	0.028	0.042	0.047	0.033	0.039	0.027	0.029	0.037	0.039	0.036	0.038	0.034	0.043	0.033	0.050	0.030	0.061	0.039	0.066	0.032
12/02/22	0.028	0.033	0.022	0.026	0.024	0.028	0.041	0.045	0.034	0.036	0.026	0.029	0.036	0.038	0.037	0.040	0.037	0.059	0.038	0.088	0.038	0.056	0.041	0.055	0.032
12/03/22	0.029	0.034	0.022	0.026	0.024	0.032	0.041	0.048	0.034	0.041	0.027	0.032	0.037	0.046	0.037	0.042	0.037	0.042	0.050	0.059	0.072	0.100	0.040	0.045	0.032
12/04/22	0.028	0.048	0.022	0.025	0.023	0.026	0.041	0.045	0.034	0.036	0.027	0.029	0.036	0.039	0.037	0.057	0.040	0.054	0.069	0.087	0.115	0.148	0.037	0.038	0.032
12/05/22	0.030	0.047	0.025	0.105	0.027	0.030	0.044	0.049	0.036	0.043	0.029	0.032	0.039	0.059	0.040	0.063	0.047	0.078	0.094	0.115	0.152	0.163	0.039	0.048	0.035
12/06/22	0.028	0.031	0.022	0.024	0.025	0.030	0.042	0.054	0.034	0.039	0.027	0.035	0.037	0.040	0.038	0.066	0.049	0.058	0.131	0.486*	0.288*	0.345*	0.045	0.078	0.034
12/07/22	0.027	0.032	0.021	0.024	0.022	0.024	0.042	0.046	0.032	0.035	0.026	0.030	0.036	0.040	0.037	0.042	0.043	0.052	0.082	0.153	0.162	0.345*	0.040	0.050	0.032
12/08/22	0.027	0.046	0.021	0.028	0.023	0.025	0.044	0.046	0.031	0.034	0.024	0.027	0.035	0.036	0.037	0.043	0.036	0.045	0.024	0.035	0.040	0.053	0.038	0.056	0.031
12/09/22	0.031	0.055	0.020	0.031	0.023	0.025	0.044	0.052	0.032	0.034	0.024	0.027	0.035	0.037	0.036	0.039	0.040	0.056	0.026	0.028	0.067	0.090	0.037	0.044	0.031
12/10/22	0.033	0.044	0.020	0.023	0.023	0.025	0.045	0.050	0.032	0.041	0.024	0.027	0.034	0.038	0.035	0.051	0.038	0.040	0.031	0.048	0.090	0.116	0.037	0.045	0.031
12/11/22	0.031	0.037	0.021	0.026	0.023	0.024	0.045	0.049	0.032	0.034	0.024	0.028	0.034	0.039	0.036	0.037	0.041	0.044	0.041	0.048	0.110	0.129	0.038	0.062	0.032
12/12/22	0.029	0.034	0.020	0.024	0.022	0.027	0.044	0.046	0.031	0.036	0.023	0.025	0.034	0.039	0.034	0.039	0.047	0.055	0.041	0.041	0.066	0.135	0.036	0.048	0.032
12/13/22	0.029	0.033	0.020	0.023	0.022	0.024	0.044	0.048	0.032	0.036	0.024	0.028	0.035	0.043	0.035	0.036	0.050	0.052	0.055	0.076	0.023	0.069	0.037	0.045	0.032
12/14/22	0.029	0.033	0.022	0.057	0.023	0.029	0.047	0.051	0.031	0.033	0.024	0.025	0.035	0.039	0.035	0.036	0.042	0.054	0.074	0.082	0.028	0.050	0.038	0.051	0.032
12/15/22	0.028	0.031	0.021	0.023	0.025	0.029	0.048	0.050	0.032	0.032	0.024	0.025	0.034	0.036	0.036	0.037	0.033	0.040	0.046	0.081	0.028	0.048	0.039	0.050	0.031
12/16/22	0.029	0.044	0.020	0.022	0.024	0.026	0.047	0.048	0.032	0.034	0.024	0.025	0.034	0.036	0.035	0.036	0.033	0.034	0.026	0.037	0.029	0.047	0.039	0.052	0.031
12/17/22	0.034	0.050	0.020	0.023	0.024	0.025	0.047	0.048	0.031	0.033	0.024	0.032	0.034	0.036	0.035	0.038	0.034	0.038	0.029	0.044	0.039	0.063	0.040	0.059	0.032
12/18/22	0.031	0.039	0.021	0.036	0.024	0.026	0.047	0.051	0.032	0.035	0.025	0.027	0.034	0.036	0.035	0.037	0.037	0.054	0.035	0.123	0.042	0.055	0.040	0.064	0.032
12/19/22	0.030	0.036	0.021	0.026	0.023	0.025	0.046	0.054	0.032	0.033	0.024	0.030	0.034	0.035	0.036	0.046	0.037	0.040	0.034	0.061	0.056	0.075	0.039	0.053	0.032
12/20/22	0.029	0.034	0.021	0.050	0.024	0.025	0.047	0.050	0.032	0.034	0.025	0.027	0.035	0.050	0.036	0.037	0.041	0.060	0.032	0.046	0.082	0.097	0.040	0.051	0.032
12/21/22	0.029	0.045	0.020	0.023	0.024	0.026	0.046	0.048	0.032	0.033	0.025	0.040	0.034	0.036	0.037	0.048	0.038	0.052	0.033	0.080	0.064	0.120	0.042	0.058	0.032
12/22/22	0.029	0.031	0.022	0.023	0.025	0.026	0.047	0.063	0.033	0.039	0.027	0.031	0.035	0.036	0.036	0.038	0.032	0.033	0.033	0.054	0.035	0.042	0.042	0.064	0.032
12/23/22	0.028	0.031	0.021	0.025	0.025	0.028	0.046	0.048	0.033	0.038	0.026	0.028	0.035	0.048	0.036	0.039	0.033	0.052	0.035	0.044	0.054	0.065	0.041	0.050	0.031
12/24/22	0.029	0.037	0.022	0.027	0.026	0.026	0.048	0.050	0.034	0.047	0.026	0.037	0.036	0.050	0.037	0.060	0.035	0.045	0.040	0.050	0.072	0.086	0.041	0.049	0.032
12/25/22	0.028	0.030	0.022	0.030	0.025	0.026	0.049	0.054	0.033	0.034	0.026	0.032	0.035	0.038	0.036	0.057	0.035	0.038	0.047	0.063	0.104	0.147	0.041	0.056	0.032
12/26/22	0.031	0.036	0.022	0.029	0.025	0.028	0.049	0.052	0.033	0.039	0.027	0.047	0.035	0.050	0.037	0.043	0.039	0.045	0.055	0.075	0.152	0.193	0.046	0.047	0.033
12/27/22	0.030	0.059	0.021	0.052	0.029	0.042	0.051	0.056	0.035	0.036	0.029	0.032	0.035	0.068	0.036	0.045	0.044	0.054	0.074	0.084	***	0.000***	***	0.000***	0.033
12/28/22	0.031	0.039	0.021	0.029	0.025	0.053	0.051	0.072	0.036	0.068	0.031	0.062	0.035	0.040	0.036	0.069	0.047	0.050	0.080	0.101	0.175	0.186	0.047	0.047	0.034
12/29/22	0.031	0.034	0.021	0.023	0.024	0.026	0.048	0.051	0.032	0.037	0.027	0.032	0.035	0.038	0.036	0.037	0.054	0.066	0.083	0.096	0.109	0.234*	0.042	0.050	0.034
12/30/22	0.031	0.035	0.021	0.024	0.025	0.032	0.047	0.052	0.032	0.033	0.028	0.033	0.036	0.046	0.037	0.039	0.062	0.073	0.086	0.097	0.064	0.081	0.040	0.056	0.035
12/31/22	0.031	0.052	0.021	0.022	0.025	0.027	0.049	0.053	0.033	0.035	0.029	0.034	0.036	0.059	0.037	0.042	0.066	0.070	0.097	0.120	0.103	0.130	0.041	0.047	0.036

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

* Erroneous value due to instrument issue.

*** Cells not in service.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Reverse Osmosis Process online monitoring results																	
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
12/01/22	0.015	0.015	8.474	7.808	9.203	0.055	0.050	0.070	1,788	1,714	1,877	40	36	46	99.35	2.19	97.74	1.65
12/02/22	0.015	0.015	8.492	7.809	9.488	0.052	0.048	0.071	1,763	1,686	1,851	37	32	43	99.38	2.21	97.89	1.67
12/03/22	0.015	0.015	8.298	7.466	9.305	0.052	0.046	0.060	1,681	1,629	1,781	37	33	42	99.37	2.20	97.78	1.65
12/04/22	0.015	0.015	8.341	7.474	9.452	0.050	0.045	0.060	1,587	1,519	1,647	36	32	41	99.40	2.22	97.74	1.65
12/05/22	0.021	0.025	8.759	8.396	9.638	0.053	0.038	0.074	1,912	1,537	2,439	48	32	67	99.39	2.22	97.49	1.60
12/06/22	0.017	0.021	7.877	6.650	9.380	0.060	0.052	0.078	2,269	1,867	2,592	57	44	110	99.24	2.12	97.51	1.60
12/07/22	0.015	0.015	8.487	7.824	9.269	0.054	0.049	0.065	1,766	1,652	1,866	43	36	49	99.36	2.20	97.56	1.61
12/08/22	0.015	0.015	8.493	7.703	9.353	0.052	0.049	0.060	1,763	1,690	1,831	40	35	47	99.39	2.21	97.70	1.64
12/09/22	0.015	0.015	8.472	7.702	9.490	0.052	0.049	0.059	1,735	1,647	1,808	41	33	46	99.39	2.21	97.66	1.63
12/10/22	0.015	0.015	8.322	7.466	9.407	0.050	0.046	0.058	1,681	1,625	1,775	38	34	50	99.39	2.22	97.74	1.65
12/11/22	0.015	0.015	8.624	7.884	9.607	0.048	0.043	0.057	1,561	1,498	1,644	35	31	116	99.44	2.25	97.76	1.65
12/12/22	0.015	0.015	8.053	7.265	9.827	0.044	0.034	0.053	1,821	1,437	2,299	38	27	51	99.45	2.26	97.93	1.68
12/13/22	0.015	0.015	7.544	7.081	8.192	0.050	0.044	0.057	2,324	1,903	2,657	53	37	73	99.34	2.18	97.70	1.64
12/14/22	0.015	0.015	7.558	6.756	8.220	0.051	0.047	0.059	2,395	1,865	2,569	55	40	62	99.33	2.17	97.71	1.64
12/15/22	0.015	0.015	7.561	7.126	8.280	0.050	0.041	0.060	2,385	1,967	2,587	55	42	65	99.34	2.18	97.67	1.63
12/16/22	0.015	0.016	7.247	6.908	7.737	0.046	0.024	0.070	2,434	2,284	2,649	51	33	58	99.36	2.20	97.91	1.68
12/17/22	0.016	0.016	7.041	6.470	7.503	0.046	0.034	0.061	2,485	2,372	2,642	50	45	56	99.35	2.19	98.00	1.70
12/18/22	0.016	0.016	7.062	6.704	7.504	0.041	0.017	0.089	2,401	2,263	2,613	48	43	56	99.42	2.24	98.01	1.70
12/19/22	0.016	0.016	7.312	6.864	7.798	0.041	0.023	0.056	2,376	2,157	2,623	47	40	57	99.43	2.25	98.02	1.70
12/20/22	0.016	0.016	7.041	6.475	7.796	0.061	0.038	0.131 *	2,720	2,313	3,232	59	47	76	99.14	2.06	97.82	1.66
12/21/22	0.016	0.016	7.064	6.285	7.662	0.068	0.048	0.140 *	2,867	2,519	3,216	66	58	77	99.04	2.02	97.69	1.64
12/22/22	0.015	0.016	7.196	6.654	8.069	0.054	0.050	0.060	2,623	2,428	2,855	58	33	70	99.25	2.13	97.77	1.65
12/23/22	0.015	0.015	7.093	6.696	7.503	0.054	0.049	0.062	2,601	2,436	2,822	60	54	68	99.24	2.12	97.68	1.64
12/24/22	0.015	0.015	7.142	6.777	7.663	0.050	0.045	0.087	2,557	2,356	2,903	59	52	71	99.29	2.15	97.70	1.64
12/25/22	0.015	0.015	6.638	5.943	7.160	0.047	0.044	0.053	2,668	2,453	3,128	64	55	79	99.28	2.15	97.62	1.62
12/26/22	0.015	0.015	6.647	6.013	7.844	0.046	0.042	0.059	2,730	2,532	3,036	65	58	77	99.30	2.16	97.60	1.62
12/27/22	0.017	0.019	7.676	7.168	8.662	0.059	0.052	0.075	2,325	2,072	2,639	57	49	85	99.23	2.11	97.56	1.61
12/28/22	0.015	0.015	7.608	7.225	8.088	0.045	0.034	0.062	2,285	2,055	2,423	52	46	58	99.41	2.23	97.72	1.64
12/29/22	0.015	0.015	7.452	7.011	8.139	0.043	0.033	0.066	2,376	1,844	2,689	52	37	66	99.42	2.23	97.81	1.66
12/30/22	0.015	0.015	7.306	6.971	7.853	0.036	0.026	0.048	2,462	2,310	2,670	52	33	60	99.50	2.30	97.88	1.67
12/31/22	0.015	0.015	7.155	6.846	7.707	0.033	0.030	0.041	2,406	2,245	2,585	51	46	57	99.54	2.33	97.88	1.67

Notes:

* Value affected by short term TOC spike.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	UltraViolet / AOP Process online monitoring results					
	UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/L	Log Removal
12/01/22	96.94	92.832	27,510.8	0.30	3	6
12/02/22	96.74	95.337	28,481.2	0.30	3	6
12/03/22	96.99	91.248	26,712.9	0.29	3	6
12/04/22	96.86	94.362	23,951.5	0.29	3	6
12/05/22	97.07	31.138	11,777.1	0.32	3	6
12/06/22	96.98	57.729	20,674.0	0.31	3	6
12/07/22	96.75	98.428	29,619.3	0.30	3	6
12/08/22	96.76	93.903	29,059.8	0.31	3	6
12/09/22	96.86	94.449	28,389.2	0.30	3	6
12/10/22	96.90	92.580	27,379.6	0.30	3	6
12/11/22	96.67	96.284	28,813.6	0.30	3	6
12/12/22	96.80	102.135	28,813.6	0.30	3	6
12/13/22	96.61	103.739	30,873.6	0.30	3	6
12/14/22	96.73	105.983	32,864.7	0.32	3	6
12/15/22	96.67	105.510	31,872.0	0.31	3	6
12/16/22	96.68	105.780	32,561.5	0.31	3	6
12/17/22	96.78	105.766	32,865.0	0.31	3	6
12/18/22	96.65	105.806	32,558.5	0.31	3	6
12/19/22	96.61	104.321	33,258.1	0.31	3	6
12/20/22	96.38	120.236	35,288.6	0.31	3	6
12/21/22	96.12	104.720	36,821.3	0.32	3	6
12/22/22	96.17	110.209	33,538.0	0.32	3	6
12/23/22	96.28	109.712	35,240.4	0.32	3	6
12/24/22	96.39	110.363	37,532.7	0.32	3	6
12/25/22	96.30	106.701	34,795.3	0.32	3	6
12/26/22	96.27	92.779	33,356.4	0.32	3	6
12/27/22	95.92	42.763	27,072.8	0.33	3	6
12/28/22	96.49	63.498	17,411.4	0.36	3	6
12/29/22	96.19	105.672	22,088.9	0.34	3	6
12/30/22	96.15	110.252	36,041.8	0.34	3	6
12/31/22	96.15	110.178	37,330.8	0.34	3	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

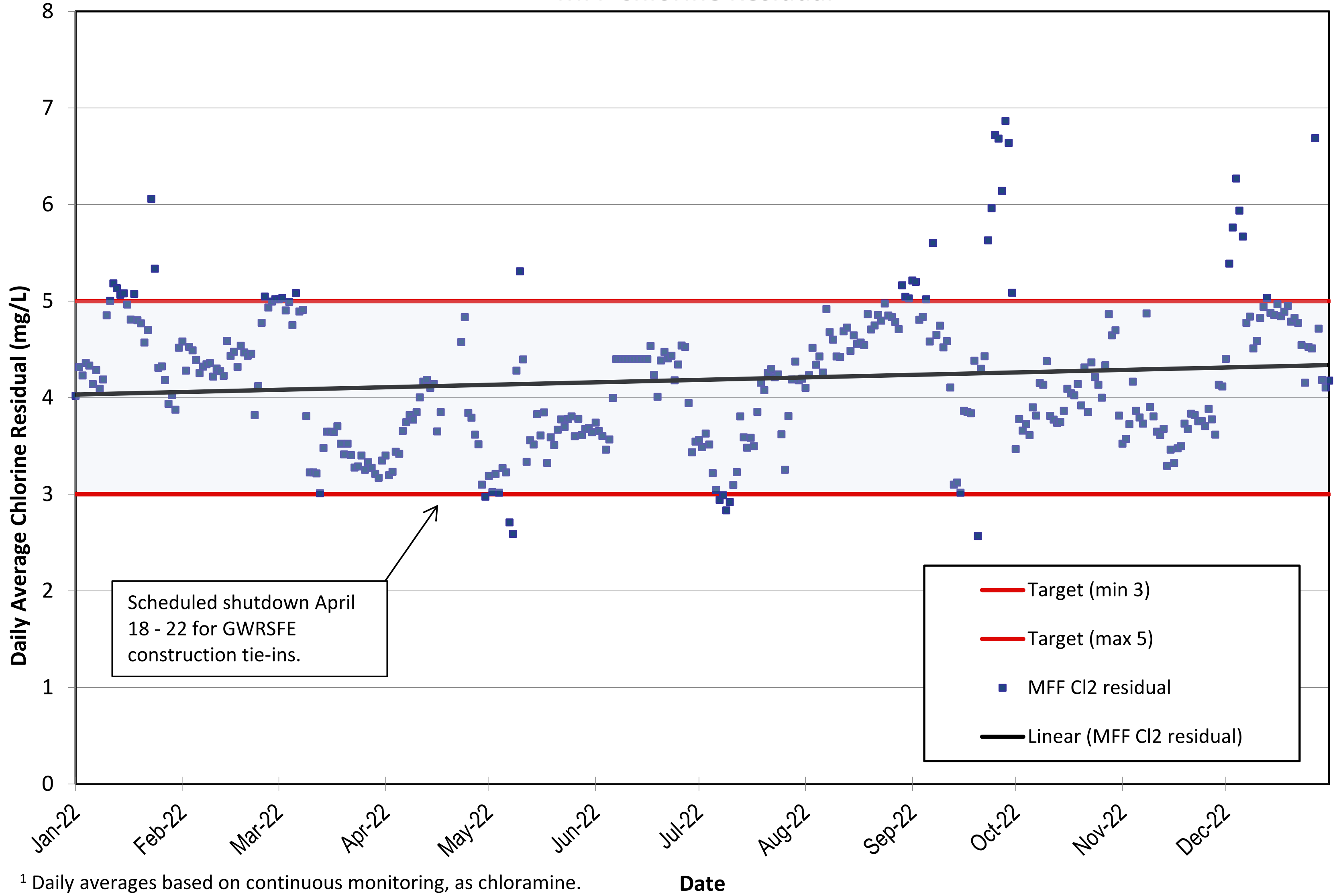
minimum EED = 0.23 kwh/kgal

Appendix E

Critical Control Points

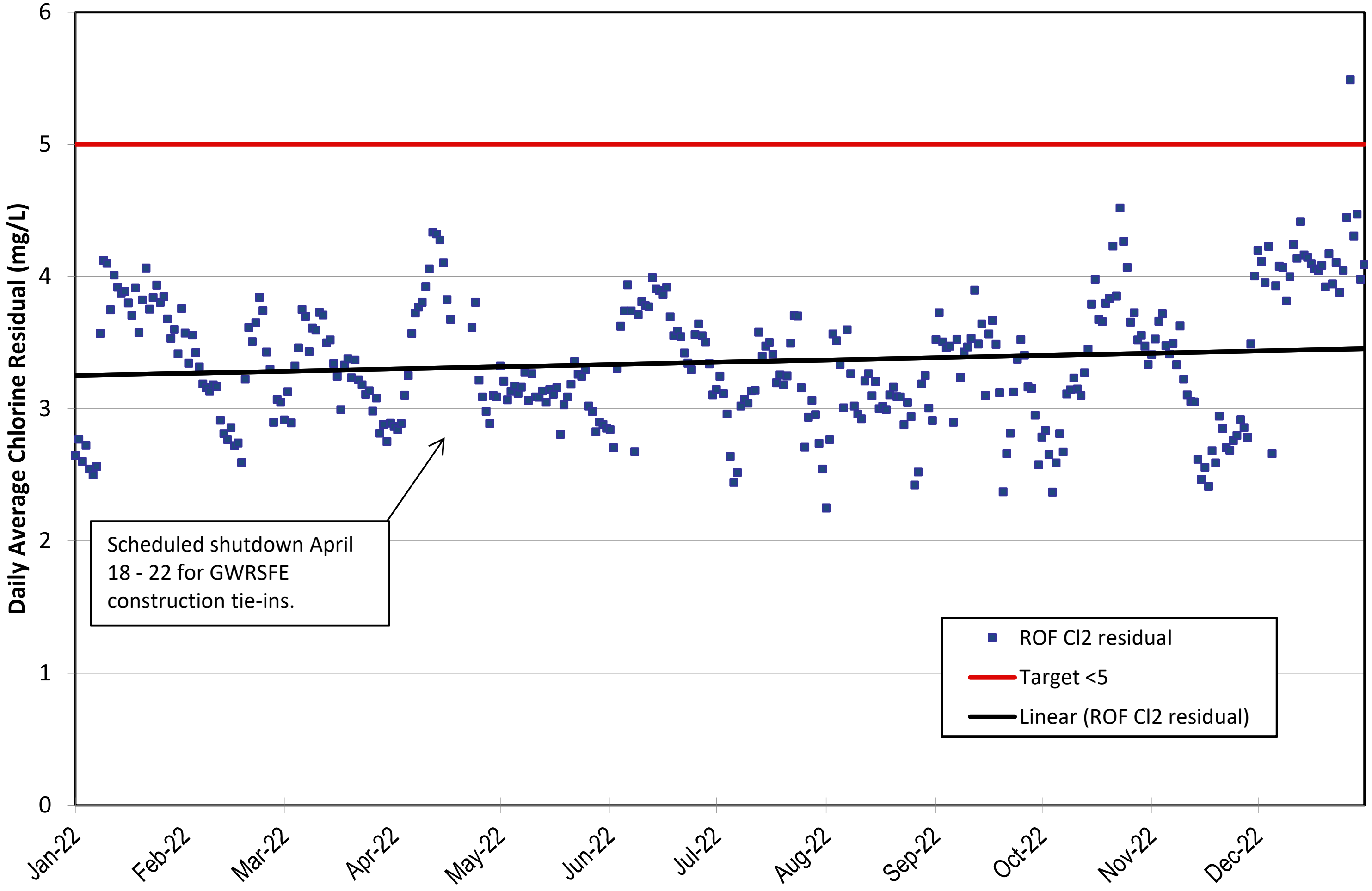
Orange County Water District
Groundwater Replenishment System
2022 Annual Report

Figure E-1
MFF Chlorine Residual[1]



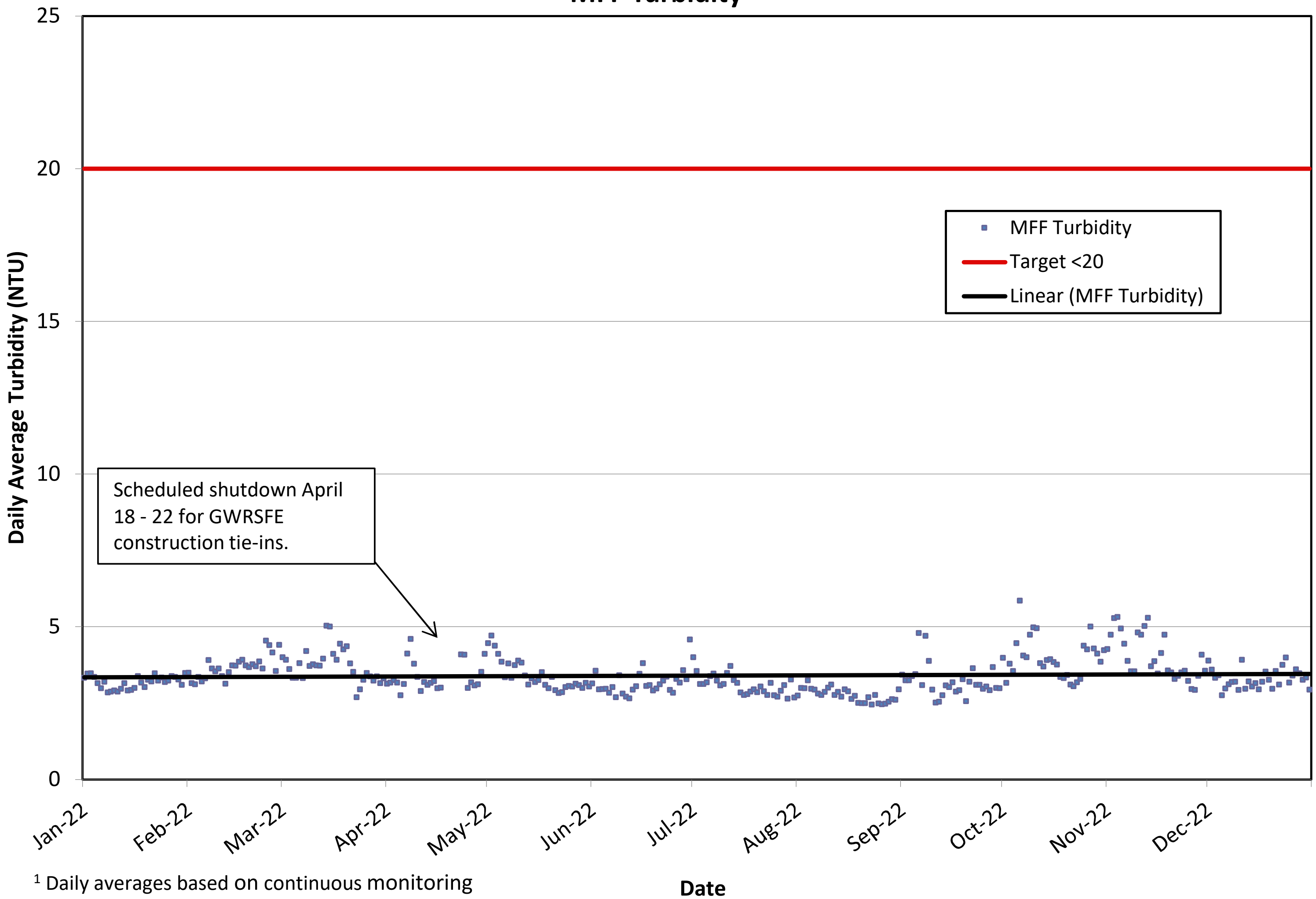
[1] Daily averages based on continuous monitoring, as chloramine.

Figure E-2
ROF Chlorine Residual[1]



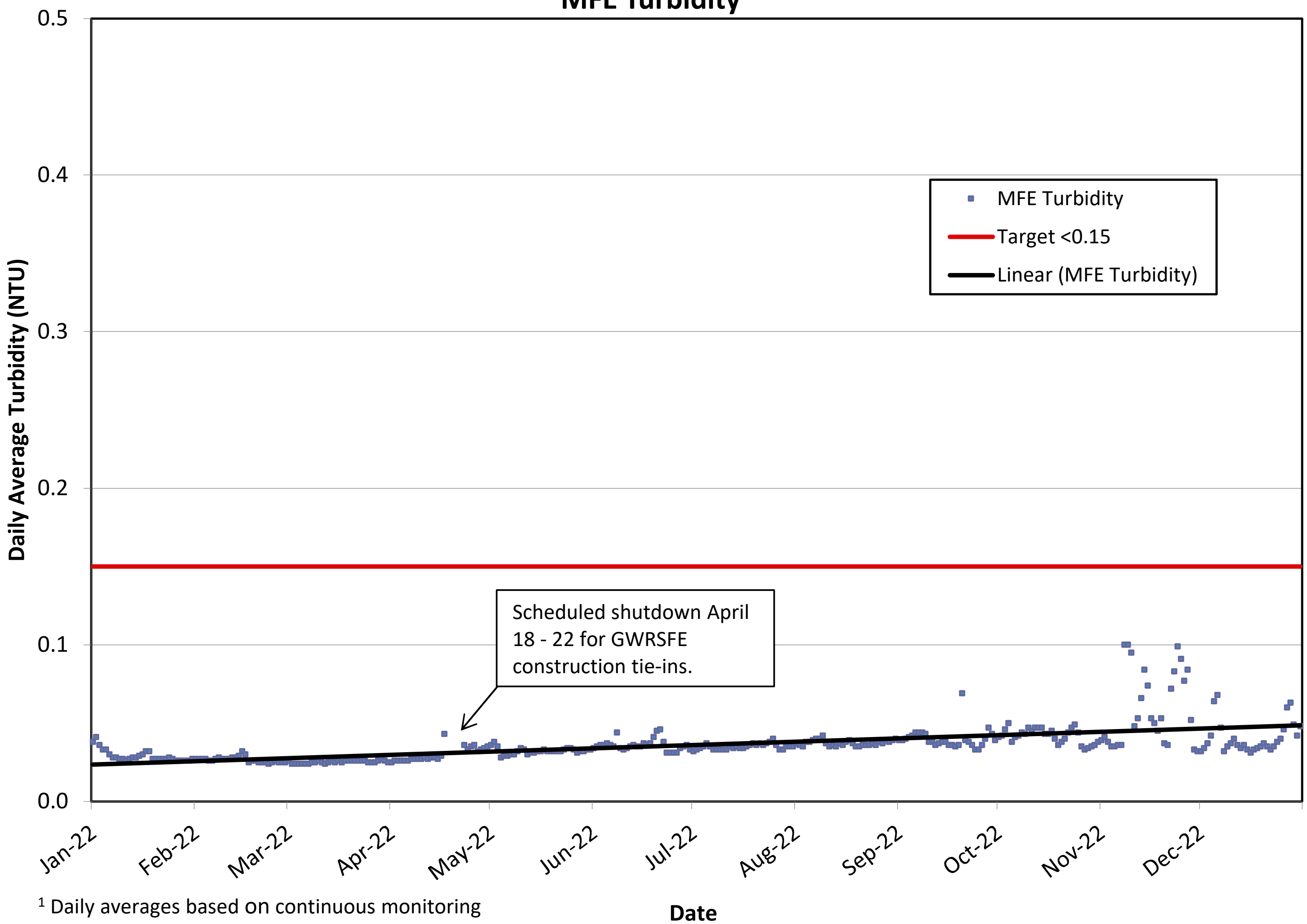
[1] Daily averages based on continuous monitoring, as chloramine.

Figure E-3
MFF Turbidity[1]



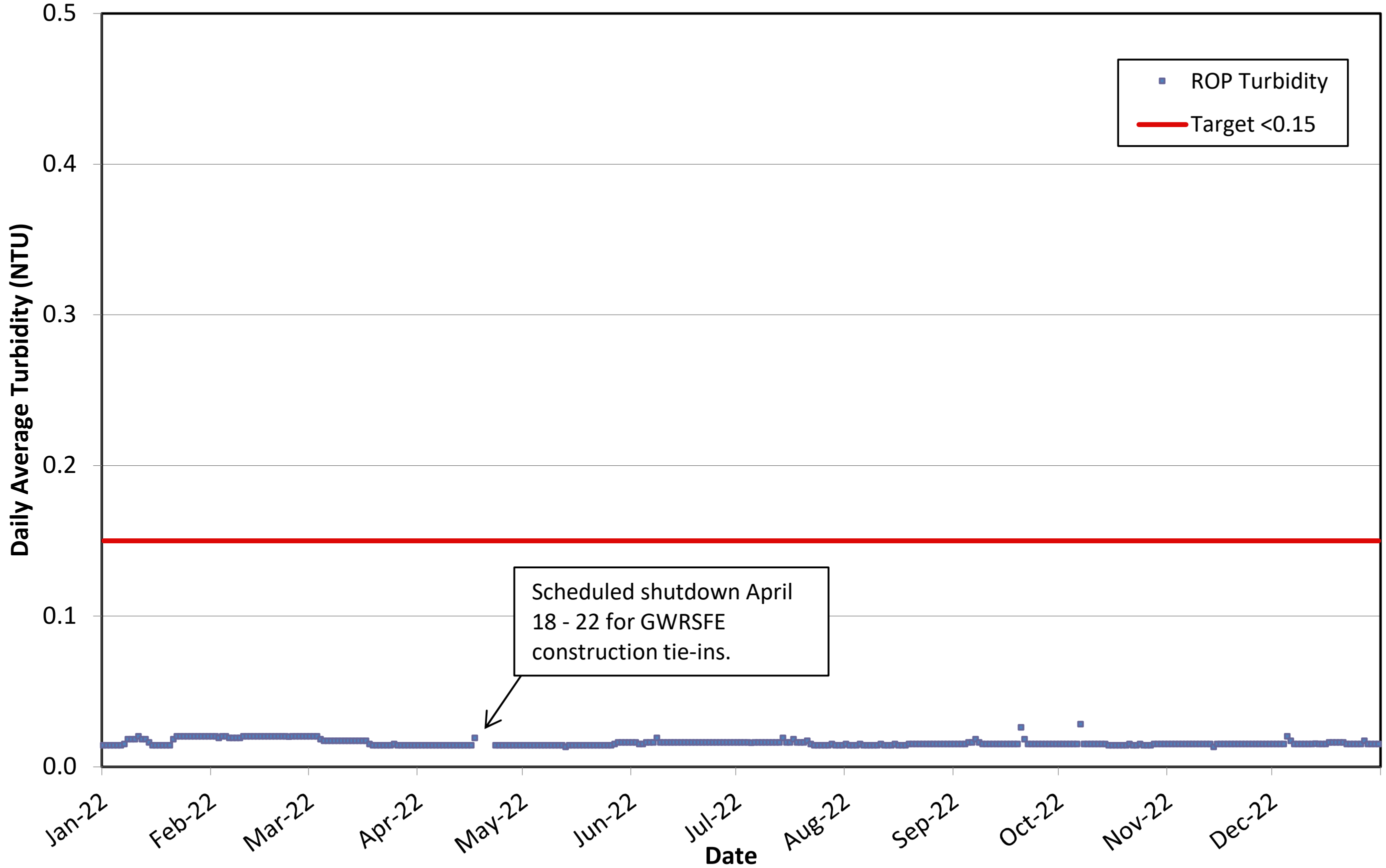
[1] Daily averages based on continuous monitoring

Figure E-4
MFE Turbidity[1]



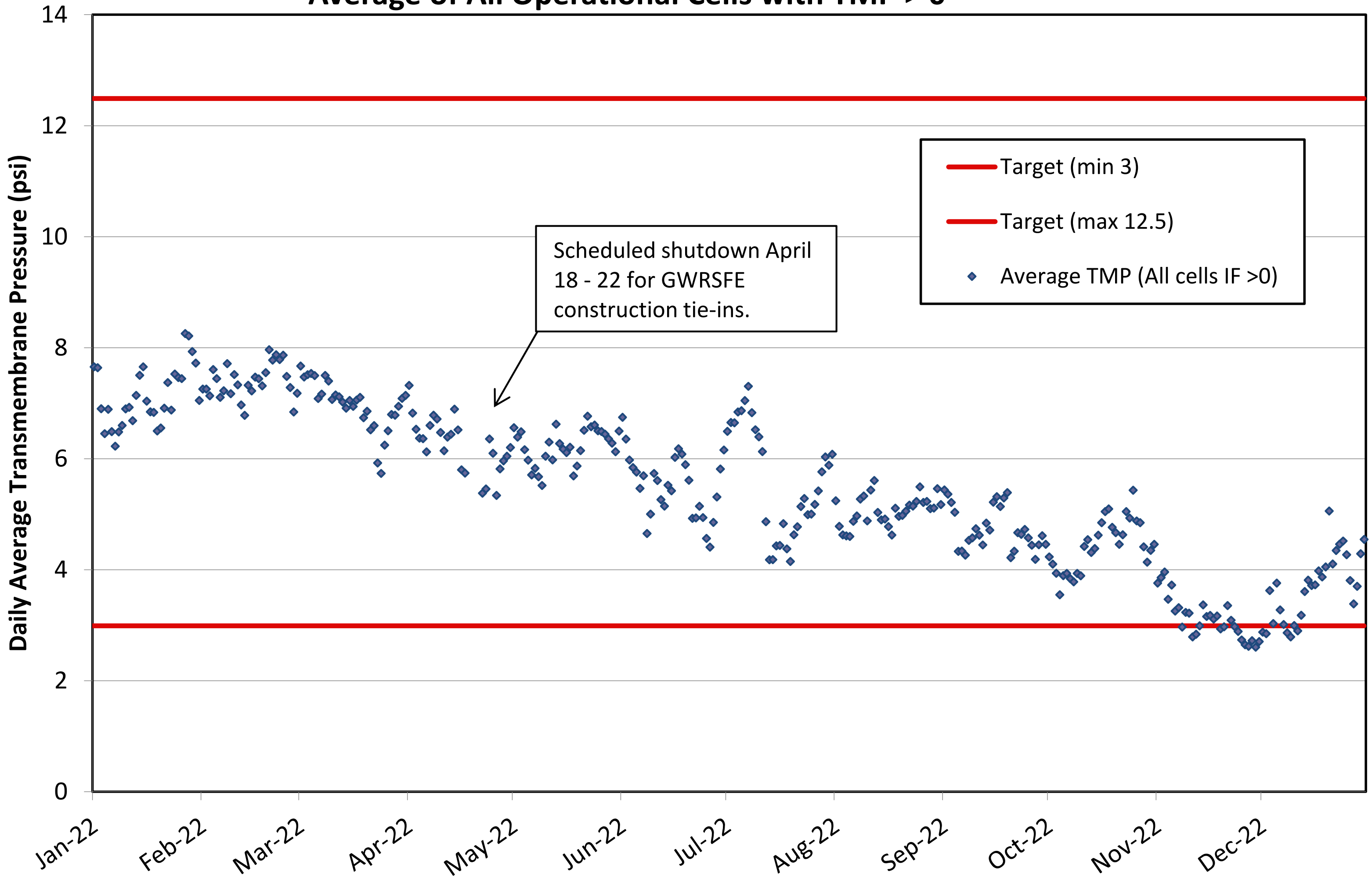
[1] Daily averages based on continuous monitoring

Figure E-5
ROP Turbidity[1]



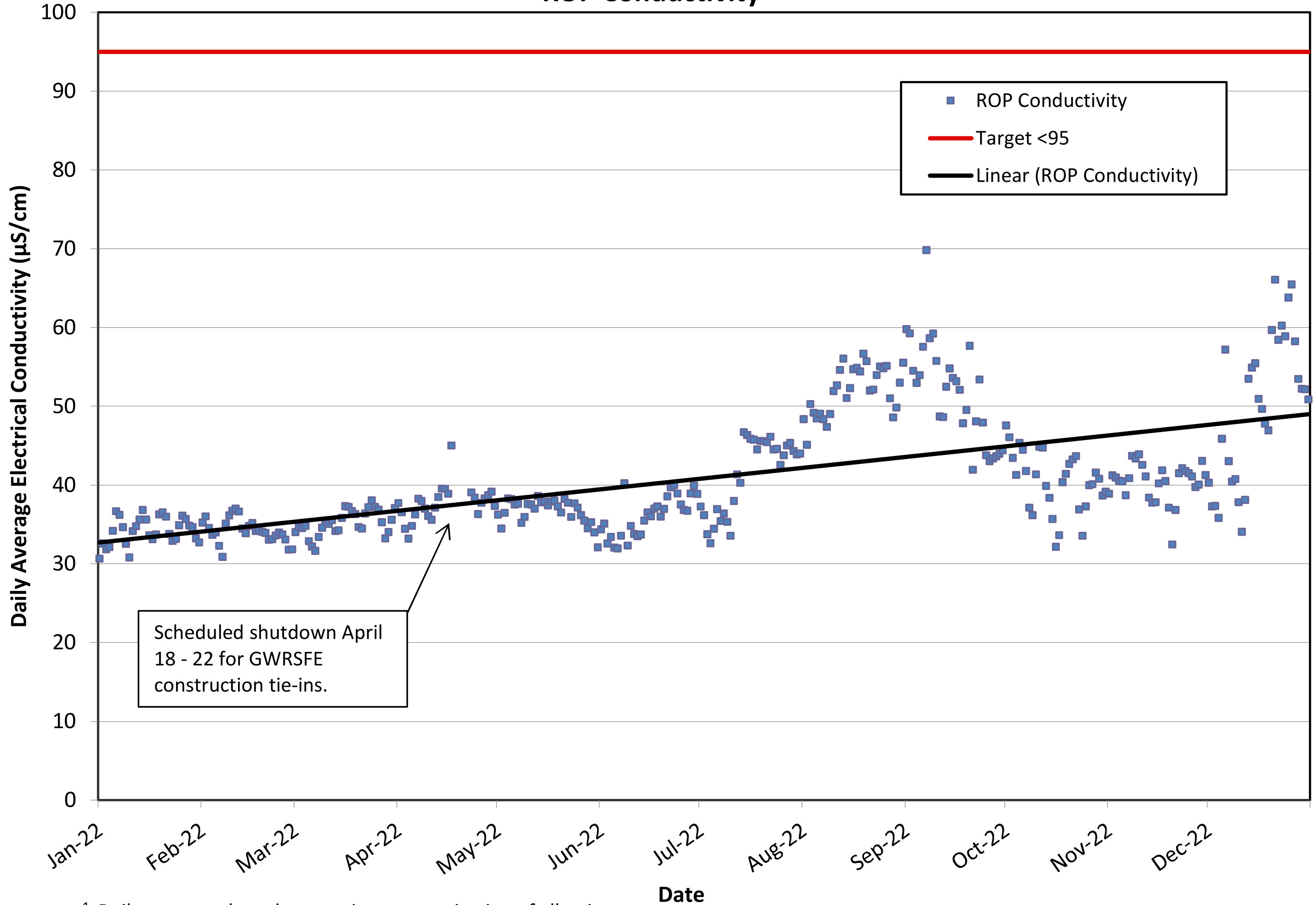
[1] Turbidity shown for UVF, which is effectively ROP downstream of hydrogen peroxide addition.
Daily averages based on continuous monitoring

Figure E-6
MF Transmembrane Pressure (TMP)[1]
All Operating Cells (A01-E04 Jan 1-Sept 27) (A01-F08 Sept 28-Dec 31)
Average of All Operational Cells with TMP > 0



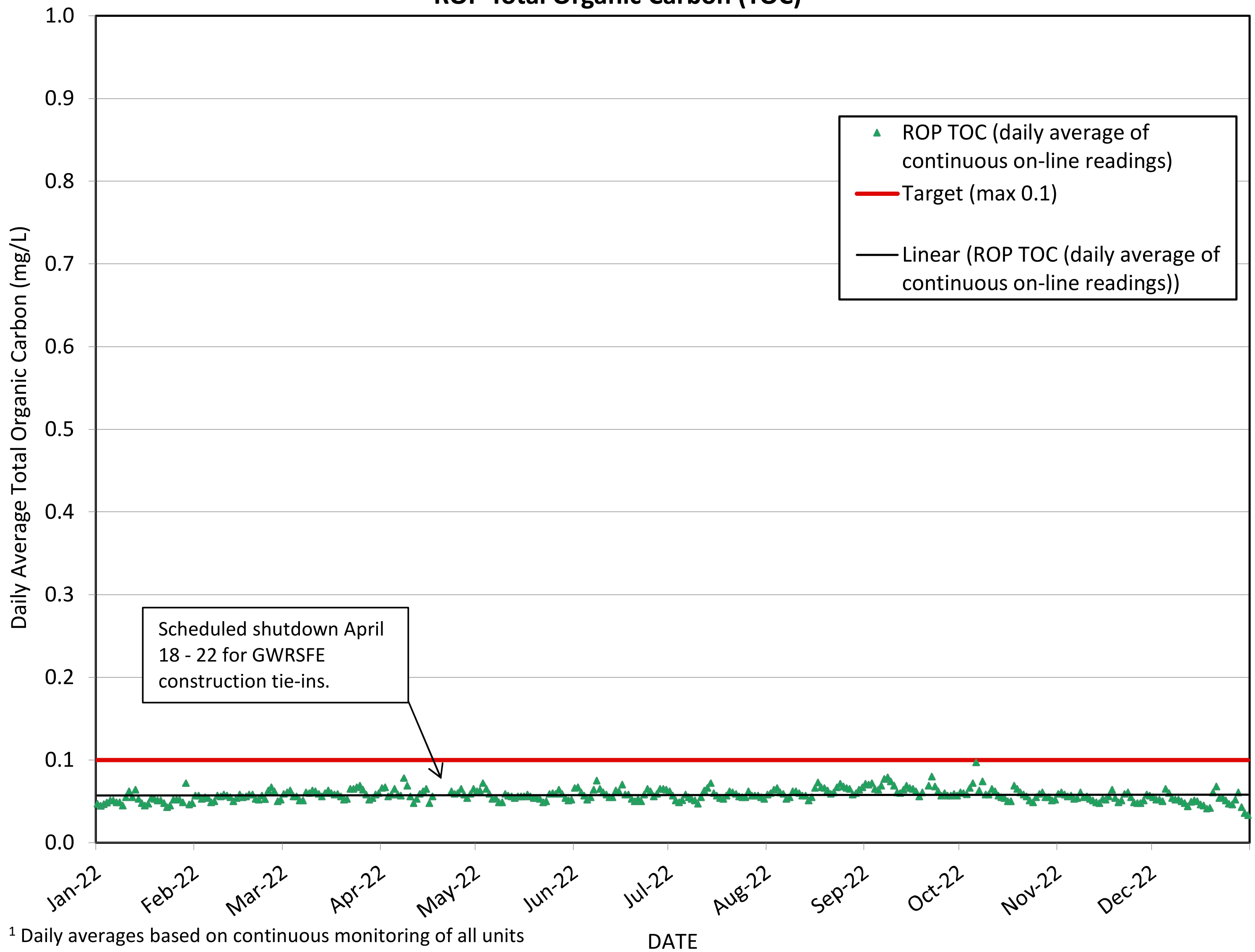
[1] Daily averages based on continuous monitoring

Figure E-7
ROP Conductivity[1]



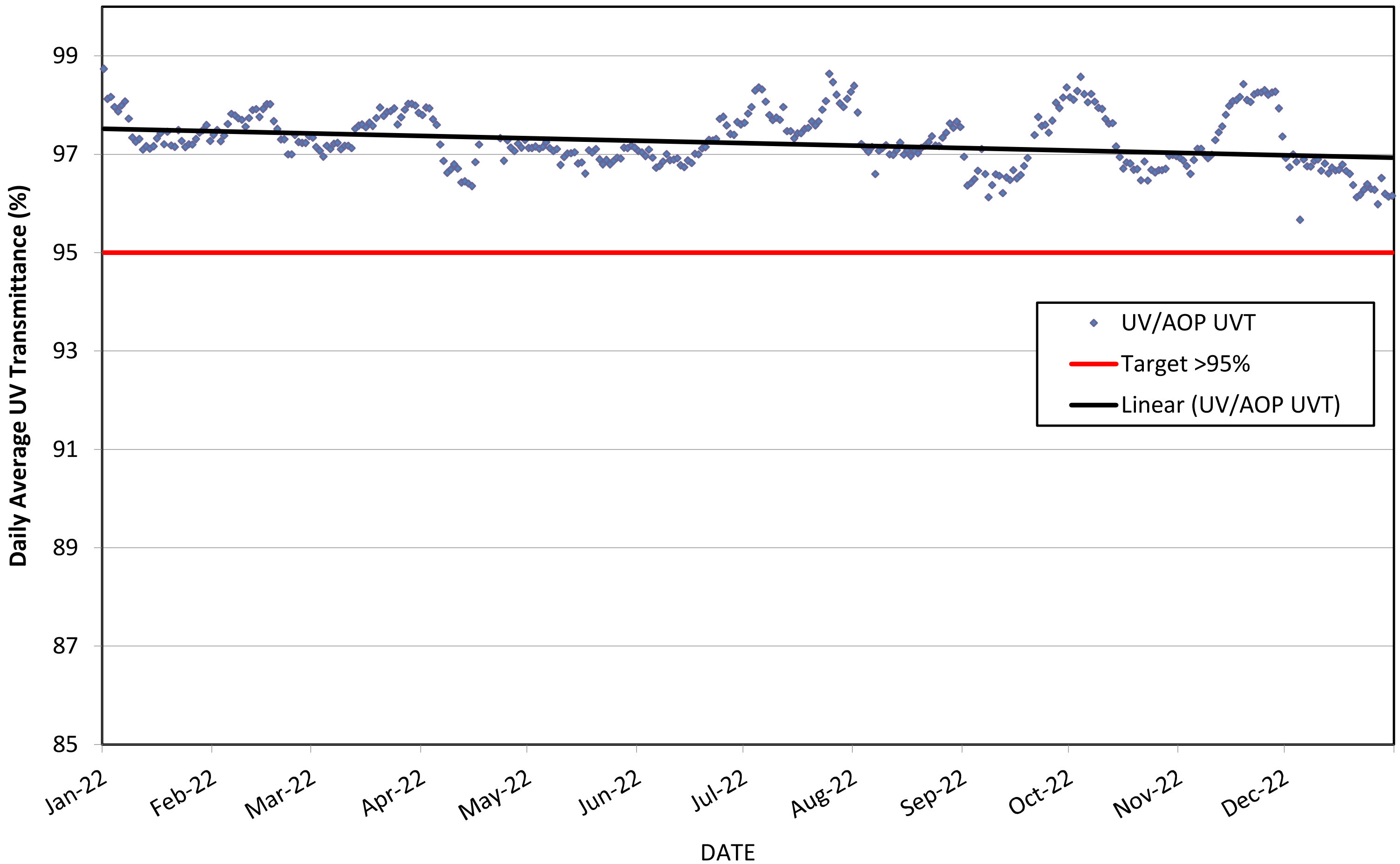
[1] Daily averages based on continuous monitoring of all units.
Electrical conductivity data for ROP are not normalized

Figure E-8
ROP Total Organic Carbon (TOC)[1]



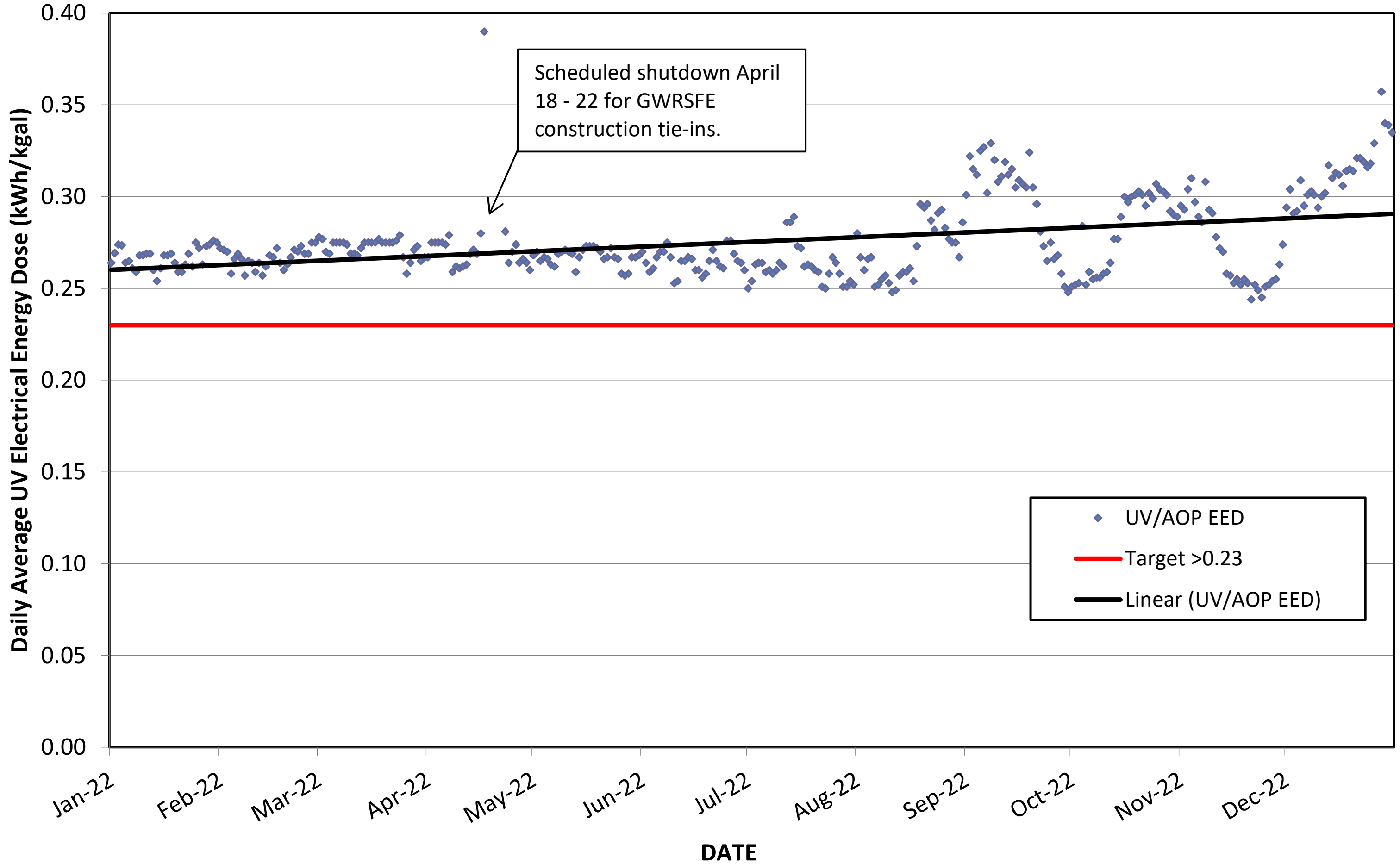
[1] Daily averages based on continuous monitoring of all units

Figure E-9
UV/AOP UV Transmittance [1]



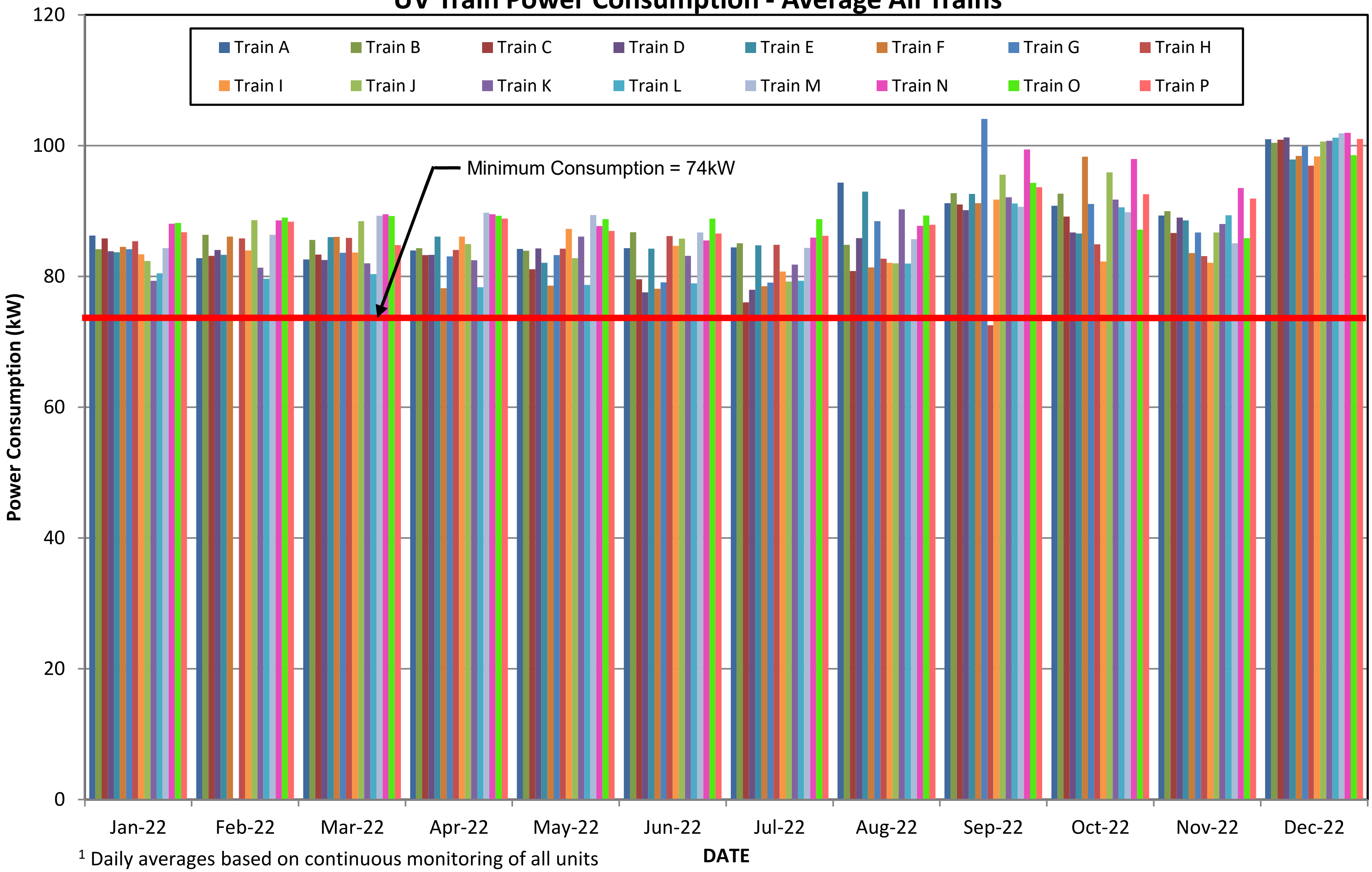
[1] UV Transmittance shown for UVF, which is effectively ROP downstream of hydrogen peroxide addition.
Daily averages based on continuous monitoring

Figure E-10
UV/AOP Electrical Energy Dose (EED)[1]



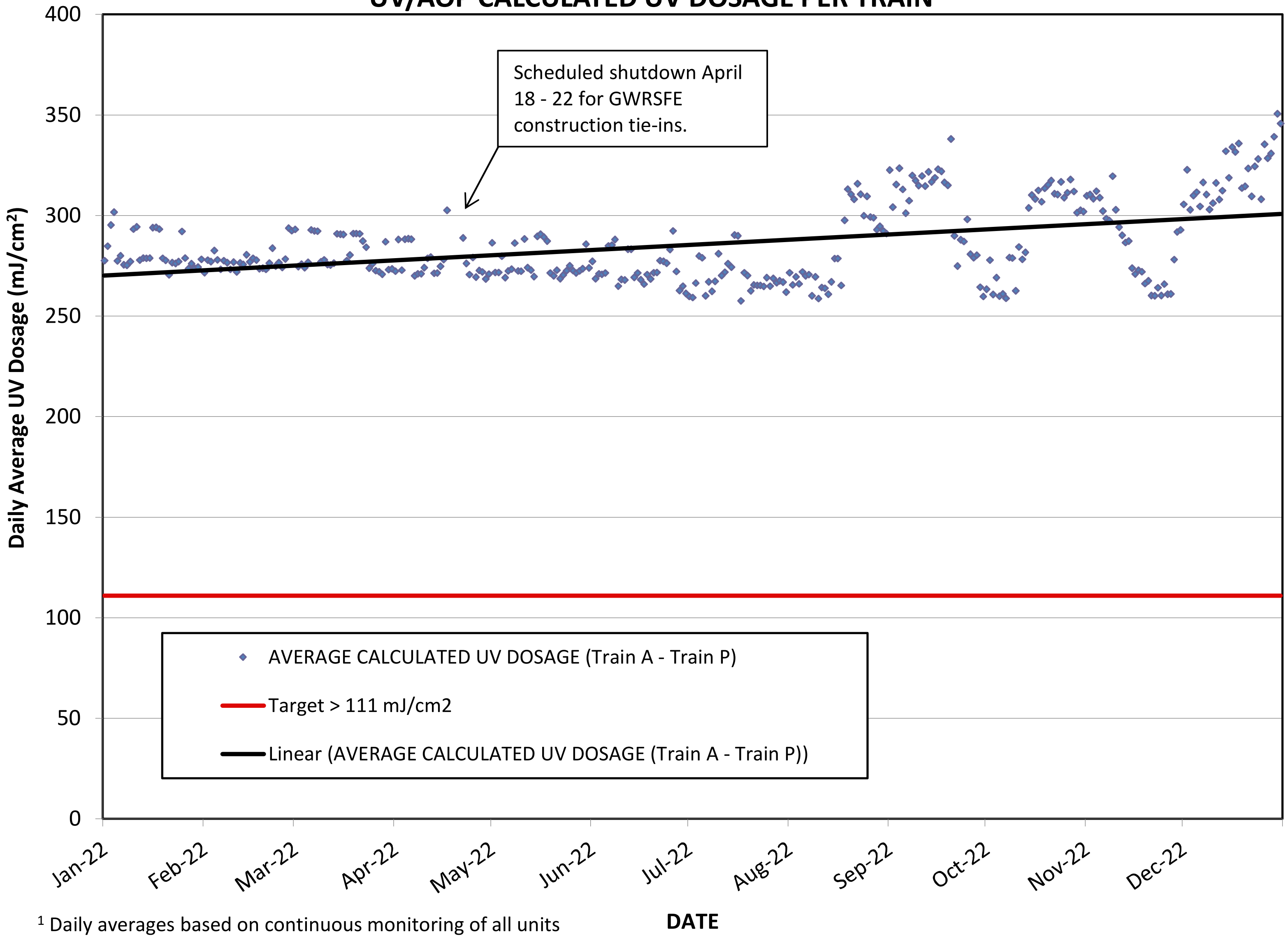
[1] Daily averages based on continuous monitoring of all units

Figure E-11
UV Train Power Consumption - Average All Trains

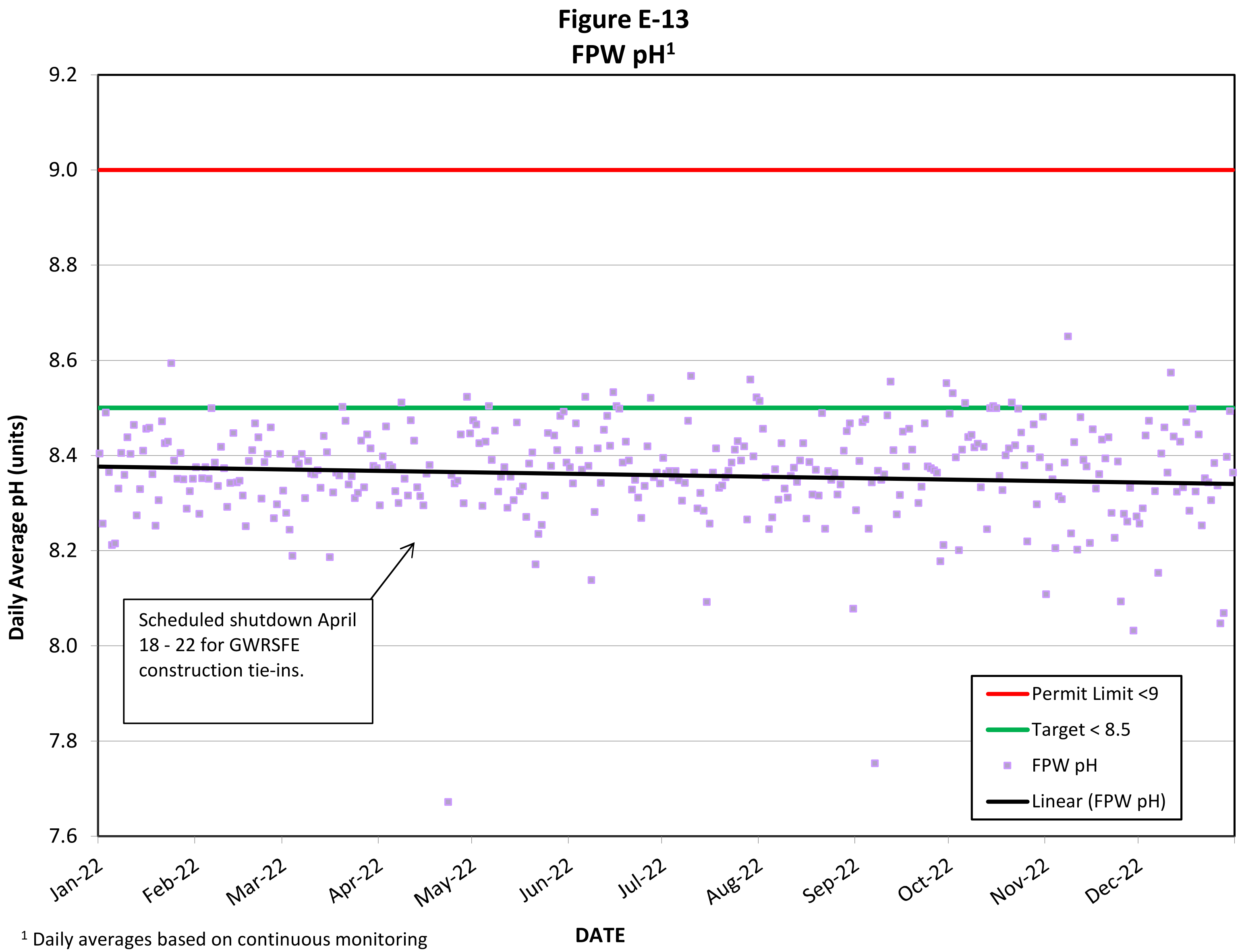


[1] Daily averages based on continuous monitoring of all units

Figure E-12
UV/AOP CALCULATED UV DOSAGE PER TRAIN[1]



[1] Daily averages based on continuous monitoring of all units



[1] Daily averages based on continuous monitoring

Appendix F

Operator Certifications, Operations and Maintenance Summary and Calibration Records

Orange County Water District Groundwater Replenishment System 2022 Annual Report

Orange County Water District
Groundwater Replenishment System
Advanced Water Purification Facility

Operations Certification Levels
(As of December 2022)

Listed according to level of Operator Certification, high-to-low

Operator	OCWD Job Title	WWTP Certification Level & No.		DWT Certification Level & No.		AWTO Certification Level & No.	
Derrick Mansell	Operations Manager	V	V-28340				
Steve Clark	Shift Supervisor	V	V-8430				
Russell Sutton	Shift Supervisor	V	V-5143				
Mario Manriquez	Lead Plant Operator	V	V-10397				
Jacob Bermudez	Lead Plant Operator	V	III-43637				
John Souza	Shift Supervisor	IV	IV-3998				
Anthony Carreira	Chief Plant Operator	IV	IV-27787				
Mike Ewing	Lead Plant Operator	III	III-10199				
Luis Torres	Lead Plant Operator	III	III-28285	T-2	27383		
Craig Liebzeit Jr.	Shift Supervisor	III	III-43546	T-2	34896		
Heinz Roehler	Sr. Plant Operator III	III	III-3534	T-3	9202		
Thomas Nicholson	Sr. Plant Operator III	III	III-9446				
Curtis Sanders	Sr. Plant Operator III	III	III-28461				
Chris Vu	Sr. Plant Operator III	III	III-10630				
Philip Jacobs	Plant Operator II	III	II-42110				
Christopher Owens	Plant Operator II			T-4	29560		
Charles Spade	Plant Operator II	II	II-7966				
Eric Gautier	Plant Operator II	II	II-10135				
Jonathan Mok	Plant Operator II	II	II-43357	T-2	41147		
Anthony Lockhart	Plant Operator II	II	II-44824	T-3	38600		
Stanley Vielma	Plant Operator II			T-3	27226		
Ron Eversole	Operations Intern			T-2	44791		
Andrele King	Operations Intern			T-1	44056		

Plant Shutdown Summary for Advanced Water Purification Facility
2022 Groundwater Replenishment System Annual Report

	Cause of AWPF Shutdown	Hours Offline per Month												Annual Total
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
1	Planned shutdown for GWRSFE construction work, PCS downloads & equipment tie-ins				144.75		10.50							155.25
2	Unplanned SCE power interruption								2.33			2.97		5.30
3	Unplanned shutdown due to equipment issues during SCE load reduction demand response									5.00				5.00
4	Planned shutdown for GWRSFE construction work & equipment/piping tie-ins									22.75				22.75
5	Unplanned shutdown due to PWPS shutdown caused by closed GWRS pipeline valve due to power failure											3.53		3.53
6	Planned shutdown (flow to waste) for GWRSFE commissioning												35.00	35.00
7	Planned shutdown (fow to waste) for UV validation testing												37.12	37.12
Total Hours Offline		**0.00**	**0.00**	**0.00**	**144.75**	**0.00**	**10.50**	**0.00**	**2.33**	**27.75**	**0.00**	**6.50**	**72.12**	**263.95**
Total Days Offline		**0.00**	**0.00**	**0.00**	**6.03**	**0.00**	**0.44**	**0.00**	**0.10**	**1.16**	**0.00**	**0.27**	**3.01**	**11.00**

Appendix F
Plant Shutdown Summary

F.1 January 2022

<u>January 1 - 31: Total Downtime 0.0 hours (0%)</u>

The AWPF / GWRS experienced no shutdowns or process interruptions during the month of January.

F.2 February 2022

<u>February 1 - 28: Total Downtime 0.0 hours (0%)</u>

The AWPF / GWRS experienced no shutdowns or process interruptions during the month of February.

F.3 March 2022

<u>March 1 - 31: Total Downtime 0.0 hours (0%)</u>

The AWPF / GWRS experienced no shutdowns or process interruptions during the month of March.

F.4 April 2022

<u>April 1 - 30: Total Downtime 144.75 hours (20.1%)</u>

The GWRS experienced one scheduled shutdown during April for GWRS Final Expansion construction work. The 144.75-hour long shutdown began April 17 at 0815 hours, and ended when the GWRS resumed FPW distribution on April 23 at 0900 hours. During the shutdown the GWRSFE contractors performed PCS (DeltaV) downloads and the following tie-ins of new equipment:

- OCSD P2 feedbox to screenings influent: sawcut new sidewall opening / install weir plate
- MF train F: 60” feedbox piping tie-in to main 96” MF Feed pipe
- MF train E: upsize 30” feedbox piping to 60” to match existing full train feed pipes
- MF train F: 54” Backwash Waste (BWW) piping tie-in to main 66” BWW to wet well
- MF train F: 60” MF Effluent (MFE) bulk piping tie-in to existing 60” MFE piping
- MF: tie-in MF train F test air piping
- MF: tie-in MF West new control air manifold piping
- MF: tie-in MF train F vacuum system piping
- RO: tie-in trains H & I 30” High Pressure Pump (HPP) feed piping to main 84” RO Feed pipe
- RO: tie-in trains H & I common 12” permeate dump RO Waste (ROW) piping to bulk 36” ROW pipe
- RO: -tie-in trains H & I common 4” Permeate Cleaning Return (PCR) piping to existing PCR piping
- RO: tie-in trains H & I Cleaning Feed (CF) / Cleaning Return (CR) piping to existing CIP system piping
- SBS: install isolation valve at tie-in location for future SBS-to-flush pump piping

During the shutdown staff used 2.24 MG of City of Fountain Valley potable water to keep the Talbert Seawater Barrier injection system pressurized until the GWRS plant resumed FPW injection on April 23.

F.5 May 2022

May 1 - 31: Total Downtime 0.0 hours (0%)

The AWPF / GWRS experienced no shutdowns or process interruptions during the month of May.

F.6 June 2022

June 1 - 30: Total Downtime 10.5 hours (1.5%)

The GWRS experienced one scheduled shutdown during June for GWRS Final Expansion construction work. The 10.5-hour long shutdown began June 8 at 0600 hours, and ended when the GWRS resumed FPW distribution on June 8 at 1630 hours. During the shutdown the GWRSFE contractors performed PCS (DeltaV) downloads and the following tie-ins of new equipment:

- MF West Blowers Configuration Device Net
- Backwash Supply Pumps vibration testing (A04, B04)
- RO Master Control Software Download for H & I
- MF air and vacuum system – configure device net
- MF inline heaters on trains E01 and E02 (new titanium)
- PWP A05 suction side 42-inch BFV actuator replacement (manual to electrical)
- Lime storage for BUSA and BUSB MCC Outage
- MF West common chemical waste sump tie-in (MF train F)
- RO west industrial water loop tie-in for RO trains H & I cooling water
- RO flush pump 1: SBS isolation valve installation.

During the shutdown staff used 0.48 MG of City of Fountain Valley potable water to keep the Talbert Seawater Barrier injection system pressurized until the GWRS plant resumed FPW injection.

F.7 July 2022

July 1 - 31: Total Downtime 0.0 hours (0%)

The AWPF / GWRS experienced no shutdowns or process interruptions during the month of July.

F.8 August 2022

August 1 - 31: Total Downtime 2.33 hours (0.3%)

The AWPF / GWRS experienced one unexpected SCE shutdown during August. SCE reported a squirrel as the cause for the power supply outage. The 2.33-hour long shutdown occurred August 1 from (0706 – 0926 hours), before the plant could be restarted and FPW distribution resumed.

F.9 September 2022

September 1 - 30: Total Downtime 27.75 hours (3.85%)

The GWRS experienced one scheduled shutdown and one unexpected shutdown during the month of September.

The first shutdown occurred September 6 at 1735 hours while reducing the GWRS plant production for a SCE load reduction demand response to 15 mgd. While operating at 20 mgd the remaining online RO transfer pump failed on vibration causing the plant to trip. After restarting the plant at 15 mgd still limited by the SCE load reduction demand response, UV train J failed creating a program logic capacity plant failure. The plant was restarted again at 25 mgd without the restriction of the SCE load reduction demand response, however the MF cells all began idling, becoming stuck calling for backwash resources. Attempts were made to reset the MF cells, but each cell would become stuck in the same resource call state. The plant was secured, and the on-call programmer was called in to correct the issue. The GWRS resumed FPW distribution on September 7 at 0320 hours. The total downtime GWRS experienced during the multiple plant failures was 5.0 hours.

During the shutdown staff used 0.36 MG of City of Fountain Valley potable water to keep the Talbert Seawater Barrier injection system pressurized until the GWRS plant resumed FPW injection.

The second shutdown was for GWRS Final Expansion construction work. The 22.75-hour long shutdown began September 19 at 2355 hours and ended when the GWRS resumed FPW distribution on September 20 at 2240 hours. During the shutdown the GWRSFE contractors performed the following work:

- RO trains H & I permeate tie-ins to main ROP bulk header
- MF CIP System: SHC injection valve control air tie-in
- MF west basement 3" IW tie-in for MF train F
- MF west new blower bypass valve B04-5265 control air tie-in
- MF west new vacuum 1" IW tie-in
- MF module downloads for (MF CIP and MW)
- RO trains F & G ERD control configuration change (indirect to direct)
- RO trains (A-E) flush sequence control download
- MF BWW VFD tie-in (west wet well for new A04 pump)
- RO flush pump A05 SBS programming (so A01 and A05 can share an SBS pump)
- PWPS device net configuration
- RO: tie-in trains H & I CR/CF piping to existing system piping
- SBS: install isolation valve at tie-in location for future SBS to flush pump piping

During the shutdown staff used 0.55 MG of City of Fountain Valley potable water to keep the Talbert Seawater Barrier injection system pressurized until the GWRS plant resumed FPW injection.

F.10 October 2022

<u>October 1 - 31: Total Downtime 0.0 hours (0%)</u>

The AWPF / GWRS experienced no shutdowns or process interruptions during the month of October.

F.11 November 2022

<u>November 1 - 30: Total Downtime 6.5 hours (0.90%)</u>

The GWRS experienced two unexpected shutdowns during the month of November.

The first shutdown occurred November 8 at 1255 due to a power failure that affected the product water pump recharge basin pipeline valve vault # 1. The valve failed closed causing the product water pumps to fail on high discharge pressure and “pipeline valves not open” permissive. I&E staff were able to correct the power failure and communication issue and re-open the valve. The GWRS resumed FPW distribution on November 8 at 1627 hours. The total downtime GWRS experienced during shutdown was 3.53 hours.

During the shutdown staff used 0.06 MG of OC-44 potable water and 0.07 MG of City of Fountain Valley potable water to keep the Talbert Seawater Barrier injection system pressurized until the GWRS plant resumed FPW injection.

The second shutdown occurred November 19 at 1058 hours due to an SCE power blip that affected multiple process systems simultaneously. The GWRS resumed FPW distribution on November 19 at 1356 hours. The total downtime GWRS experienced during the shutdown was 2.97 hours.

During the shutdown staff used 0.14 MG of OC-44 potable water and 0.09 MG of City of Fountain Valley potable water to keep the Talbert Seawater Barrier injection system pressurized until the GWRS plant resumed FPW injection.

F.12 December 2022

<u>December 1 - 31: Total Downtime 72.12 hours (9.69%)</u>

The GWRS experienced two scheduled shutdowns during the month of December.

The first shutdown occurred December 5 at 0553 hours. The plant was secured to allow transition to flow to waste operation where product water is diverted to OCSD Plant No. 2 to their ocean outfall. The shutdown was scheduled to conduct OCSD Plant No. 2 trickling filter solids contact source water commissioning testing and verify the new area 144 SEFE pump station equipment operation. The GWRS resumed FPW distribution on December 6 at 1656 hours. The total downtime GWRS experienced during shutdown was 35.0 hours.

During the shutdown staff used 1.74 MG of City of Fountain Valley potable water to keep the Talbert Seawater Barrier injection system pressurized until the GWRS plant resumed FPW injection.

The GWRS operated in flow to waste mode for a total of 23.8 hours and wasted a total 50.13 MG of finished product water.

The second shutdown occurred December 27 at 0205 hours. The plant was secured to allow transition to flow to waste operation where product water is diverted to OCSD Plant No. 2 to their ocean outfall. The shutdown was scheduled to conduct UV validation testing as part of a state requirement to confirm system effectiveness with the inclusion of the new trickling filter solids contact source water from OCSD Plant No. 2. GWRS resumed FPW distribution on December 28 at 1513 hours. The total downtime GWRS experienced during shutdown was 37.12 hours.

During the shutdown staff used 1.54 MG of City of Fountain Valley potable water to keep the Talbert Seawater Barrier injection system pressurized until the GWRS plant resumed FPW injection.

The GWRS operated in flow to waste mode for a total of 33.55 hours and wasted a total of 68.31 MG of finished product water.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit A01

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/11/22	10.0	11.40	5.20	(See Note 2)
	1/23/22	10.0	11.70	5.47	(See Note 2)
February	2/5/22	10.0	12.49	5.83	5.11
	2/18/22	10.0	11.90	5.27	(See Note 2)
March	3/2/22	10.0	11.60	5.78	(See Note 2)
	3/15/22	10.0	12.20	5.53	4.53
	3/27/22	10.0	12.00	5.07	(See Note 2)
April	4/9/22	10.0	12.30	5.21	(See Note 2)
	4/27/22	10.0	13.40	5.41	4.78
May	5/10/22	10.0	11.80	4.51	(See Note 2)
	5/23/22	10.0	12.60	4.00	(See Note 2)
June	6/4/22	9.7	12.10	5.42	4.48
	6/17/22	10.0	11.40	4.87	(See Note 2)
	6/30/22	10.0	10.50	4.73	(See Note 2)
July	7/12/22	10.0	11.10	5.89	4.99
	7/26/22	10.0	8.30	4.25	(See Note 2)
August	8/7/22	10.0	8.25	4.62	4.10
	8/21/22	10.0	7.90	4.01	(See Note 2)
September	9/3/22	10.0	10.30	4.04	(See Note 2)
	9/16/22	10.0	9.80	5.10	4.33
	9/29/22	10.0	7.30	0.00	(See Note 2)
October	10/12/22	10.0	8.60	3.22	(See Note 2)
	10/25/22	10.0	8.83	3.96	3.99
November	11/7/22	10.0	6.68	2.98	(See Note 2)
	11/20/22	10.0	5.20	3.05	(See Note 2)
December	12/2/22	10.0	6.20	2.93	2.81

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit A02

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/10/22	10.0	13.00	4.67	(See Note 2)
	1/23/22	10.0	12.70	4.07	(See Note 2)
February	2/4/22	10.0	12.20	4.55	4.26
	2/16/22	10.0	12.50	5.11	(See Note 2)
	2/28/22	10.0	11.90	4.30	(See Note 2)
March	3/13/22	10.2	12.70	4.65	3.99
	3/25/22	10.0	12.40	4.17	(See Note 2)
April	4/7/22	10.0	12.80	3.98	(See Note 2)
	4/26/22	10.2	13.20	4.50	3.76
May	5/8/22	10.0	12.20	4.08	(See Note 2)
	5/20/22	10.0	12.60	4.88	(See Note 2)
June	6/1/22	10.0	12.60	4.59	3.81
	6/14/22	10.0	9.70	3.99	(See Note 2)
	6/27/22	10.0	8.30	4.76	(See Note 2)
July	7/9/22	10.1	12.50	10.42	6.47
	7/23/22	10.0	8.60	3.27	(See Note 2)
August	8/4/22	10.1	9.40	3.67	(See Note 2)
	8/17/22	9.9	12.65	4.34	3.45
	8/29/22	10.0	7.50	3.04	(See Note 2)
September	9/11/22	10.1	7.75	2.91	(See Note 2)
	9/25/22	10.0	9.57	3.18	2.79
October	10/7/22	10.0	5.50	2.50	(See Note 2)
	10/20/22	10.0	8.02	3.16	(See Note 2)
November	11/1/22	10.2	7.45	2.75	2.44
	11/14/22	10.0	5.24	2.12	(See Note 2)
	11/26/22	10.0	5.05	3.30	1.45
December	12/7/22	(See Note 3)			

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

3 Unit wetting. No CIP performed.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit A03

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/9/22	10.0	12.10	3.83	(See Note 2)
	1/21/22	10.0	12.20	6.16	(See Note 2)
February	2/2/22	10.0	12.40	6.12	4.25
	2/15/22	10.0	11.80	6.16	(See Note 2)
March	2/28/22	10.0	12.40	4.68	(See Note 2)
	3/14/22	10.1	13.30	4.61	8.56
April	3/17/22	2.1	11.10	3.95	(See Note 2)
	3/29/22	9.5	12.00	4.63	(See Note 2)
May	4/10/22	10.0	12.50	4.37	4.01
June	4/30/22	10.0	12.60	5.88	(See Note 2)
	5/14/22	9.9	12.60	5.16	(See Note 2)
July	5/27/22	10.0	12.30	4.51	3.88
	6/9/22	10.0	11.70	4.66	(See Note 2)
August	6/21/22	10.0	12.34	4.01	(See Note 2)
September	7/4/22	9.8	10.90	4.20	3.29
October	7/18/22	10.2	9.00	2.76	(See Note 2)
	7/30/22	10.0	10.00	3.85	(See Note 2)
	8/12/22	10.0	8.54	3.93	3.13
	8/27/22	10.0	8.70	3.14	(See Note 2)
	9/9/22	10.0	9.20	3.36	(See Note 2)
	9/21/22	8.5	12.90	3.39	2.60
	10/5/22	10.0	6.12	2.92	(See Note 2)
	10/17/22	10.0	9.00	3.87	(See Note 2)
November	10/29/22	8.9	7.00	2.98	1.80
	11/12/22	10.0	3.05	3.55	(See Note 2)
December	11/18/22	(See Note 3)			
	12/17/22	21.0	4.10	2.10	2.44

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.
2 CIP using caustic only.
3 Unit wetting. No CIP performed.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit A04

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/15/22	10.0	11.40	4.89	(See Note 2)
	1/26/22	8.3	12.10	6.37	(See Note 2)
February	2/7/22	10.0	12.90	5.42	7.28
	2/17/22	8.3	13.60	5.87	(See Note 2)
March	3/1/22	9.9	14.20	7.32	(See Note 2)
	3/12/22	8.6	12.99	4.56	5.29
	3/25/22	9.9	12.30	5.66	(See Note 2)
April	4/6/22	9.8	13.30	4.99	(See Note 2)
	4/25/22	10.2	12.20	5.87	4.48
May	5/9/22	10.0	9.90	3.98	(See Note 2)
	5/19/22	8.9	10.60	4.02	(See Note 2)
June	6/3/22	8.0	10.60	4.68	4.36
	6/8/22	10.0	10.60	4.09	(See Note 2)
	6/16/22	10.0	11.40	5.22	(See Note 2)
	6/28/22	9.6	10.40	4.72	3.56
July	7/10/22	10.0	9.00	6.29	(See Note 2)
	7/18/22	5.4	9.37	5.26	(See Note 2)
	7/25/22	6.4	8.07	4.63	3.80
August	8/8/22	10.0	8.37	4.41	(See Note 2)
	8/29/22	10.0	7.60	3.93	(See Note 2)
September	9/11/22	10.0	12.00	4.56	3.83
	9/25/22	10.0	9.10	4.11	(See Note 2)
October	10/7/22	10.0	9.14	3.67	(See Note 2)
	10/19/22	9.5	8.26	4.61	3.70
November	11/2/22	(See Note 3)			
	11/30/22	21.0	2.45	1.65	1.48
December	12/26/22	21.0	3.69	2.16	2.10

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.
2 CIP using caustic only.
3 Unit wetting. No CIP performed.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit A05

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/17/22	10.0	9.30	4.91	(See Note 2)
	1/29/22	10.0	11.50	5.17	(See Note 2)
February	2/11/22	10.2	12.30	5.33	4.67
	2/23/22	10.0	11.40	4.73	(See Note 2)
March	3/7/22	10.0	12.90	5.90	(See Note 2)
	3/20/22	10.1	10.20	4.98	(See Note 2)
	3/30/22	7.8	9.17	6.05	5.19
April	4/11/22	10.0	10.80	5.49	(See Note 2)
	4/30/22	10.0	12.30	4.54	(See Note 2)
May	5/15/22	10.0	12.60	4.59	4.88
	5/28/22	10.0	10.90	4.71	(See Note 2)
June	6/10/22	10.0	12.30	4.84	(See Note 2)
	6/22/22	9.7	10.60	5.37	(See Note 2)
July	7/3/22	8.5	9.50	5.17	3.88
	7/15/22	10.0	7.50	3.97	(See Note 2)
	7/28/22	10.0	11.20	5.25	(See Note 2)
August	8/9/22	9.2	7.94	5.06	3.36
	8/21/22	10.0	7.46	4.54	(See Note 2)
September	9/3/22	10.0	10.10	4.72	(See Note 2)
	9/16/22	10.0	8.60	5.70	4.28
	9/30/22	10.0	6.04	3.58	(See Note 2)
October	10/12/22	10.1	7.80	3.88	(See Note 2)
	10/25/22	10.0	11.20	4.20	3.45
November	11/5/22	10.0	7.00	3.21	(See Note 2)
	11/18/22	10.0	5.70	2.86	(See Note 2)
December	12/1/22	10.0	4.95	2.31	2.27
	12/14/22	10.0	4.68	3.63	(See Note 2)
	12/26/22	10.0	8.28	4.45	(See Note 2)

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit A06

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/5/22	11.7	10.00	6.41	(See Note 2)
	1/17/22	10.0	10.33	6.02	(See Note 2)
	1/30/22	10.0	11.10	3.81	5.12
February	2/11/22	10.0	13.20	4.90	4.62
	2/24/22	10.0	11.40	5.27	(See Note 2)
March	3/8/22	10.0	9.80	5.43	4.64
	3/21/22	10.0	9.40	3.30	(See Note 2)
April	4/2/22	10.0	10.20	6.32	(See Note 2)
	4/14/22	9.1	10.00	4.43	4.22
May	5/2/22	10.0	12.50	4.80	(See Note 2)
	5/14/22	10.0	11.20	4.49	(See Note 2)
	5/26/22	8.7	8.50	4.32	4.13
June	6/7/22	10.0	10.00	5.12	(See Note 2)
	6/20/22	10.0	7.80	5.16	(See Note 2)
July	7/3/22	10.0	9.90	4.40	3.89
	7/17/22	10.4	7.90	4.04	(See Note 2)
	7/28/22	10.0	6.90	4.38	(See Note 2)
August	8/11/22	9.9	6.47	4.30	4.03
	8/23/22	10.0	7.90	3.78	(See Note 2)
September	9/5/22	10.0	7.20	3.10	(See Note 2)
	9/18/22	9.8	6.60	4.21	3.58
October	10/1/22	10.0	5.50	3.19	(See Note 2)
	10/12/22	8.6	5.45	4.02	(See Note 2)
	10/24/22	9.7	5.82	3.86	3.73
November	11/5/22	9.6	6.30	3.11	(See Note 2)
	11/15/22	8.0	3.20	2.20	(See Note 2)
	11/28/22	10.2	6.88	2.36	2.12
December	12/11/22	10.0	5.44	1.85	(See Note 2)
	12/20/22	7.1	5.90	4.70	(See Note 2)
	12/28/22	6.1	4.19	2.49	2.10

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit A07

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/6/22	10.4	10.60	5.25	(See Note 2)
	1/18/22	10.1	10.70	6.09	(See Note 2)
	1/31/22	10.2	11.40	5.04	4.63
February	2/12/22	10.1	12.40	5.32	(See Note 2)
	2/24/22	10.0	11.90	4.85	(See Note 2)
March	3/9/22	10.1	12.10	6.07	5.36
	3/22/22	10.0	12.30	4.82	(See Note 2)
April	4/3/22	10.2	12.40	5.51	(See Note 2)
	4/16/22	10.0	12.50	5.05	4.61
May	5/4/22	10.0	10.80	4.95	(See Note 2)
	5/17/22	10.0	11.70	5.50	(See Note 2)
	5/30/22	10.0	11.60	4.96	4.35
June	6/11/22	10.1	9.20	4.91	(See Note 2)
	6/25/22	10.0	8.06	3.74	(See Note 2)
July	7/8/22	10.0	11.60	6.29	4.73
	7/21/22	10.0	8.10	3.96	(See Note 2)
August	8/2/22	10.0	6.42	4.73	(See Note 2)
	8/15/22	10.0	9.83	4.72	4.46
	8/27/22	10.0	7.60	4.50	(See Note 2)
September	9/9/22	10.0	7.01	4.60	(See Note 2)
	9/25/22	10.0	8.66	4.41	4.27
October	10/8/22	10.0	6.60	3.78	(See Note 2)
	10/20/22	10.0	7.44	3.81	(See Note 2)
November	11/1/22	10.2	8.25	4.32	3.95
	11/14/22	10.1	6.18	3.34	(See Note 2)
	11/28/22	10.5	3.42	2.49	(See Note 2)
December	12/11/22	10.1	3.53	2.86	3.81
	12/24/22	10.0	7.83	2.04	(See Note 2)

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit A08

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/6/22	13.3	9.50	5.34	(See Note 1)
	1/15/22	7.0	11.50	5.24	4.50
	1/24/22	MW (See Note 2)			
February	2/2/22	MW (See Note 2)			
	2/10/22	21.0	10.20	5.57	5.20
	2/18/22	MW (See Note 2)			
March	3/1/22	MW (See Note 2)			
	3/9/22	21.1	9.20	5.24	5.21
	3/19/22	MW (See Note 2)			
	3/27/22	MW (See Note 2)			
April	4/5/22	20.5	13.20	4.80	4.60
	4/14/22	MW (See Note 2)			
	4/28/22	MW (See Note 2)			
May	5/6/22	19.9	7.91	4.75	4.64
	5/15/22	MW (See Note 2)			
	5/24/22	MW (See Note 2)			
	5/31/22	19.4	7.30	5.27	5.31
June	6/9/22	MW (See Note 2)			
	6/18/22	MW (See Note 2)			
	6/27/22	21.0	8.36	4.92	4.30
July	7/10/22	10.1	7.60	6.42	(See Note 1)
	7/18/22	5.4	7.70	4.18	(See Note 1)
	7/25/22	6.2	7.30	4.02	4.24
August	8/8/22	10.0	7.80	4.48	(See Note 1)
	8/21/22	9.9	6.27	4.09	(See Note 1)
	8/31/22	7.6	6.60	4.11	3.94
September	9/13/22	10.0	7.58	3.42	(See Note 1)
	9/25/22	8.2	5.24	4.06	(See Note 1)
October	10/4/22	7.0	4.23	3.10	3.09
	10/16/22	9.2	5.10	3.92	(See Note 1)
	10/26/22	7.6	5.13	4.50	(See Note 1)
November	11/2/22	5.6	7.90	3.77	3.79
	11/15/22	9.9	5.94	2.20	(See Note 1)
	11/28/22	10.5	7.02	2.45	(See Note 1)
December	12/7/22	6.5	5.05	3.16	2.74
	12/18/22	8.6	5.62	3.05	3.22
	12/23/23	3.8	6.30	3.22	(See Note 1)
	12/29/22	4.5	6.30	4.46	See Note 1)

1 CIP using caustic only.

2 Maintenance Wash using dilute caustic and no citric.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit B01

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/16/22	21.1	8.00	3.27	2.88
February	2/11/22	21.0	9.40	3.58	3.16
March	3/9/22	21.1	10.70	3.60	2.72
April	4/4/22	21.0	9.80	4.23	2.92
May	5/6/22	21.0	8.30	3.46	2.62
	5/31/22	21.0	9.60	4.20	3.11
June	6/27/22	21.0	6.10	2.59	2.01
July	7/23/22	21.0	6.20	3.17	2.25
August	8/19/22	21.0	7.37	3.48	2.70
September	9/14/22	21.0	5.60	3.20	2.69
October	10/11/22	21.1	7.10	2.89	2.39
November	11/5/22	21.1	7.30	2.68	2.29
December	12/1/22	21.0	8.10	2.32	1.29
	12/30/22	21.0	3.96	3.11	2.60

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit B02

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/1/22	21.0	9.00	3.39	2.93
	1/27/22	21.0	8.70	3.73	2.98
February	2/22/22	21.0	10.30	3.90	3.24
March	3/20/22	21.1	9.00	3.16	2.68
April	4/16/22	21.1	8.40	2.97	2.47
May	5/17/22	21.0	6.90	2.53	1.77
June	6/13/22	21.0	6.10	2.36	1.62
July	7/8/22	21.0	6.60	2.76	1.41
August	8/5/22	21.1	5.65	3.33	2.56
	8/31/22	21.2	6.30	2.80	2.12
September	9/27/22	21.1	3.69	2.08	1.40
October	10/23/22	21.0	4.80	1.04	0.70
November	11/17/22	21.1	0.74	0.57	0.21
December	12/15/22	21.0	4.40	1.98	1.51

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit B03

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/10/22	21.0	6.77	3.76	3.54
February	2/5/22	21.0	9.30	3.83	3.32
March	3/2/22	21.0	10.80	4.15	3.58
	3/28/22	21.0	10.94	4.87	3.73
April	4/28/22	21.0	8.60	3.87	3.87
May	5/24/22	21.0	10.24	4.76	3.59
June	6/20/22	21.0	8.50	3.34	2.67
July	7/16/22	21.0	5.40	3.76	3.11
August	8/12/22	21.0	7.00	3.91	2.87
September	9/8/22	21.0	5.70	2.98	2.61
October	10/5/22	21.1	5.70	3.19	2.98
	10/31/22	21.0	6.49	3.22	2.76
November	11/25/22	21.0	2.74	2.09	1.76
December	12/23/22	21.2	6.80	2.82	3.47

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit B04

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/4/22	21.0	7.86	3.91	(See Note 1)
	1/30/22	21.0	12.10	4.56	3.43
February	2/24/22	21.0	11.90	4.14	3.92
March	3/22/22	21.0	10.20	4.30	3.70
April	4/23/22	21.0	7.70	3.46	3.08
May	5/19/22	21.0	8.20	3.83	2.86
June	6/14/22	21.0	7.60	3.92	3.32
July	7/10/22	21.0	7.90	3.81	3.15
August	8/5/22	21.0	6.42	3.21	2.48
	8/31/22	21.2	7.40	3.67	2.65
September	9/27/22	21.0	5.00	3.22	2.70
October	10/22/22	21.0	6.70	3.26	3.01
November	11/17/22	21.0	4.58	3.32	1.81
December	12/14/22	21.1	5.25	3.11	3.06

1 Caustic/memclean-only CIP due to vendor-related low citric acid inventory.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit B05

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/6/22	11.4	12.50	5.17	(See Note 2)
	1/18/22	10.0	12.30	5.96	(See Note 2)
	1/31/22	10.1	11.70	5.53	5.99
February	2/13/22	10.0	12.20	5.11	(See Note 2)
	2/25/22	10.0	12.70	5.75	(See Note 2)
March	3/10/22	10.0	13.00	5.41	4.30
	3/14/22	(See Note 3)			
April	4/13/22	21.0	6.20	2.96	2.76
May	5/14/22	21.2	6.30	3.16	2.95
June	6/9/22	21.0	6.80	3.37	2.62
July	7/5/22	21.0	6.94	3.37	2.58
	7/31/22	21.0	6.57	3.16	2.55
August	8/26/22	21.0	5.50	2.89	2.26
September	9/23/22	21.1	4.27	2.88	2.45
October	10/18/22	21.0	5.77	2.64	2.17
November	11/13/22	21.0	2.36	1.25	1.36
December	12/10/22	21.0	4.00	1.11	1.40

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

3 Unit taken offline for filter replacements.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit B06

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/5/22	12.3	11.20	4.97	(See Note 2)
	1/18/22	10.0	10.40	5.24	(See Note 2)
	1/30/22	10.3	11.30	6.50	6.88
February	2/12/22	10.0	11.50	5.04	(See Note 2)
	2/24/22	9.8	11.70	5.25	(See Note 2)
	2/28/22	(See Note 3)			
April	4/1/22	21.0	6.52	2.82	2.26
May	5/3/22	21.0	6.80	2.84	2.30
	5/28/22	21.1	7.50	2.93	2.43
June	6/24/22	21.0	5.36	2.86	2.20
July	7/20/22	21.0	4.98	2.91	2.40
August	8/15/22	21.0	5.22	2.86	2.35
September	9/10/22	21.0	5.40	3.06	2.57
October	10/7/22	21.0	4.67	2.89	2.48
November	11/1/22	21.0	5.89	2.48	1.91
	11/27/22	21.2	2.40	1.34	1.29
December	12/25/22	21.2	4.70	2.83	2.66

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

3 Unit taken offline for filter replacements.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit B07

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/5/22	14.4	12.70	6.39	(See Note 2)
	1/19/22	10.0	12.20	5.86	(See Note 2)
February	2/2/22	10.0	12.20	5.98	4.83
	2/14/22	(See Note 3)			
March	3/20/22	21.1	6.50	3.24	2.92
April	4/25/22	21.1	7.60	3.54	2.71
May	5/25/22	21.0	7.90	3.75	2.95
June	6/25/22	21.0	6.10	3.37	2.77
July	7/25/22	21.0	5.72	3.65	2.83
August	8/25/22	21.1	6.60	3.45	2.57
September	9/26/22	21.0	4.80	2.47	2.38
October	10/27/22	21.0	5.80	3.23	2.53
November	11/27/22	21.0	2.65	1.55	1.29
December	12/30/22	21.0	6.00	3.64	2.67

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

3 Unit taken offline for filter replacements.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit B08

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/12/22	21.2	6.60	3.12	2.63
February	2/7/22	21.0	8.20	3.86	3.14
March	3/4/22	21.0	8.30	3.20	2.76
	3/31/22	21.1	9.30	7.58	3.42
May	5/1/22	21.0	9.00	3.61	3.09
	5/27/22	21.0	9.10	3.80	3.11
June	6/22/22	21.0	6.10	3.27	2.77
July	7/19/22	21.0	5.83	3.31	1.90
August	8/14/22	21.0	6.50	3.21	2.71
September	9/10/22	21.0	5.90	3.11	2.55
October	10/7/22	21.2	5.01	3.02	2.43
November	11/1/22	21.1	5.87	3.06	2.78
	11/27/22	21.3	4.72	1.96	2.95
December	12/24/22	20.9	6.30	3.11	3.02

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit C01

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/6/22	10.7	9.30	3.75	(See Note 2)
	1/19/22	10.1	8.30	3.59	(See Note 2)
February	2/1/22	10.5	11.40	4.37	4.06
	2/14/22	10.0	10.80	4.20	(See Note 2)
	2/26/22	10.1	10.50	4.27	(See Note 2)
March	3/11/22	10.2	12.90	5.20	4.62
	3/24/22	10.0	9.80	4.78	(See Note 2)
April	4/6/22	10.0	11.30	4.76	(See Note 2)
	4/24/22	10.2	11.50	9.28	3.74
May	5/7/22	10.0	9.30	2.48	(See Note 2)
	5/20/22	10.0	8.78	3.88	(See Note 2)
June	6/2/22	10.0	12.30	4.44	3.47
	6/15/22	10.0	7.40	3.48	(See Note 2)
July	7/12/22	21.0	11.50	3.55	3.37
August	8/8/22	21.0	9.40	4.28	2.66
September	9/4/22	21.0	7.40	3.14	2.26
October	10/2/22	21.0	6.54	2.75	1.96
	10/28/22	21.0	11.30	2.58	1.96
November	11/24/22	21.0	1.83	1.00	1.00
December	12/22/22	21.1	7.80	3.24	2.14

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit C02

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/15/22	10.0	8.30	3.46	(See Note 2)
	1/28/22	10.0	9.79	4.50	(See Note 2)
February	2/10/22	10.1	11.10	4.52	3.38
	2/23/22	10.0	12.60	4.19	(See Note 2)
March	3/7/22	10.0	9.90	4.78	(See Note 2)
	3/20/22	10.0	8.81	4.00	(See Note 2)
April	4/1/22	10.1	12.50	4.57	3.92
	4/14/22	10.0	9.60	3.72	(See Note 2)
May	5/3/22	10.0	11.00	4.01	(See Note 2)
	5/16/22	10.0	12.50	4.24	3.15
	5/28/22	10.0	8.30	3.95	(See Note 2)
June	6/11/22	10.0	8.50	3.71	(See Note 2)
July	7/5/22	18.9	13.30	5.36	3.11
	7/31/22	21.0	12.17	4.52	3.15
August	8/27/22	21.0	10.60	4.08	2.58
September	9/24/22	21.0	10.10	2.65	2.48
October	10/20/22	21.0	10.60	3.00	2.31
November	11/15/22	21.1	6.22	2.38	1.60
December	12/13/22	21.0	4.15	2.23	1.88

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit C03

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/5/22	19.5	11.40	4.74	(See Note 2)
	1/18/22	10.2	12.40	5.30	(See Note 2)
	1/31/22	10.3	12.20	5.68	3.89
February	2/13/22	10.0	9.70	3.83	(See Note 2)
	2/26/22	10.0	10.20	4.31	(See Note 2)
March	3/10/22	10.0	11.40	4.29	3.54
	3/23/22	10.0	9.00	4.03	(See Note 2)
April	4/5/22	10.0	10.20	3.87	(See Note 2)
	4/25/22	10.6	9.70	4.62	3.81
May	5/8/22	10.1	8.00	2.14	(See Note 2)
	5/21/22	10.1	9.12	3.48	(See Note 2)
June	6/2/22	10.0	12.10	4.40	3.57
	6/16/22	10.0	7.10	3.60	(See Note 2)
July	7/13/22	21.1	11.80	5.23	1.30
August	8/8/22	21.1	11.02	4.46	2.99
September	9/4/22	21.3	8.29	2.84	1.60
October	10/30/22	21.1	2.66	2.27	1.97
November	11/25/22	21.0	5.78	1.32	1.02
December	12/22/22	21.0	8.50	3.02	2.46

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit C04

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/15/22	10.0	8.90	3.57	(See Note 2)
	1/27/22	10.0	10.20	4.36	(See Note 2)
February	2/9/22	10.0	10.70	4.54	4.18
	2/21/22	10.0	13.00	5.37	(See Note 2)
March	3/6/22	10.0	11.70	4.48	(See Note 2)
	3/18/22	10.0	11.20	4.82	(See Note 2)
	3/31/22	10.0	11.80	4.72	3.98
April	4/12/22	10.0	9.20	3.87	(See Note 2)
May	5/1/22	10.0	11.10	3.86	(See Note 2)
	5/14/22	10.0	10.80	4.26	3.51
	5/26/22	10.0	8.40	3.12	(See Note 2)
June	6/7/22	10.0	8.26	4.09	(See Note 2)
	6/20/22	10.0	8.70	4.01	(See Note 2)
July	7/18/22	21.0	12.70	4.55	2.82
August	8/13/22	21.0	11.40	4.53	3.23
September	9/8/22	21.0	8.88	3.96	2.67
October	10/5/22	21.0	8.54	3.59	2.74
	10/31/22	21.0	12.21	4.74	3.41
November	11/26/22	21.0	2.80	3.66	1.57
December	12/24/22	21.0	10.60	3.52	3.14

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit C05

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/6/22	14.6	7.30	3.31	(See Note 2)
	1/19/22	10.2	7.10	3.30	(See Note 2)
February	2/1/22	10.3	8.20	3.14	2.88
	2/14/22	10.0	7.00	3.09	(See Note 2)
	2/26/22	10.0	8.10	3.26	(See Note 2)
March	3/11/22	10.0	8.70	3.31	3.03
	3/24/22	10.0	6.20	2.98	(See Note 2)
April	4/5/22	10.0	7.30	3.21	(See Note 2)
	4/24/22	10.0	8.20	3.36	2.87
May	5/7/22	10.0	6.60	3.43	(See Note 2)
	5/20/22	10.0	6.60	3.42	(See Note 2)
June	6/1/22	10.0	9.50	3.83	3.15
	6/15/22	10.0	6.00	2.76	(See Note 2)
July	7/11/22	21.1	12.40	4.95	3.21
August	8/7/22	21.1	8.86	4.34	2.94
September	9/3/22	21.1	9.24	3.39	2.35
October	10/1/22	21.0	6.96	3.42	2.52
	10/28/22	21.1	11.44	4.24	3.02
November	11/23/22	21.0	6.20	1.98	1.61
December	12/21/22	21.1	5.67	3.10	2.53

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit C06

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/9/22	10.0	6.80	3.53	(See Note 2)
	1/21/22	10.0	7.70	3.61	(See Note 2)
February	2/3/22	10.0	9.10	3.74	3.63
	2/15/22	10.0	9.10	4.49	(See Note 2)
	2/28/22	10.0	7.90	3.51	(See Note 2)
March	3/12/22	10.0	9.90	3.74	3.65
	3/25/222	10.0	7.00	3.60	(See Note 2)
April	4/6/22	10.0	7.84	3.39	(See Note 2)
	4/25/22	10.6	8.20	3.89	3.32
May	5/8/22	10.1	7.20	3.60	(See Note 2)
	5/21/22	10.0	8.14	3.49	(See Note 2)
June	6/2/22	10.1	9.10	4.17	3.46
	6/15/22	10.0	6.30	3.39	(See Note 2)
July	7/11/22	21.0	12.70	5.62	3.73
August	8/7/22	21.0	7.12	3.20	2.59
September	9/2/22	21.0	8.90	4.04	3.13
	9/29/22	21.1	6.67	3.85	3.07
October	10/25/22	21.0	8.40	3.79	2.70
November	11/20/22	21.0	5.60	2.51	1.83
December	12/17/22	21.0	5.90	2.51	2.56

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit C07

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/6/22	16.6	9.30	3.74	(See Note 2)
	1/18/22	10.0	7.20	3.42	(See Note 2)
	1/31/22	10.3	9.20	3.64	3.32
February	2/12/22	10.0	8.20	3.68	(See Note 2)
	2/25/22	10.0	10.10	3.17	(See Note 2)
March	3/9/22	10.1	9.80	3.83	3.05
	3/22/22	10.0	7.40	3.22	(See Note 2)
April	4/3/22	10.0	8.00	3.50	(See Note 2)
	4/16/22	10.3	8.50	3.86	3.33
May	5/5/22	10.0	6.90	3.29	(See Note 2)
	5/18/22	10.0	7.50	3.52	(See Note 2)
	5/30/22	10.1	8.50	3.73	3.52
June	6/13/22	10.0	6.00	2.95	(See Note 2)
July	7/9/22	21.0	12.30	5.18	3.17
August	8/5/22	21.0	9.37	4.24	2.96
	8/31/22	21.1	9.21	3.91	2.48
September	9/28/22	0.0	6.90	3.65	2.63
October	10/28/22	0.0	6.79	3.78	2.89
November	11/24/22	19.5	6.10	1.86	1.37
December	12/22/22	21.0	4.28	3.32	2.54

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit C08

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/11/22	10.0	6.26	3.59	(See Note 2)
	1/24/22	10.0	6.10	3.30	(See Note 2)
February	2/5/22	10.0	7.90	3.36	3.49
	2/18/22	10.0	9.00	3.85	(See Note 2)
March	3/3/22	10.2	8.90	3.31	(See Note 2)
	3/15/22	10.0	9.50	3.73	4.20
	3/27/22	10.0	7.60	3.53	(See Note 2)
April	4/9/22	10.0	8.50	3.42	(See Note 2)
	4/28/22	10.0	7.30	3.42	3.42
May	5/10/22	10.0	6.75	3.35	(See Note 2)
	5/23/22	10.1	8.30	3.41	(See Note 2)
June	6/4/22	10.0	8.80	3.61	2.95
	6/18/22	10.0	6.40	3.10	(See Note 2)
July	7/14/22	21.0	12.30	5.02	2.89
August	8/9/22	21.0	10.05	3.96	2.91
September	9/4/22	21.2	9.62	3.77	2.77
October	10/2/22	21.3	6.70	3.41	3.23
	10/29/22	21.0	7.46	3.55	2.30
November	11/24/22	21.1	3.70	2.18	1.80
December	12/21/22	21.0	9.70	3.12	2.71

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit D01

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/6/22	10.3	10.50	4.72	(See Note 2)
	1/18/22	10.0	11.60	6.19	(See Note 2)
	1/31/22	10.4	11.80	5.87	5.54
February	2/13/22	10.0	11.50	4.44	(See Note 2)
	2/25/22	10.0	9.70	5.62	(See Note 2)
March	3/9/22	9.5	8.70	5.75	4.58
	3/22/22	10.0	10.10	5.85	(See Note 2)
April	4/4/22	10.0	9.80	5.25	(See Note 2)
	4/14/22	8.1	8.70	5.46	4.15
May	5/3/22	10.0	12.10	5.15	(See Note 2)
	5/16/22	10.0	10.30	4.66	(See Note 2)
	5/25/22	7.2	8.80	5.09	4.11
June	6/7/22	10.0	9.80	4.40	(See Note 2)
	6/20/22	10.0	11.30	4.68	(See Note 2)
	6/30/22	8.2	7.75	5.27	4.14
July	7/13/22	10.0	7.78	2.95	(See Note 2)
	7/25/22	10.0	9.20	4.50	(See Note 2)
August	8/4/22	7.1	9.50	4.90	3.42
	8/17/22	10.0	8.50	4.28	(See Note 2)
	8/29/22	10.0	8.78	4.96	(See Note 2)
September	9/11/22	9.4	7.55	4.88	3.25
	9/25/22	10.0	7.50	3.48	(See Note 2)
October	10/8/22	10.0	7.24	3.55	(See Note 2)
	10/20/22	10.0	7.75	3.88	3.58
November	11/1/22	10.1	6.21	3.97	(See Note 2)
	11/14/22	10.1	5.50	3.02	(See Note 2)
	11/27/22	10.0	2.98	1.80	1.25
December	12/10/22	10.0	2.85	2.80	(See Note 2)
	12/20/22	8.0	12.90	6.44	(See Note 2)
	12/28/22	6.2	8.30	3.77	3.46

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit D02

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/16/22	9.9	10.30	5.68	(See Note 2)
	1/29/22	10.0	12.20	5.36	(See Note 2)
February	2/6/22	6.5	8.70	5.27	5.65
	2/18/22	9.2	9.00	8.48	6.83
March	3/3/22	10.0	11.30	4.81	(See Note 2)
	3/15/22	10.0	10.84	6.15	5.71
	3/28/22	10.0	11.90	4.12	(See Note 2)
April	4/10/22	10.0	12.30	4.03	(See Note 2)
	4/29/22	10.0	12.20	5.05	4.25
May	5/12/22	10.0	11.30	4.45	(See Note 2)
	5/25/22	10.0	12.90	4.87	(See Note 2)
June	6/5/22	8.6	9.80	4.10	4.08
	6/18/22	10.0	8.90	4.63	(See Note 2)
July	7/1/22	10.0	8.80	4.59	(See Note 2)
	7/11/22	8.1	9.05	4.26	4.54
	7/24/22	10.0	9.30	3.80	(See Note 2)
August	8/6/22	10.0	10.44	4.44	(See Note 2)
	8/15/22	7.5	8.36	4.88	3.94
	8/28/22	10.0	7.22	4.55	(See Note 2)
September	9/11/22	10.0	7.10	3.96	(See Note 2)
	9/22/22	7.3	6.00	4.36	(See Note 2)
October	10/1/22	6.6	5.69	3.93	3.75
	10/14/22	10.0	5.30	3.84	(See Note 2)
	10/26/22	10.0	8.10	3.85	(See Note 2)
November	11/5/22	8.1	11.00	2.88	3.70
	11/18/22	10.0	6.60	4.23	(See Note 2)
	11/29/22	9.0	4.20	2.28	(See Note 2)
December	12/12/22	10.0	5.24	3.52	2.97
	12/25/22	10.0	8.41	4.79	(See Note 2)

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit D03

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/15/22	10.0	11.50	5.61	(See Note 2)
	1/28/22	10.0	11.20	5.83	(See Note 2)
February	2/8/22	9.0	10.90	4.43	4.97
	2/21/22	10.0	9.60	5.00	(See Note 2)
March	3/5/22	10.0	12.30	5.75	(See Note 2)
	3/18/22	10.0	10.00	5.61	(See Note 2)
	3/29/22	9.0	10.00	4.00	4.66
April	4/11/22	9.9	9.20	4.80	(See Note 2)
	4/30/29	10.0	12.70	4.80	4.22
May	5/12/22	9.4	10.50	4.52	(See Note 2)
	5/24/22	9.4	9.70	4.53	(See Note 2)
June	6/2/22	6.8	8.20	5.78	4.75
	6/16/22	10.0	9.90	4.20	(See Note 2)
	6/28/22	10.0	7.85	4.11	(See Note 2)
July	7/7/22	7.1	7.10	5.73	4.13
	7/20/22	10.0	8.30	4.98	(See Note 2)
	7/30/22	7.5	10.10	4.70	(See Note 2)
August	8/9/22	7.7	5.92	4.34	4.27
	8/23/22	5.9	7.60	4.40	(See Note 2)
September	9/5/22	10.0	8.32	3.35	(See Note 2)
	9/15/22	7.3	9.10	4.86	4.27
	9/29/23	10.0	6.74	3.47	(See Note 2)
October	10/12/22	10.0	7.80	4.71	(See Note 2)
	10/23/22	8.9	8.20	4.83	3.81
November	11/4/22	10.0	9.60	4.37	(See Note 2)
	11/17/22	10.2	6.40	3.45	(See Note 2)
	11/30/22	10.0	5.17	3.14	2.45
December	12/13/22	10.0	6.20	4.04	(See Note 2)
	12/26/22	10.0	7.74	3.70	(See Note 2)

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit D04

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/5/22	13.9	11.60	5.71	(See Note 2)
	1/17/22	10.0	12.00	5.42	(See Note 2)
	1/30/22	10.2	12.10	4.94	5.17
February	2/11/22	10.0	10.10	5.27	4.46
	2/24/22	10.0	10.60	5.64	(See Note 2)
March	3/8/22	10.0	11.44	6.41	4.86
	3/20/22	10.0	11.30	5.00	(See Note 2)
April	4/2/22	10.0	10.40	4.94	(See Note 2)
	4/15/22	10.0	12.40	5.68	4.22
May	5/4/22	10.0	13.30	4.62	(See Note 2)
	5/17/22	10.0	10.30	4.87	(See Note 2)
	5/27/22	8.3	10.20	4.73	4.33
June	6/10/22	10.0	10.40	4.55	(See Note 2)
	6/22/22	10.0	10.85	4.48	(See Note 2)
July	7/4/22	9.7	11.34	4.72	4.15
	7/17/22	10.0	8.52	3.52	(See Note 2)
	7/29/22	10.0	10.80	4.39	(See Note 2)
August	8/10/22	9.2	12.04	4.65	3.70
	8/23/22	10.2	9.00	4.44	(See Note 2)
September	9/5/22	10.1	8.10	3.70	(See Note 2)
	9/18/22	10.0	8.62	4.56	4.30
October	10/2/22	10.0	6.38	3.45	(See Note 2)
	10/14/22	10.0	5.85	4.08	(See Note 2)
	10/23/22	7.3	6.27	3.64	4.07
November	11/5/22	10.1	5.87	3.25	(See Note 2)
	11/16/22	9.0	7.12	3.37	(See Note 2)
	11/29/22	10.0	4.05	2.36	2.11
December	12/12/22	10.2	5.30	2.99	(See Note 2)
	12/24/22	9.8	6.95	4.56	(See Note 2)

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit D05

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/10/22	10.0	10.60	4.89	(See Note 2)
	1/23/22	10.0	12.40	5.08	(See Note 2)
February	2/5/22	10.0	11.80	4.61	4.74
	2/17/22	10.0	12.40	4.68	(See Note 2)
March	3/2/22	10.0	11.80	5.38	(See Note 2)
	3/14/22	10.0	12.40	5.18	6.09
	3/27/22	10.0	11.70	4.41	(See Note 2)
April	4/9/222	10.0	10.60	4.87	(See Note 2)
	4/28/22	10.0	12.40	4.60	3.86
May	5/11/22	10.0	12.20	4.34	(See Note 2)
	5/24/22	10.0	12.80	5.35	(See Note 2)
June	6/6/22	10.0	10.40	4.91	4.00
	6/19/22	10.0	9.60	4.01	(See Note 2)
July	7/1/22	10.0	10.70	4.71	(See Note 2)
	7/15/22	10.0	10.10	4.07	4.00
	7/28/22	10.0	8.71	4.09	(See Note 2)
August	8/9/22	10.0	9.20	4.88	(See Note 2)
	8/19/22	7.8	7.85	5.66	3.95
September	9/4/22	10.0	6.30	3.29	(See Note 2)
	9/18/22	10.0	7.62	3.96	(See Note 2)
October	10/3/22	10.0	7.97	4.25	2.98
	10/16/22	10.0	7.51	3.49	(See Note 2)
	10/28/22	10.0	8.04	3.55	(See Note 2)
November	11/10/22	10.0	7.90	3.25	2.87
	11/23/22	10.0	3.54	1.95	(See Note 2)
December	12/6/22	10.0	5.05	2.88	(See Note 2)
	12/19/22	10.0	5.93	3.30	3.35

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit D06

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/5/22	13.6	10.00	4.25	(See Note 2)
	1/18/22	10.0	10.10	4.48	(See Note 2)
	1/30/22	10.4	12.00	4.36	5.39
February	2/12/22	10.0	11.60	4.53	(See Note 2)
	2/24/22	10.0	13.10	5.05	(See Note 2)
March	3/8/22	10.0	12.00	5.48	4.79
	3/21/22	10.0	10.50	3.80	(See Note 2)
April	4/2/22	10.0	11.80	4.30	(See Note 2)
	4/16/22	10.2	10.90	4.51	4.10
May	5/4/22	10.0	10.10	4.10	(See Note 2)
	5/17/22	10.1	11.00	4.20	(See Note 2)
	5/29/22	9.9	11.00	2.81	4.04
June	6/11/22	10.0	8.80	7.81	(See Note 2)
	6/24/22	10.0	9.13	4.05	(See Note 2)
July	7/6/22	10.0	11.80	6.26	4.32
	7/19/22	10.0	6.20	4.29	(See Note 2)
August	8/1/22	10.0	10.03	4.61	(See Note 2)
	8/13/22	10.0	7.72	4.00	3.83
	8/26/22	10.0	6.10	3.37	(See Note 2)
September	9/8/22	10.0	6.20	3.06	(See Note 2)
	9/23/22	21.1	7.68	3.92	3.85
October	10/6/22	10.0	6.40	3.35	(See Note 2)
	10/18/22	10.0	8.82	3.70	(See Note 2)
	10/30/22	10.1	7.50	3.47	3.20
November	11/11/22	10.0	4.40	1.99	(See Note 2)
	11/23/22	10.0	6.30	2.22	(See Note 2)
December	12/6/22	10.0	6.80	2.62	2.72
	12/19/22	10.2	6.50	6.50	4.32
	12/31/22	10.0	9.50	4.51	(See Note 2)

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit D07

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/8/22	10.0	10.60	4.86	(See Note 2)
	1/20/22	10.0	10.90	4.68	(See Note 2)
February	2/1/22	10.0	12.20	6.06	5.94
	2/14/22	10.1	11.10	4.50	(See Note 2)
	2/26/22	10.0	12.10	4.37	(See Note 2)
March	3/11/22	10.0	11.70	5.10	4.40
	3/23/22	10.0	12.12	4.87	(See Note 2)
April	4/5/22	10.0	10.60	5.13	(See Note 2)
	4/24/22	10.0	12.10	4.62	4.71
May	5/7/22	10.0	13.10	4.33	(See Note 2)
	5/19/22	10.0	11.60	4.59	(See Note 2)
June	6/1/22	10.6	11.32	5.02	4.58
	6/14/22	10.0	10.70	5.03	(See Note 2)
	6/27/22	10.0	7.47	3.79	(See Note 2)
July	7/8/22	8.4	7.30	6.21	4.39
	7/21/22	10.0	8.90	4.20	(See Note 2)
August	8/3/22	10.0	10.47	4.98	(See Note 2)
	8/15/22	10.0	11.10	4.86	4.19
	8/28/22	10.0	8.40	3.74	(See Note 2)
September	9/10/22	10.0	6.77	4.03	(See Note 2)
	9/24/22	10.0	9.60	4.21	3.62
October	10/6/22	10.0	6.79	3.33	(See Note 2)
	10/19/22	10.2	8.70	3.97	(See Note 2)
	10/31/22	10.0	8.42	4.47	4.39
November	11/13/22	10.1	4.78	2.71	(See Note 2)
	11/24/22	10.0	6.41	3.95	(See Note 2)
December	12/8/22	10.0	5.30	2.58	1.86
	12/20/22	10.2	10.15	3.22	(See Note 2)

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit D08

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/5/22	(See Note 1)			
	1/6/22	13.3	11.60	4.39	(See Note 2)
	1/18/22	10.0	10.70	4.40	(See Note 2)
	1/31/22	10.3	12.00	4.97	4.33
February	2/12/22	10.0	9.20	4.11	(See Note 2)
	2/24/22	10.0	10.80	5.36	(See Note 2)
March	3/9/22	10.1	10.50	5.30	5.26
	3/21/22	10.0	10.60	5.04	(See Note 2)
April	4/3/22	10.0	10.10	5.30	(See Note 2)
	4/16/22	10.0	10.00	4.45	4.52
May	5/5/22	10.1	12.10	4.00	(See Note 2)
	5/18/22	10.0	12.10	4.82	(See Note 2)
	5/29/22	9.3	9.80	4.18	4.32
June	6/12/22	10.0	8.70	4.05	(See Note 2)
	6/24/22	10.0	10.20	4.46	(See Note 2)
July	7/7/22	10.0	9.80	6.62	4.48
	7/20/22	10.0	8.10	3.71	(See Note 2)
August	8/2/22	10.0	8.06	3.67	(See Note 2)
	8/13/22	9.0	7.39	4.48	3.39
	8/26/22	10.0	7.80	3.75	(See Note 2)
September	9/8/22	10.2	9.60	4.27	(See Note 2)
	9/22/22	9.4	7.40	3.44	3.59
October	10/5/22	10.3	6.30	3.38	(See Note 2)
	10/17/22	9.8	9.10	4.54	(See Note 2)
	10/27/22	8.2	6.90	3.91	3.45
November	11/9/22	10.0	5.84	4.06	(See Note 2)
	11/22/22	10.1	4.61	3.14	(See Note 2)
December	12/4/22	10.0	9.04	2.59	2.44
	12/17/22	10.0	6.60	3.61	(See Note 2)
	12/30/22	10.1	8.37	3.99	(See Note 2)

1 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.
2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E01

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/3/22	MW (See Note 1)			
	1/11/22	20.6	12.60	6.11	6.57
	1/20/22	MW (See Note 1)			
	1/29/22	MW (See Note 1)			
February	2/7/22	21.0	11.80	6.33	5.93
	2/16/22	MW (See Note 1)			
	2/24/22	MW (See Note 1)			
March	3/5/22	21.0	12.40	7.93	6.48
	3/14/22	MW (See Note 1)			
	3/23/22	MW (See Note 1)			
	3/31/22	21.0	11.90	7.01	6.01
April	4/6/22	4.1	11.04	5.68	6.46
	4/16/22	MW (See Note 1)			
May	5/5/22	MW (See Note 1)			
	5/13/22	20.4	10.50	6.54	5.66
	5/23/22	MW (See Note 1)			
June	6/1/22	MW (See Note 1)			
	6/11/22	21.1	11.50	6.08	5.34
	6/21/22	MW (See Note 1)			
	6/30/22	MW (See Note 1)			
July	7/7/22	19.3	10.90	8.29	5.27
	7/20/22	10.0	11.70	6.04	(See Note 2)
August	8/1/22	9.3	9.64	6.41	(See Note 2)
	8/12/22	8.7	10.10	4.38	4.89
	8/25/22	10.17	12.80	5.48	(See Note 2)
September	9/8/22	9.77	9.70	4.73	(See Note 2)
	9/30/22	MW (See Note 1)			

1 Maintenance Wash using dilute caustic and no citric.
2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E01

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
October	10/3/22	MW (See Note 1)			
	10/6/22	MW (See Note 1)			
	10/9/22	MW (See Note 1)			
	10/12/22	MW (See Note 1)			
	10/15/22	MW (See Note 1)			
	10/18/22	MW (See Note 1)			
	10/21/22	MW (See Note 1)			
	10/25/22	MW (See Note 1)			
	10/28/22	21.23	4.50	3.06	1.63
	10/31/22	MW (See Note 1)			
November	11/3/22	MW (See Note 1)			
	11/6/22	MW (See Note 1)			
	11/9/22	MW (See Note 1)			
	11/12/22	MW (See Note 1)			
	11/15/22	MW (See Note 1)			
	11/18/22	MW (See Note 1)			
	11/22/22	MW (See Note 1)			
	11/25/22	MW (See Note 1)			
	11/28/22	MW (See Note 1)			
	11/29/22	24.56	4.02	2.61	2.60
December	12/2/22	MW (See Note 1)			
	12/6/22	MW (See Note 1)			
	12/9/22	MW (See Note 1)			
	12/12/22	MW (See Note 1)			
	12/15/22	MW (See Note 1)			
	12/18/22	MW (See Note 1)			
	12/21/22	MW (See Note 1)			
	12/24/22	MW (See Note 1)			
	12/25/22	21.02			
	12/29/22	MW (See Note 1)	5.00	2.90	2.64

1 Maintenance Wash using dilute caustic and no citric.
2 CIP using caustic only.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E02

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/3/22	15.1	11.70	5.88	(See Note 1)
	1/5/22	(See Note 2)			
	1/16/22	10.0	11.20	4.62	9.65
	1/29/22	10.0	12.20	5.89	(See Note 1)
February	2/8/22	8.3	9.60	5.89	5.27
	2/21/22	10.0	10.90	4.78	(See Note 1)
March	3/5/22	10.2	10.90	5.69	(See Note 1)
	3/18/22	10.0	10.80	5.67	(See Note 1)
	3/30/22	10.0	10.90	5.03	4.36
April	4/12/22	10.0	9.40	5.68	(See Note 1)
May	5/5/22	10.0	11.00	4.74	(See Note 1)
	5/15/22	8.5	11.20	4.85	3.55
	5/28/22	10.0	11.80	4.80	(See Note 1)
June	6/11/22	10.2	8.30	4.93	(See Note 1)
	6/23/22	10.0	8.70	4.56	4.03
July	7/6/22	10.0	11.17	6.46	(See Note 1)
	7/14/22	6.2	8.60	5.10	(See Note 1)
	7/22/22	6.1	8.20	4.89	4.01
August	8/4/22	10.1	8.64	4.39	(See Note 1)
	8/17/22	10.0	9.90	4.17	(See Note 1)
	8/25/22	6.5	8.90	3.68	3.23
September	9/9/22	10.0	6.50	4.34	(See Note 1)
October	10/1/22	MW (See Note 3)			
	10/4/22	MW (See Note 3)			
	10/7/22	MW (See Note 3)			
	10/10/22	MW (See Note 3)			
	10/13/22	MW (See Note 3)			
	10/16/22	MW (See Note 3)			
	10/19/22	MW (See Note 3)			
	10/22/22	MW (See Note 3)			
	10/25/22	MW (See Note 3)			
	10/28/22	21.4	2.91	1.63	1.30
	10/31/22	MW (See Note 3)			

1 CIP using caustic only.
2 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.
3 Maintenance Wash using dilute caustic and no citric.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E02

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
November	11/3/22	MW (See Note 3)			
	11/5/22	MW (See Note 3)			
	11/9/22	MW (See Note 3)			
	11/11/22	MW (See Note 3)			
	11/15/22	MW (See Note 3)			
	11/18/22	MW (See Note 3)			
	11/22/22	MW (See Note 3)			
	11/25/22	21.5	3.60	1.84	1.91
	11/28/22	MW (See Note 3)			
December	12/1/22	MW (See Note 3)			
	12/4/22	MW (See Note 3)			
	12/8/22	MW (See Note 3)			
	12/11/22	MW (See Note 3)			
	12/14/22	MW (See Note 3)			
	12/17/22	MW (See Note 3)			
	12/20/22	MW (See Note 3)			
	12/23/22	21.1	3.93	2.03	2.17
	12/26/22	MW (See Note 3)			
	12/30/22	MW (See Note 3)			

1 CIP using caustic only.

2 Starting 1/5/2022, switched to full caustic-only (no citric acid) on 10-day/240 hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

3 Maintenance Wash using dilute caustic and no citric.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E03

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/6/22	16.7	8.10	3.82	5.00
	1/13/22	MW (See Note 1)			
	1/16/22	MW (See Note 1)			
	1/19/22	MW (See Note 1)			
	1/22/22	MW (See Note 1)			
	1/25/22	MW (See Note 1)			
	1/28/22	MW (See Note 1)			
	1/31/22	MW (See Note 1)			
February	2/3/22	MW (See Note 1)			
	2/6/22	MW (See Note 1)			
	2/9/22	22.5	6.10	4.13	3.62
	2/12/22	MW (See Note 1)			
	2/15/22	MW (See Note 1)			
	2/18/22	MW (See Note 1)			
	2/20/22	MW (See Note 1)			
	2/24/22	MW (See Note 1)			
	2/27/22	MW (See Note 1)			
March	3/2/22	MW (See Note 1)			
	3/5/22	MW (See Note 1)			
	3/8/22	MW (See Note 1)			
	3/11/22	23.1	9.10	4.42	4.40
	3/14/22	MW (See Note 1)			
	3/17/22	MW (See Note 1)			
	3/20/22	MW (See Note 1)			
	3/23/22	MW (See Note 1)			
	3/26/22	MW (See Note 1)			
	3/29/22	MW (See Note 1)			
April	4/1/22	MW (See Note 1)			
	4/4/22	MW (See Note 1)			
	4/7/22	MW (See Note 1)			
	4/10/22	21.8	9.80	3.62	2.82
	4/13/22	MW (See Note 1)			
	4/16/22	MW (See Note 1)			
	4/29/22	MW (See Note 1)			
May	5/2/22	MW (See Note 1)			
	5/5/22	MW (See Note 1)			
	5/8/22	MW (See Note 1)			
	5/11/22	MW (See Note 1)			
	5/14/22	MW (See Note 1)			
	5/17/22	MW (See Note 1)			
	5/20/22	22.9	7.70	6.67	3.57
	5/23/22	MW (See Note 1)			
	5/26/22	MW (See Note 1)			
	5/29/22	MW (See Note 1)			

1 Maintenance Wash using dilute caustic and no citric.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E03

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
June	6/1/22	MW (See Note 1)			
	6/4/22	MW (See Note 1)			
	6/7/22	MW (See Note 1)			
	6/11/22	MW (See Note 1)			
	6/14/22	MW (See Note 1)			
	6/17/22	MW (See Note 1)			
	6/20/22	21.5	6.90	3.15	2.76
	6/23/22	MW (See Note 1)			
	6/26/22	MW (See Note 1)			
	6/29/22	MW (See Note 1)			
July	7/2/22	MW (See Note 1)			
	7/5/22	MW (See Note 1)			
	7/8/22	MW (See Note 1)			
	7/11/22	MW (See Note 1)			
	7/14/22	MW (See Note 1)			
	7/17/22	MW (See Note 1)			
	7/20/22	22.3	9.20	4.64	3.76
	7/23/22	MW (See Note 1)			
	7/26/22	MW (See Note 1)			
	7/29/22	MW (See Note 1)			
August	8/1/22	MW (See Note 1)			
	8/4/22	MW (See Note 1)			
	8/7/22	MW (See Note 1)			
	8/10/22	MW (See Note 1)			
	8/13/22	MW (See Note 1)			
	8/17/22	MW (See Note 1)			
	8/19/22	2.1	7.30	3.85	3.34
	8/22/22	MW (See Note 1)			
	8/25/22	MW (See Note 1)			
	8/28/22	MW (See Note 1)			
	8/31/22	MW (See Note 1)			
September	9/3/22	MW (See Note 1)			
	9/6/22	MW (See Note 1)			
	9/10/22	MW (See Note 1)			
	9/13/22	MW (See Note 1)			
	9/17/22	MW (See Note 1)			
	9/30/22	23.6	3.79	3.32	3.56
October	10/3/22	MW (See Note 1)			
	10/6/22	MW (See Note 1)			
	10/9/22	MW (See Note 1)			
	10/12/22	MW (See Note 1)			
	10/15/22	MW (See Note 1)			
	10/18/22	MW (See Note 1)			
	10/21/22	MW (See Note 1)			
	10/25/22	MW (See Note 1)			
	10/27/22	MW (See Note 1)			
	10/30/22	24.1	9.57	4.56	4.05
November	11/2/22	MW (See Note 1)			
	11/4/22	MW (See Note 1)			
	11/8/22	MW (See Note 1)			
	11/11/22	MW (See Note 1)			
	11/14/22	MW (See Note 1)			
	11/17/22	MW (See Note 1)			
	11/21/22	MW (See Note 1)			
	11/24/22	MW (See Note 1)			
	11/26/22	21.0	9.80	3.58	4.30
	11/29/22	MW (See Note 1)			
December	12/2/22	MW (See Note 1)			
	12/5/22	MW (See Note 1)			
	12/8/22	MW (See Note 1)			
	12/11/22	MW (See Note 1)			
	12/14/22	MW (See Note 1)			
	12/17/22	MW (See Note 1)			
	12/20/22	MW (See Note 1)			
	12/24/22	21.0	13.15	6.57	5.67
	12/27/22	MW (See Note 1)			
	12/30/22	MW (See Note 1)			

1 Maintenance Wash using dilute caustic and no citric.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E04

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/3/22	MW (See Note 1)			
	1/6/22	22.6	12.30	3.31	3.50
	1/13/22	MW (See Note 1)			
	1/16/22	MW (See Note 1)			
	1/19/22	MW (See Note 1)			
	1/22/22	MW (See Note 1)			
	1/25/22	MW (See Note 1)			
	1/28/22	MW (See Note 1)			
	1/31/22	MW (See Note 1)			
February	2/3/22	MW (See Note 1)			
	2/6/22	20.5	12.80	3.62	4.06
	2/9/22	MW (See Note 1)			
	2/12/22	MW (See Note 1)			
	2/15/22	MW (See Note 1)			
	2/18/22	MW (See Note 1)			
	2/21/22	MW (See Note 1)			
	2/24/22	MW (See Note 1)			
	2/27/22	MW (See Note 1)			
March	3/2/22	MW (See Note 1)			
	3/5/22	MW (See Note 1)			
	3/8/22	19.6	13.90	2.68	2.64
	3/11/22	MW (See Note 1)			
	3/14/22	MW (See Note 1)			
	3/17/22	MW (See Note 1)			
	3/20/22	MW (See Note 1)			
	3/23/22	MW (See Note 1)			
	3/26/22	MW (See Note 1)			
	3/29/22	MW (See Note 1)			
April	4/1/22	MW (See Note 1)			
	4/4/22	MW (See Note 1)			
	4/7/22	22.5	12.00	2.11	2.59
	4/10/22	MW (See Note 1)			
	4/13/22	MW (See Note 1)			
	4/16/22	MW (See Note 1)			
	4/29/22	MW (See Note 1)			
May	5/2/22	MW (See Note 1)			
	5/5/22	MW (See Note 1)			
	5/8/22	MW (See Note 1)			
	5/11/22	MW (See Note 1)			
	5/14/22	MW (See Note 1)			
	5/17/22	22.9	8.80	2.95	2.38
	5/20/22	MW (See Note 1)			
	5/23/22	MW (See Note 1)			
	5/26/22	MW (See Note 1)			
	5/29/22	MW (See Note 1)			
June	6/1/22	MW (See Note 1)			
	6/4/22	MW (See Note 1)			
	6/7/22	MW (See Note 1)			
	6/11/22	MW (See Note 1)			
	6/14/22	MW (See Note 1)			
	6/17/22	22.7	10.80	2.27	2.17
	6/20/22	MW (See Note 1)			
	6/23/22	MW (See Note 1)			
	6/25/22	MW (See Note 1)			
	6/29/22	MW (See Note 1)			
July	7/2/22	MW (See Note 1)			
	7/5/22	MW (See Note 1)			
	7/8/22	MW (See Note 1)			
	7/11/22	MW (See Note 1)			
	7/14/22	MW (See Note 1)			
	7/17/22	22.7	4.50	1.83	2.37
	7/20/22	MW (See Note 1)			
	7/23/22	MW (See Note 1)			
	7/26/22	MW (See Note 1)			
	7/29/22	MW (See Note 1)			
August	8/1/22	MW (See Note 1)			
	8/4/22	MW (See Note 1)			
	8/7/22	MW (See Note 1)			
	8/10/22	MW (See Note 1)			
	8/13/22	MW (See Note 1)			
	8/16/22	22.8	5.77	2.00	1.82
	8/19/22	MW (See Note 1)			
	8/22/22	MW (See Note 1)			
	8/25/22	MW (See Note 1)			
	8/28/22	MW (See Note 1)			
	8/31/22	MW (See Note 1)			

1 Maintenance Wash using dilute caustic and no citric.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E04

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
September	9/3/22	MW (See Note 1)			
	9/6/22	MW (See Note 1)			
	9/10/22	MW (See Note 1)			
	9/13/22	MW (See Note 1)			
	9/16/22	23.6	5.17	1.99	2.09
	9/29/22	MW (See Note 1)			
October	10/2/22	MW (See Note 1)			
	10/5/22	MW (See Note 1)			
	10/8/22	MW (See Note 1)			
	10/11/22	MW (See Note 1)			
	10/15/22	MW (See Note 1)			
	10/19/22	MW (See Note 1)			
	10//22/22	MW (See Note 1)			
	10/25/22	MW (See Note 1)			
	10/28/22	MW (See Note 1)			
	10/31/22	MW (See Note 1)			
November	11/3/22	MW (See Note 1)			
	11/6/22	MW (See Note 1)			
	11/9/22	MW (See Note 1)			
	11/12/22	MW (See Note 1)			
	11/16/22	21.2	4.57	2.95	2.65
	11/19/22	MW (See Note 1)			
	11/23/22	MW (See Note 1)			
	11/26/22	MW (See Note 1)			
	11/29/22	MW (See Note 1)			
December	12/2/22	MW (See Note 1)			
	12/5/22	MW (See Note 1)			
	12/8/22	MW (See Note 1)			
	12/12/22	MW (See Note 1)			
	12/14/22	MW (See Note 1)			
	12/17/22	2.3	4.09	2.80	2.39
	12/20/22	MW (See Note 1)			
	12/23/22	MW (See Note 1)			
	12/26/22	MW (See Note 1)			
	12/30/22	MW (See Note 1)			

1 Maintenance Wash using dilute caustic and no citric.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E05

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
October	10/11/22	(See Note 1)			
	10/12/22	(See Note 1)			
	10/13/22	(See Note 1)			
	10/31/22	MW (See Note 2)			
November	11/2/22	MW (See Note 2)			
	11/5/22	MW (See Note 2)			
	11/8/22	MW (See Note 2)			
	11/11/22	MW (See Note 2)			
	11/14/22	MW (See Note 2)			
	11/18/22	MW (See Note 2)			
	11/22/22	MW (See Note 2)			
	11/24/22	21.3	4.00	2.46	2.03
	11/28/22	MW (See Note 2)			
December	12/1/22	MW (See Note 2)			
	12/7/22	MW (See Note 2)			
	12/11/22	MW (See Note 2)			
	12/14/22	MW (See Note 2)			
	12/17/22	MW (See Note 2)			
	12/21/22	MW (See Note 2)			
	12/24/22	MW (See Note 2)			
	12/27/22	21.1	3.88	2.60	2.48
	12/30/22	MW (See Note 2)			

1 Commissioning/wetting of new MF modules.
2 Maintenance Wash using dilute caustic and no citric.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E06

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
October	10/4/22	(See Note 1)			
	10/14/22	(See Note 1)			
	10/17/22	(See Note 1)			
November	11/2/22	MW (See Note 2)			
	11/6/22	MW (See Note 2)			
	11/8/22	MW (See Note 2)			
	11/12/22	MW (See Note 2)			
	11/17/22	MW (See Note 2)			
	11/21/22	MW (See Note 2)			
	11/25/22	MW (See Note 2)			
	11/27/22	21.1	3.17	3.79	2.09
December	12/6/22	MW (See Note 2)			
	12/10/22	MW (See Note 2)			
	12/14/22	MW (See Note 2)			
	12/17/22	MW (See Note 2)			
	12/20/22	MW (See Note 2)			
	12/23/22	MW (See Note 2)			
	12/26/22	MW (See Note 2)			
	12/29/22	MW (See Note 2)			

1 Commissioning/wetting of new MF modules.
2 Maintenance Wash using dilute caustic and no citric.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E07

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
October	10/18/22	(See Note 1)			
	10/19/22	(See Note 1)			
	10/29/22	MW (See Note 2)			
November	11/1/22	MW (See Note 2)			
	11/4/22	MW (See Note 2)			
	11/7/22	MW (See Note 2)			
	11/10/22	MW (See Note 2)			
	11/13/22	MW (See Note 2)			
	11/16/22	MW (See Note 2)			
	11/21/22	MW (See Note 2)			
	11/23/22	21.1	3.03	2.12	1.55
	11/26/22	MW (See Note 2)			
	11/29/22	MW (See Note 2)			
December	12/2/22	MW (See Note 2)			
	12/6/22	MW (See Note 2)			
	12/10/22	MW (See Note 2)			
	12/13/22	MW (See Note 2)			
	12/16/22	MW (See Note 2)			
	12/19/22	MW (See Note 2)			
	12/22/22	21.0	5.50	2.29	2.03
	12/25/22	MW (See Note 2)			
	12/28/22	MW (See Note 2)			
	12/31/22	MW (See Note 2)			

1 Commissioning/wetting of new MF modules.
2 Maintenance Wash using dilute caustic and no citric.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E08

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
October	10/24/22	(See Note 1)			
	10/29/22	MW (See Note 2)			
November	11/2/22	MW (See Note 2)			
	11/5/22	MW (See Note 2)			
	11/8/22	MW (See Note 2)			
	11/11/22	MW (See Note 2)			
	11/14/22	MW (See Note 2)			
	11/17/22	MW (See Note 2)			
	11/22/22	MW (See Note 2)			
	11/25/22	21.4	4.20	2.45	1.75
	11/28/22	MW (See Note 2)			
December	12/1/22	MW (See Note 2)			
	12/4/22	MW (See Note 2)			
	12/10/22	MW (See Note 2)			
	12/13/22	MW (See Note 2)			
	12/24/22	MW (See Note 2)			
	12/27/22	MW (See Note 2)			
	12/30/22	MW (See Note 2)			

1 Commissioning/wetting of new MF modules.
2 Maintenance Wash using dilute caustic and no citric.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit F01

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
November	11/9/22	(See Note 1)			
	11/13/22	MW (See Note 2)			
	11/17/22	MW (See Note 2)			
	11/21/22	MW (See Note 2)			
	11/24/22	MW (See Note 2)			
	11/27/22	MW (See Note 2)			
December	12/1/22	MW (See Note 2)			
	12/7/22	MW (See Note 2)			
	12/11/22	MW (See Note 2)			
	12/13/22	21.1	4.64	2.64	2.45
	12/16/22	MW (See Note 2)			
	12/19/22	MW (See Note 2)			
	12/22/22	MW (See Note 2)			
	12/25/22	MW (See Note 2)			
	12/31/22	MW (See Note21)			

1 Commissioning/wetting of new MF modules.
2 Maintenance Wash using dilute caustic and no citric.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit F02

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
November	11/4/22	(See Note 1)			
	11/7/22	(See Note 1)			
	11/16/22	MW (See Note 2)			
	11/22/22	MW (See Note 2)			
	11/24/22	MW (See Note 2)			
	11/28/22	MW (See Note 2)			
December	12/1/22	MW (See Note 2)			
	12/4/22	MW (See Note 2)			
	12/10/22	MW (See Note 2)			
	12/14/22	MW (See Note 2)			
	12/17/22	21.1	3.90	1.95	1.57
	12/20/22	MW (See Note 2)			
	12/23/22	MW (See Note 2)			
	12/26/22	MW (See Note 2)			
	12/31/22	MW (See Note 2)			

1 Commissioning/wetting of new MF modules.
2 Maintenance Wash using dilute caustic and no citric.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit F03

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
November	11/3/22	(See Note 1)			
	11/7/22	(See Note 1)			
	11/15/22	MW (See Note 2)			
	11/20/22	MW (See Note 2)			
	11/23/22	MW (See Note 2)			
	11/26/22	MW (See Note 2)			
	11/29/22	MW (See Note 2)			
December	12/2/22	MW (See Note 2)			
	12/8/22	MW (See Note 2)			
	12/12/22	MW (See Note 2)			
	12/14/22	21.1	5.12	2.72	2.65
	12/21/22	MW (See Note 2)			

1 Commissioning/wetting of new MF modules.
2 Maintenance Wash using dilute caustic and no citric.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit F04

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
November	11/2/22	(See Note 1)			
	11/13/22	MW (See Note 2)			
	11/16/22	MW (See Note 2)			
	11/20/22	MW (See Note 2)			
	11/23/22	MW (See Note 2)			
	11/26/22	MW (See Note 2)			
	11/30/22	MW (See Note 2)			
December	12/3/22	MW (See Note 2)			
	12/9/22	MW (See Note 2)			
	12/10/22	21.0	3.69	2.88	2.40
	12/13/22	MW (See Note 2)			
	12/16/22	MW (See Note 2)			
	12/20/22	MW (See Note 2)			
	12/23/22	MW (See Note 2)			
	12/26/22	MW (See Note 2)			
	12/31/22	MW (See Note 2)			

1 Commissioning/wetting of new MF modules.
2 Maintenance Wash using dilute caustic and no citric.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit F05

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
October	10/10/22	(See Note 1)			
November	11/1/22	(See Note 1)			
	11/11/22	MW (See Note 2)			
	11/14/22	MW (See Note 2)			
	11/23/22	MW (See Note 2)			
	11/26/22	MW (See Note 2)			
	11/29/22	MW (See Note 2)			
December	12/2/22	MW (See Note 2)			
	12/8/22	MW (See Note 2)			
	12/11/22	MW (See Note 2)			
	12/17/22	21.1	3.65	2.65	2.34
	12/20/22	MW (See Note 2)			
	12/23/22	MW (See Note 2)			
	12/26/22	MW (See Note 2)			
	12/31/22	MW (See Note 2)			

1 Commissioning/wetting of new MF modules.
2 Maintenance Wash using dilute caustic and no citric.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit F06

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
October	10/25/22	(See Note 1)			
	10/26/22	(See Note 1)			
	10/27/22	(See Note 1)			
November	11/11/22	MW (See Note 2)			
	11/14/22	MW (See Note 2)			
	11/17/22	MW (See Note 2)			
	11/22/22	MW (See Note 2)			
	11/25/22	MW (See Note 2)			
	11/28/22	MW (See Note 2)			
December	12/1/22	MW (See Note 2)			
	12/7/22	MW (See Note 2)			
	12/10/22	21.1	2.88	1.16	2.08
	12/13/22	MW (See Note 2)			
	12/16/22	MW (See Note 2)			
	12/19/22	MW (See Note 2)			
	12/22/22	MW (See Note 2)			
	12/25/22	MW (See Note 2)			
	12/30/22	MW (See Note 2)			

1 Commissioning/wetting of new MF modules.
2 Maintenance Wash using dilute caustic and no citric.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit F07

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
October	10/20/22	(See Note 1)			
November	11/10/22	MW (See Note 2)			
	11/28/22	MW (See Note 2)			
December	12/1/22	MW (See Note 2)			
	12/7/22	MW (See Note 2)			
	12/11/22	MW (See Note 2)			
	12/14/22	MW (See Note 2)			
	12/21/22	MW (See Note 2)			

1 Commissioning/wetting of new MF modules.

2 Maintenance Wash using dilute caustic and no citric.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit F08

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
October	10/20/22	(See Note 1)			
	10/21/22	(See Note 1)			
	10/24/22	(See Note 1)			
November	11/11/22	MW (See Note 2)			
	11/14/22	MW (See Note 2)			
	11/17/22	MW (See Note 2)			
	11/22/22	MW (See Note 2)			
	11/25/22	MW (See Note 2)			
	11/28/22	MW (See Note 2)			
December	12/1/22	MW (See Note 2)			
	12/7/22	MW (See Note 2)			
	12/8/22	21.2	2.86	2.16	1.85
	12/11/22	MW (See Note 2)			
	12/15/22	MW (See Note 2)			
	12/17/22	MW (See Note 2)			
	12/22/22	MW (See Note 2)			

1 Commissioning/wetting of new MF modules.

2 Maintenance Wash using dilute caustic and no citric.

Reverse Osmosis Plant Cleaning Summary

Unit A01

Date of Cleaning	Treatment Performed
Jul-22	Full unit CIP using 2.2% AWC C-227, followed by full unit acid wash (2% citric acid) 2.2% AWC C-227 cleaning solutions at pH 12 / 95°F with contact times of 13-14 hours were used. The high pH cleanings were followed by standard 2% citric acid cleaning solutions at pH 2.1-2.5 with ambient water temperatures for approximately 3-4 hours of contact time.

Reverse Osmosis Plant Cleaning Summary

Unit A02

Date of Cleaning	Treatment Performed
Jul-22	Full unit CIP using 2.2% AWC C-227, followed by full unit acid wash (2% citric acid) 2.2% AWC C-227 cleaning solutions at pH 12 / 95°F with contact times of 13-14 hours were used. The high pH cleanings were followed by standard 2% citric acid cleaning solutions at pH 2.1-2.5 with ambient water temperatures for approximately 3-4 hours of contact time.

Reverse Osmosis Plant Cleaning Summary

Unit A03

Date of Cleaning	Treatment Performed
Aug-22	Full unit CIP using 2.2% AWC C-227, followed by full unit acid wash (2% citric acid) 2.2% AWC C-227 cleaning solutions at pH 11.5 / 95°F with contact times of 13-14 hours were used. The high pH cleanings were followed by standard 2% citric acid cleaning solutions at pH 2.1-2.5 with ambient water temperatures for approximately 3-4 hours of contact time.

PMNUM	DESCRIPTION	ASSETNUM	ASSETDESC	LOCATION	LASTCOMPDATE	FREQUENCY	FREQUNIT	NEXTDATE
7343	3 Mo. Rosemount Chlorine Analyzer Maintenance 450-AE-2164	9075	Element Analyzer Total Chlorine - RO Feed	450-CPF-0001	1/19/2023	3	MONTHS	4/21/2023
7344	3 Mo. Rosemount Chlorine Analyzer Maintenance 460-AE-0312	9091	Element Analyzer Total Chlorine - MF Feedwater	460-CPF-0001	1/12/2023	3	MONTHS	4/14/2023
7345	3 Mo. Rosemount Chlorine Analyzer Maintenance 460-AE-0314	9092	Element Analyzer Total Chlorine - MF Feedwater	460-CPF-0001	2/1/2023	3	MONTHS	4/14/2023
7346	3 Mo. Rosemount Chlorine Analyzer Maintenance 710-AE-3425	8675	Element Analyzer Chlorine - Finished Product Water to PWPS	710-CPF-0009	1/26/2023	3	MONTHS	4/28/2023
9284	540-SWGR-125VDC Inspect Batteries & Monitor	12711	540 RO Electric 12KV Switchgear 125 VDC Battery Syst	540-SWG12000	6/8/2022	1	YEARS	6/4/2023
9283	815-SWGR-125VDC Inspect Batteries & Monitor	12712	815 12KV Switchgear 125 VDC Battery System	815-SWG-8001B	6/8/2022	1	YEARS	6/3/2023
3253	Ammonia Sensor Replacement 1 YR 450-AE-2185	13663	Element Analyzer Ammonia	450-CPF-0001	2/7/2023	10	MONTHS	12/1/2023
3204	Area 450 Ammonia Analyzer Weekly	13662	RO Feed Ammonia Analyzer 450-AIT-2185	450-CPF-0001	2/23/2023	1	WEEKS	3/7/2023
3055	AVFM Enclosure PM 100-FIT-5020-East MF CIP Tank E01	17320	Transmitter Flow Indicating - East MF CIP Tank E01	100-PIP-SW	9/19/2022	6	MONTHS	3/14/2023
3056	AVFM Enclosure PM on 100-FIT-5500-160 Bldg South Wal	17345	Transmitter Flow Indicating - south side of 160 building	100-PIP-SD-SITE-MAIN	9/26/2022	6	MONTHS	3/16/2023
3053	AVFM Enclosure PM on 100-FIT-5530-910 Bldg. North Wal	17341	Transmitter Flow Indicating - north side 910 building	100-PIP-SD-SITE-MAIN	9/26/2022	6	MONTHS	3/15/2023
9779	Bi-Weekly Flush M9 Portable TOC Feed Analyzer	13954	Portable M9 TOC Analyzer No.1 RO Feed	510-B02-RO-2200	2/22/2023	2	WEEKS	3/6/2023
2290	Block, Bleed and Check Zero - A01-DPIT-0405 Every 6 MO	4463	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA1	1/3/2023	6	MONTHS	7/7/2023
2291	Block, Bleed and Check Zero -A02- DPIT-0405 Every 6 MO	4473	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA2	7/25/2022	1	YEARS	7/7/2023
2292	Block, Bleed and Check Zero -A03- DPIT-0405 Every 6 MO	4483	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA3	7/25/2022	1	YEARS	7/7/2023
2293	Block, Bleed and Check Zero -A04- DPIT-0405 Every 6 MO	4493	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA4	7/25/2022	1	YEARS	7/7/2023
2294	Block, Bleed and Check Zero -A05- DPIT-0405 Every 6 MO	4503	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA5	7/19/2022	1	YEARS	7/21/2023
2295	Block, Bleed and Check Zero -A06- DPIT-0405 Every 6 MO	4513	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA6	7/19/2022	1	YEARS	7/21/2023
2296	Block, Bleed and Check Zero -A07- DPIT-0405 Every 6 MO	4523	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA7	7/19/2022	1	YEARS	7/21/2023
2297	Block, Bleed and Check Zero -A08- DPIT-0405 Every 6 MO	4533	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA8	7/19/2022	1	YEARS	7/21/2023
2298	Block, Bleed and Check Zero -B01- DPIT-0405 Every 6 MO	4545	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB1	8/23/2022	1	YEARS	8/3/2023
2299	Block, Bleed and Check Zero -B02- DPIT-0405 Every 6 MO	4553	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB2	8/23/2022	1	YEARS	8/3/2023
2300	Block, Bleed and Check Zero -B03- DPIT-0405 Every 6 MO	4561	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB3	8/23/2022	1	YEARS	8/3/2023
2301	Block, Bleed and Check Zero -B04- DPIT-0405 Every 6 MO	5771	Valve Ball 1/2"	216-PIP-PA-MEMDE	8/23/2022	1	YEARS	8/3/2023
2302	Block, Bleed and Check Zero -B05- DPIT-0405 Every 6 MO	4581	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB5	8/16/2022	1	YEARS	8/17/2023
2303	Block, Bleed and Check Zero -B06- DPIT-0405 Every 6 MO	4591	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB6	8/16/2022	1	YEARS	8/17/2023
2304	Block, Bleed and Check Zero -B07- DPIT-0405 Every 6 MO	4601	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB7	8/16/2022	1	YEARS	8/17/2023
2305	Block, Bleed and Check Zero -B08- DPIT-0405 Every 6 MO	4611	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB8	8/16/2022	1	YEARS	8/17/2023
2306	Block, Bleed and Check Zero -D01- DPIT-0405 Every 6 MO	4623	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD1	8/23/2022	1	YEARS	8/3/2023
2307	Block, Bleed and Check Zero -D02- DPIT-0405 Every 6 MO	4633	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD2	8/23/2022	1	YEARS	8/3/2023
2308	Block, Bleed and Check Zero -D03- DPIT-0405 Every 6 MO	4643	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD3	8/23/2022	1	YEARS	8/3/2023
2309	Block, Bleed and Check Zero -D04- DPIT-0405 Every 6 MO	4653	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD4	8/23/2022	1	YEARS	8/3/2023
2310	Block, Bleed and Check Zero -D05- DPIT-0405 Every 6 MO	4663	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD5	8/17/2022	1	YEARS	8/17/2023
2311	Block, Bleed and Check Zero -D06- DPIT-0405 Every 6 MO	4673	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD6	8/17/2022	1	YEARS	8/17/2023
2312	Block, Bleed and Check Zero -D07- DPIT-0405 Every 6 MO	4683	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD7	8/17/2022	1	YEARS	8/17/2023
2313	Block, Bleed and Check Zero -D08- DPIT-0405 Every 6 MO	4693	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD8	8/17/2022	1	YEARS	8/17/2023
2314	Block, Bleed and Check Zero -E01- DPIT-0405 Every 6 MO	4705	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEME1	8/17/2022	1	YEARS	8/17/2023
2315	Block, Bleed and Check Zero -E02- DPIT-0405 Every 6 MO	4715	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEME2	8/17/2022	1	YEARS	8/17/2023
3507	Block, Bleed, and Check Zero - C01-DPIT-0405 6 MO	30335	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC1	8/29/2022	1	YEARS	9/1/2023
3508	Block, Bleed, and Check Zero - C02-DPIT-0405 6 MO	30377	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC2	8/29/2022	1	YEARS	9/1/2023
3510	Block, Bleed, and Check Zero - C04-DPIT-0405 6 MO	30461	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC4	8/29/2022	1	YEARS	9/1/2023
3511	Block, Bleed, and Check Zero - C05-DPIT-0405 6 MO	30503	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC5	9/2/2022	1	YEARS	9/1/2023
3512	Block, Bleed, and Check Zero - C06-PDIT-0405 6 MO	30545	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC6	9/2/2022	1	YEARS	9/1/2023
3509	Block, Bleed, and Check Zero C03-DPIT-0405 6 MO	30419	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC3	8/29/2022	1	YEARS	9/1/2023
3513	Block, Bleed, and Check Zero C07-DPIT-0405 6 MO	30587	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC7	9/2/2022	1	YEARS	9/1/2023
3514	Block, Bleed, and Check Zero C08-DPIT-0405 6 MO	30629	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC8	9/2/2022	1	YEARS	9/1/2023
2866	Calibration of O2 Analyzer 750- AE-4040	8304	Element Analyzer Oxygen - North Building	750-CPF-0030	8/24/2022	6	MONTHS	8/22/2023
2867	Calibration of O2 Analyzer 750- AE-4045	8305	Element Analyzer Oxygen - South Building	750-CPF-0030	8/24/2022	6	MONTHS	8/22/2023
2868	Calibration of O2 Analyzer 750- AE-4050	8306	Element Analyzer Oxygen - North Trench	750-CPF-0030	8/25/2022	6	MONTHS	8/22/2023
2869	Calibration of O2 Analyzer 750- AE-4055	8307	Element Analyzer Oxygen - South Trench	750-CPF-0030	8/24/2022	6	MONTHS	8/22/2023
3519	Check Calibration of TIT-0420 MF Filtrate Train C Cell 5	30508	Transmitter Temperature Indicating	210-PIP-MFE-MEMC5	2/9/2023	6	MONTHS	8/10/2023
3561	Check Calibration of BFV-0460 MF Filtrate Train C Cell 2	34318	Actuator	210-PIP-MFE-MEMC2	6/17/2022	1	YEARS	6/1/2023
3562	Check Calibration of BFV-0460 MF Filtrate Train C Cell 3	34319	Actuator	210-PIP-MFE-MEMC3	6/17/2022	1	YEARS	6/1/2023
3563	Check Calibration of BFV-0460 MF Filtrate Train C Cell 4	34320	Actuator	210-PIP-MFE-MEMC4	6/17/2022	1	YEARS	6/1/2023
3564	Check Calibration of BFV-0460 MF Filtrate Train C Cell 5	34321	Actuator	210-PIP-MFE-MEMC5	6/3/2022	1	YEARS	6/1/2023
3565	Check Calibration of BFV-0460 MF Filtrate Train C Cell 6	34322	Actuator	210-PIP-MFE-MEMC6	6/3/2022	1	YEARS	6/1/2023
3566	Check Calibration of BFV-0460 MF Filtrate Train C Cell 7	30609	Valve Butterfly 12"	210-PIP-MFE-MEMC7	6/3/2022	1	YEARS	6/1/2023
3567	Check Calibration of BFV-0460 MF Filtrate Train C Cell 8	30651	Valve Butterfly 12"	210-PIP-MFE-MEMC8	6/3/2022	1	YEARS	6/1/2023
3560	Check Calibration of BFV-0460 MF Filtrate Train C Cell1	34317	Actuator	210-PIP-MFE-MEMC1	6/17/2022	1	YEARS	6/1/2023
3642	Check Calibration of BFV-0460 MF Filtrate Train E Cell 3	34325	Actuator	210-PIP-MFE-MEME3	7/13/2022	1	YEARS	7/4/2023
3643	Check Calibration of BFV-0460 MF Filtrate Train E Cell 4	34326	Actuator	210-PIP-MFE-MEME4	7/13/2022	1	YEARS	7/4/2023
7560	Check Calibration of BFV-0460, MF Filtrate Train A Cell 1	3044	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA1	10/20/2022	1	YEARS	10/17/2023
7561	Check Calibration of BFV-0460, MF Filtrate Train A Cell 2	3095	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA2	10/20/2022	1	YEARS	10/17/2023

PMNUM	DESCRIPTION	ASSETNUM	ASSETDESC	LOCATION	LASTCOMPDATE	FREQUENCY	FREQUNIT	NEXTDATE
7562	Check Calibration of BFV-0460, MF Filtrate Train A Cell 3	3146	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA3	10/20/2022	1	YEARS	10/17/2023
7563	Check Calibration of BFV-0460, MF Filtrate Train A Cell 4	3197	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA4	10/20/2022	1	YEARS	10/17/2023
7564	Check Calibration of BFV-0460, MF Filtrate Train A Cell 5	3248	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA5	10/25/2022	1	YEARS	10/23/2023
7565	Check Calibration of BFV-0460, MF Filtrate Train A Cell 6	3299	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA6	10/25/2022	1	YEARS	10/23/2023
7566	Check Calibration of BFV-0460, MF Filtrate Train A Cell 7	3350	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA7	10/25/2022	1	YEARS	10/23/2023
7567	Check Calibration of BFV-0460, MF Filtrate Train A Cell 8	3401	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA8	10/25/2022	1	YEARS	10/23/2023
7568	Check Calibration of BFV-0460, MF Filtrate Train B Cell 1	3474	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB1	11/1/2022	1	YEARS	11/3/2023
7569	Check Calibration of BFV-0460, MF Filtrate Train B Cell 2	3525	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB2	11/1/2022	1	YEARS	11/3/2023
7570	Check Calibration of BFV-0460, MF Filtrate Train B Cell 3	3576	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB3	11/1/2022	1	YEARS	11/3/2023
7571	Check Calibration of BFV-0460, MF Filtrate Train B Cell 4	3627	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB4	11/1/2022	1	YEARS	11/3/2023
7572	Check Calibration of BFV-0460, MF Filtrate Train B Cell 5	3678	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB5	11/17/2022	1	YEARS	11/19/2023
7573	Check Calibration of BFV-0460, MF Filtrate Train B Cell 6	3729	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB6	11/17/2022	1	YEARS	11/19/2023
7574	Check Calibration of BFV-0460, MF Filtrate Train B Cell 7	3780	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB7	11/17/2022	1	YEARS	11/19/2023
7575	Check Calibration of BFV-0460, MF Filtrate Train B Cell 8	3831	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB8	11/17/2022	1	YEARS	11/19/2023
7576	Check Calibration of BFV-0460, MF Filtrate Train D Cell 1	3904	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD1	11/30/2022	1	YEARS	11/26/2023
7577	Check Calibration of BFV-0460, MF Filtrate Train D Cell 2	3955	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD2	11/30/2022	1	YEARS	11/26/2023
7578	Check Calibration of BFV-0460, MF Filtrate Train D Cell 3	4006	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD3	11/30/2022	1	YEARS	11/26/2023
7579	Check Calibration of BFV-0460, MF Filtrate Train D Cell 4	4057	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD4	11/30/2022	1	YEARS	11/26/2023
7580	Check Calibration of BFV-0460, MF Filtrate Train D Cell 5	4108	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD5	12/9/2022	1	YEARS	12/9/2023
7581	Check Calibration of BFV-0460, MF Filtrate Train D Cell 6	4159	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD6	12/9/2022	1	YEARS	12/9/2023
7582	Check Calibration of BFV-0460, MF Filtrate Train D Cell 7	4210	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD7	12/9/2022	1	YEARS	12/9/2023
7583	Check Calibration of BFV-0460, MF Filtrate Train D Cell 8	4261	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD8	12/9/2022	1	YEARS	12/9/2023
7584	Check Calibration of BFV-0460, MF Filtrate Train E Cell 1	4324	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEME1	12/19/2022	1	YEARS	12/17/2023
7585	Check Calibration of BFV-0460, MF Filtrate Train E Cell 2	4375	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEME2	12/19/2022	1	YEARS	12/17/2023
7390	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 1 MFE	3007	Transmitter Level Indicating	210-A01-TNK-0340	3/16/2022	1	YEARS	3/9/2023
7391	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 2 MFE	3058	Transmitter Level Indicating	210-A02-TNK-0340	3/16/2022	1	YEARS	3/9/2023
7392	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 3 MFE	3109	Transmitter Level Indicating	210-A03-TNK-0340	3/16/2022	1	YEARS	3/9/2023
7393	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 4 MFE	3160	Transmitter Level Indicating	210-A04-TNK-0340	3/16/2022	1	YEARS	3/9/2023
7394	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 5 MFE	3211	Transmitter Level Indicating	210-A05-TNK-0340	3/17/2022	1	YEARS	3/16/2023
7395	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 6 MFE	3262	Transmitter Level Indicating	210-A06-TNK-0340	3/17/2022	1	YEARS	3/16/2023
7396	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 7 MFE	3313	Transmitter Level Indicating	210-A07-TNK-0340	3/17/2022	1	YEARS	3/16/2023
7397	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 8 MFE	3364	Transmitter Level Indicating	210-A08-TNK-0340	3/17/2022	1	YEARS	3/16/2023
7398	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 1 MFE	3437	Transmitter Level Indicating	210-B01-TNK-0340	3/22/2022	1	YEARS	3/23/2023
7399	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 2 MFE	3488	Transmitter Level Indicating	210-B02-TNK-0340	3/22/2022	1	YEARS	3/23/2023
7400	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 3 MFE	3539	Transmitter Level Indicating	210-B03-TNK-0340	3/22/2022	1	YEARS	3/23/2023
7401	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 4 MFE	3590	Transmitter Level Indicating	210-B04-TNK-0340	3/22/2022	1	YEARS	3/23/2023
7402	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 5 MFE	3641	Transmitter Level Indicating	210-B05-TNK-0340	3/31/2022	1	YEARS	3/30/2023
7403	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 6 MFE	3692	Transmitter Level Indicating	210-B06-TNK-0340	3/31/2022	1	YEARS	3/30/2023
7404	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 7 MFE	3743	Transmitter Level Indicating	210-B07-TNK-0340	3/31/2022	1	YEARS	3/30/2023
7405	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 8 MFE	3794	Transmitter Level Indicating	210-B08-TNK-0340	4/1/2022	1	YEARS	3/30/2023
3537	Check Calibration of Cell Level Transmitter LIT-0345 Train C Cell 1 MFE	30331	Transmitter Level Indicating	210-C01-TNK-0340	3/16/2022	1	YEARS	3/14/2023
3538	Check Calibration of Cell Level Transmitter LIT-0345 Train C Cell 2 MFE	30373	Transmitter Level Indicating	210-C02-TNK-0340	3/16/2022	1	YEARS	3/14/2023
3539	Check Calibration of Cell Level Transmitter LIT-0345 Train C Cell 3 MFE	30415	Transmitter Level Indicating	210-C03-TNK-0340	3/16/2022	1	YEARS	3/14/2023
3540	Check Calibration of Cell Level Transmitter LIT-0345 Train C Cell 4 MFE	30457	Transmitter Level Indicating	210-C04-TNK-0340	3/16/2022	1	YEARS	3/14/2023
3541	Check Calibration of Cell Level Transmitter LIT-0345 Train C Cell 5 MFE	30499	Transmitter Level Indicating	210-C05-TNK-0340	3/16/2022	1	YEARS	3/14/2023
3543	Check Calibration of Cell Level transmitter LIT-0345 Train C Cell 7 MFE	30583	Transmitter Level Indicating	210-C07-TNK-0340	3/16/2022	1	YEARS	3/14/2023
3544	Check Calibration of Cell Level Transmitter LIT-0345 Train C Cell 8 MFE	30625	Transmitter Level Indicating	210-C08-TNK-0340	3/16/2022	1	YEARS	3/14/2023
3542	Check Calibration of Cell Level Transmitter LIT-0345 Train C Cell6 MFE	30541	Transmitter Level Indicating	210-C06-TNK-0340	3/16/2022	1	YEARS	3/14/2023
7406	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 1 MFW	3867	Transmitter Level Indicating	210-D01-TNK-0340	4/7/2022	1	YEARS	4/7/2023
7407	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 2 MFW	3918	Transmitter Level Indicating	210-D02-TNK-0340	4/7/2022	1	YEARS	4/7/2023
7408	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 3 MFW	3969	Transmitter Level Indicating	210-D03-TNK-0340	4/7/2022	1	YEARS	4/7/2023
7409	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 4 MFW	4020	Transmitter Level Indicating	210-D04-TNK-0340	4/7/2022	1	YEARS	4/7/2023
7410	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 5 MFW	4071	Transmitter Level Indicating	210-D05-TNK-0340	4/19/2022	1	YEARS	4/14/2023
7411	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 6 MFW	4122	Transmitter Level Indicating	210-D06-TNK-0340	4/19/2022	1	YEARS	4/14/2023
7412	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 7 MFW	4173	Transmitter Level Indicating	210-D07-TNK-0340	4/19/2022	1	YEARS	4/14/2023
7413	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 8 MFW	4224	Transmitter Level Indicating	210-D08-TNK-0340	4/19/2022	1	YEARS	4/14/2023
7414	Check calibration of Cell Level Transmitter LIT-0345 Train E Cell 1 MFW	4287	Transmitter Level Indicating	210-E01-TNK-0340	4/25/2022	1	YEARS	4/21/2023
7415	Check calibration of Cell Level Transmitter LIT-0345 Train E Cell 2 MFW	4338	Transmitter Level Indicating	210-E02-TNK-0340	4/25/2022	1	YEARS	4/21/2023
3648	Check Calibration of Cell Level Transmitter LIT-0345 Train E Cell 3	30202	Transmitter Level Indicating	210-E03-TNK-0340	6/9/2022	1	YEARS	6/6/2023
3649	Check Calibration of Cell Level Transmitter LIT-0345 Train E Cell 4	30242	Transmitter Level Indicating	210-E04-TNK-0340	6/9/2022	1	YEARS	6/6/2023
3569	Check Calibration of DPIT-0405 Train C Cell 1	30335	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC1	5/6/2022	1	YEARS	5/2/2023
3570	Check Calibration of DPIT-0405 Train C Cell 2	30377	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC2	5/6/2022	1	YEARS	5/2/2023
3571	Check Calibration of DPIT-0405 Train C Cell 3	30419	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC3	5/6/2022	1	YEARS	5/2/2023

PMNUM	DESCRIPTION	ASSETNUM	ASSETDESC	LOCATION	LASTCOMPDATE	FREQUENCY	FREQUNIT	NEXTDATE
3572	Check Calibration of DPIT-0405 Train C Cell 4	30461	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC4	5/6/2022	1	YEARS	5/2/2023
3573	Check Calibration of DPIT-0405 Train C Cell 5	30503	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC5	5/6/2022	1	YEARS	5/2/2023
3574	Check Calibration of DPIT-0405 Train C Cell 6	30545	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC6	5/6/2022	1	YEARS	5/2/2023
3575	Check Calibration of DPIT-0405 Train C Cell 7	30587	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC7	5/11/2022	1	YEARS	5/2/2023
3576	Check Calibration of DPIT-0405 Train C Cell 8	30629	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC8	5/11/2022	1	YEARS	5/2/2023
3652	Check Calibration of DPIT-0405 Train E Cell 3	30206	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEME3	6/9/2022	1	YEARS	6/1/2023
3653	Check Calibration of DPIT-0405 Train E Cell 4	30246	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEME4	6/9/2022	1	YEARS	6/1/2023
7350	Check calibration of DPIT-0405, Train A Cell 1 MFE	4463	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA1	12/7/2022	1	YEARS	12/7/2023
7351	Check calibration of DPIT-0405, Train A Cell 2 MFE	4473	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA2	12/9/2022	1	YEARS	12/7/2023
7352	Check calibration of DPIT-0405, Train A Cell 3 MFE	4483	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA3	12/9/2022	1	YEARS	12/7/2023
7353	Check calibration of DPIT-0405, Train A Cell 4 MFE	4493	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA4	12/7/2022	1	YEARS	12/7/2023
7354	Check calibration of DPIT-0405, Train A Cell 5 MFE	4503	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA5	1/12/2023	1	YEARS	1/4/2024
7355	Check calibration of DPIT-0405, Train A Cell 6 MFE	4513	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA6	1/12/2023	1	YEARS	1/4/2024
7356	Check calibration of DPIT-0405, Train A Cell 7 MFE	4523	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA7	1/12/2023	1	YEARS	1/4/2024
7357	Check calibration of DPIT-0405, Train A Cell 8 MFE	4533	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA8	1/12/2023	1	YEARS	1/4/2024
7358	Check calibration of DPIT-0405, Train B Cell 1 MFE	4545	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB1	2/7/2023	1	YEARS	1/18/2024
7359	Check calibration of DPIT-0405, Train B Cell 2 MFE	4553	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB2	2/7/2023	1	YEARS	1/18/2024
7360	Check calibration of DPIT-0405, Train B Cell 3 MFE	4561	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB3	2/7/2023	1	YEARS	1/18/2024
7361	Check calibration of DPIT-0405, Train B Cell 4 MFE	4571	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB4	2/7/2023	1	YEARS	1/18/2024
7362	Check calibration of DPIT-0405, Train B Cell 5 MFE	4581	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB5	2/9/2023	1	YEARS	2/8/2024
7363	Check calibration of DPIT-0405, Train B Cell 6 MFE	4591	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB6	2/9/2023	1	YEARS	2/8/2024
7364	Check calibration of DPIT-0405, Train B Cell 7 MFE	4601	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB7	2/9/2023	1	YEARS	2/8/2024
7365	Check calibration of DPIT-0405, Train B Cell 8 MFE	4611	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB8	2/9/2023	1	YEARS	2/8/2024
7366	Check calibration of DPIT-0405, Train D Cell 1 MFW	4623	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD1	2/23/2022	1	YEARS	2/22/2024
7367	Check calibration of DPIT-0405, Train D Cell 2 MFW	4633	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD2	2/23/2022	1	YEARS	2/22/2024
7368	Check calibration of DPIT-0405, Train D Cell 3 MFW	4643	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD3	2/23/2022	1	YEARS	2/22/2024
7369	Check calibration of DPIT-0405, Train D Cell 4 MFW	4653	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD4	2/23/2022	1	YEARS	2/22/2024
7370	Check calibration of DPIT-0405, Train D Cell 5 MFW	4663	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD5	3/9/2022	1	YEARS	3/8/2023
7371	Check calibration of DPIT-0405, Train D Cell 6 MFW	4673	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD6	3/9/2022	1	YEARS	3/8/2023
7372	Check calibration of DPIT-0405, Train D Cell 7 MFW	4683	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD7	3/9/2022	1	YEARS	3/8/2023
7373	Check calibration of DPIT-0405, Train D Cell 8 MFW	4693	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD8	3/9/2022	1	YEARS	3/8/2023
7374	Check calibration of DPIT-0405, Train E Cell 1 MFW	4705	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEME1	3/9/2022	1	YEARS	3/8/2023
7375	Check calibration of DPIT-0405, Train E Cell 2 MFW	4715	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEME2	3/9/2022	1	YEARS	3/8/2023
7713	Check Calibration of LIT-1207, MF CIP Tank A01	5830	Transmitter Level Indicating 0 - 12 FT	220-A01-TNK-1200	7/6/2022	1	YEARS	7/9/2023
7714	Check Calibration of LIT-1207, MF CIP Tank B01	5847	Transmitter Level Indicating 0 - 12 FT	220-B01-TNK-1200	7/6/2022	1	YEARS	7/9/2023
7715	Check Calibration of LIT-1207, MF CIP Tank D01	5864	Transmitter Level Indicating 0 - 12 FT	220-D01-TNK-1200	7/8/2022	1	YEARS	7/9/2023
7716	Check Calibration of LIT-1207, MF CIP Tank E01	5881	Transmitter Level Indicating 0 - 12 FT	220-E01-TNK-1200	7/8/2022	1	YEARS	7/9/2023
3568	Check Calibration of PIT-0454 MF Effluent Train C Cell 3	30437	Transmitter Pressure Indicating	210-PIP-MFE-MEMC3	8/24/2021	2	YEARS	8/5/2023
3644	Check Calibration of PIT-0454 MF Effluent Train E Cell 3	30222	Transmitter Pressure Indication	210-PIP-MFE-MEME3	6/29/2021	2	YEARS	6/5/2023
3645	Check Calibration of PIT-0454 MF Effluent Train E Cell 4	30262	Transmitter Pressure Indication	210-PIP-MFE-MEME4	6/29/2021	2	YEARS	6/5/2023
7515	Check Calibration of PIT-0454, MF Effluent Train A Cell 1	3051	Transmitter Pressure Indicating	210-PIP-MFE-MEMA1	11/10/2021	2	YEARS	11/4/2023
7516	Check Calibration of PIT-0454, MF Effluent Train A Cell 2	3102	Transmitter Pressure Indicating	210-PIP-MFE-MEMA2	11/10/2021	2	YEARS	11/4/2023
7517	Check Calibration of PIT-0454, MF Effluent Train A Cell 3	3153	Transmitter Pressure Indicating	210-PIP-MFE-MEMA3	11/10/2021	2	YEARS	11/4/2023
7518	Check Calibration of PIT-0454, MF Effluent Train A Cell 4	3204	Transmitter Pressure Indicating	210-PIP-MFE-MEMA4	11/10/2021	2	YEARS	11/4/2023
7519	Check Calibration of PIT-0454, MF Effluent Train A Cell 5	3255	Transmitter Pressure Indicating	210-PIP-MFE-MEMA5	11/12/2021	2	YEARS	11/11/2023
7520	Check Calibration of PIT-0454, MF Effluent Train A Cell 6	3306	Transmitter Pressure Indicating	210-PIP-MFE-MEMA6	11/12/2021	2	YEARS	11/11/2023
7521	Check Calibration of PIT-0454, MF Effluent Train A Cell 7	3357	Transmitter Pressure Indicating	210-PIP-MFE-MEMA7	11/12/2021	2	YEARS	11/11/2023
7522	Check Calibration of PIT-0454, MF Effluent Train A Cell 8	3408	Transmitter Pressure Indicating	210-PIP-MFE-MEMA8	11/12/2021	2	YEARS	11/11/2023
7523	Check Calibration of PIT-0454, MF Effluent Train B Cell 1	3481	Transmitter Pressure Indicating	210-PIP-MFE-MEMB1	11/18/2021	2	YEARS	11/18/2023
7524	Check Calibration of PIT-0454, MF Effluent Train B Cell 2	3532	Transmitter Pressure Indicating	210-PIP-MFE-MEMB2	11/18/2021	2	YEARS	11/18/2023
7525	Check Calibration of PIT-0454, MF Effluent Train B Cell 3	3583	Transmitter Pressure Indicating	210-PIP-MFE-MEMB3	11/18/2021	2	YEARS	11/18/2023
7526	Check Calibration of PIT-0454, MF Effluent Train B Cell 4	3634	Transmitter Pressure Indicating	210-PIP-MFE-MEMB4	11/18/2021	2	YEARS	11/18/2023
7527	Check Calibration of PIT-0454, MF Effluent Train B Cell 5	3685	Transmitter Pressure Indicating	210-PIP-MFE-MEMB5	11/30/2021	2	YEARS	11/25/2023
7528	Check Calibration of PIT-0454, MF Effluent Train B Cell 6	3736	Transmitter Pressure Indicating	210-PIP-MFE-MEMB6	11/30/2021	2	YEARS	11/25/2023
7529	Check Calibration of PIT-0454, MF Effluent Train B Cell 7	3787	Transmitter Pressure Indicating	210-PIP-MFE-MEMB7	11/30/2021	2	YEARS	11/25/2023
7538	Check Calibration of PIT-0454, MF Effluent Train B Cell 8	3838	Transmitter Pressure Indicating	210-PIP-MFE-MEMB8	11/30/2021	2	YEARS	11/25/2023
3552	Check Calibration of PIT-0454, MF Effluent Train C Cell 1	30353	Transmitter Pressure Indication	210-PIP-MFE-MEMC1	7/30/2021	2	YEARS	8/1/2023
3553	Check Calibration of PIT-0454, MF Effluent Train C Cell 2	30395	Transmitter Pressure Indication	210-PIP-MFE-MEMC2	7/30/2021	2	YEARS	8/1/2023
3555	Check Calibration of PIT-0454, MF Effluent Train C Cell 4	30479	Transmitter Pressure Indicating	210-PIP-MFE-MEMC4	7/30/2021	2	YEARS	8/1/2023
3556	Check Calibration of PIT-0454, MF Effluent Train C Cell 5	30521	Transmitter Pressure Indicating	210-PIP-MFE-MEMC5	7/30/2021	2	YEARS	8/1/2023
3557	Check Calibration of PIT-0454, MF Effluent Train C Cell 6	30563	Transmitter Pressure Indicating	210-PIP-MFE-MEMC6	7/30/2021	2	YEARS	8/1/2023
3558	Check Calibration of PIT-0454, MF Effluent Train C Cell 7	30605	Transmitter Pressure Indicating	210-PIP-MFE-MEMC7	7/29/2021	2	YEARS	8/1/2023
3559	Check Calibration of PIT-0454, MF Effluent Train C Cell 8	30647	Transmitter Pressure Indicating	210-PIP-MFE-MEMC8	7/29/2021	2	YEARS	8/1/2023

PMNUM	DESCRIPTION	ASSETNUM	ASSETDESC	LOCATION	LASTCOMPDATE	FREQUENCY	FREQUNIT	NEXTDATE
7530	Check Calibration of PIT-0454, MF Effluent Train D Cell 1	3911	Transmitter Pressure Indicating	210-PIP-MFE-MEMD1	11/30/2021	2	YEARS	12/2/2023
7531	Check Calibration of PIT-0454, MF Effluent Train D Cell 2	3962	Transmitter Pressure Indicating	210-PIP-MFE-MEMD2	11/30/2021	2	YEARS	12/2/2023
7532	Check Calibration of PIT-0454, MF Effluent Train D Cell 3	4013	Transmitter Pressure Indicating	210-PIP-MFE-MEMD3	11/30/2021	2	YEARS	12/2/2023
7533	Check Calibration of PIT-0454, MF Effluent Train D Cell 4	4064	Transmitter Pressure Indicating	210-PIP-MFE-MEMD4	11/30/2021	2	YEARS	12/2/2023
7534	Check Calibration of PIT-0454, MF Effluent Train D Cell 5	4115	Transmitter Pressure Indicating	210-PIP-MFE-MEMD5	12/15/2021	2	YEARS	12/9/2023
7535	Check Calibration of PIT-0454, MF Effluent Train D Cell 6	4166	Transmitter Pressure Indicating	210-PIP-MFE-MEMD6	12/15/2021	2	YEARS	12/9/2023
7536	Check Calibration of PIT-0454, MF Effluent Train D Cell 7	4217	Transmitter Pressure Indicating	210-PIP-MFE-MEMD7	12/15/2021	2	YEARS	12/9/2023
7537	Check Calibration of PIT-0454, MF Effluent Train D Cell 8	4268	Transmitter Pressure Indicating	210-PIP-MFE-MEMD8	12/15/2021	2	YEARS	12/9/2023
7539	Check Calibration of PIT-0454, MF Effluent Train E Cell 1	4331	Transmitter Pressure Indicating	210-PIP-MFE-MEME1	12/20/2021	2	YEARS	12/16/2023
7540	Check Calibration of PIT-0454, MF Effluent Train E Cell 2	4382	Transmitter Pressure Indicating	210-PIP-MFE-MEME2	12/20/2021	2	YEARS	12/16/2023
7550	Check Calibration of PIT-0471, MF Filtrate Header Train A Cells 1-4	2995	Transmitter Pressure Indicating	210-PIP-MFE-MEMA	12/1/2021	2	YEARS	11/27/2023
7551	Check Calibration of PIT-0471, MF Filtrate Header Train A Cells 5-8	3005	Transmitter Pressure Indicating	210-PIP-MFE-MEMA	12/1/2021	2	YEARS	11/27/2023
7552	Check Calibration of PIT-0471, MF Filtrate Header Train B Cells 1-4	3425	Transmitter Pressure Indicating	210-PIP-MFE-MEMB	12/1/2021	2	YEARS	11/27/2023
7553	Check Calibration of PIT-0471, MF Filtrate Header Train B Cells 5-8	3435	Transmitter Pressure Indicating	210-PIP-MFE-MEMB	12/1/2021	2	YEARS	11/27/2023
7554	Check Calibration of PIT-0471, MF Filtrate Header Train D Cells 1-4	3855	Transmitter Pressure Indicating	210-PIP-MFE-MEMD	12/9/2021	2	YEARS	11/27/2023
7556	Check Calibration of PIT-0471, MF Filtrate Header Train D Cells 5-8	3865	Transmitter Pressure Indicating	210-PIP-MFE-MEMD	12/9/2021	2	YEARS	11/27/2023
7557	Check Calibration of PIT-0471, MF Filtrate Header Train E Cells 1-4	4285	Transmitter Pressure Indicating	210-PIP-MFE-MEME	12/9/2021	2	YEARS	11/27/2023
7712	Check Calibration of PIT-0750, MF backwash - Do during plant shutdown	6922	Transmitter Pressure Indicating 0 - 60 psi	255-PIP-BW	12/7/2022	1	YEARS	11/24/2023
3515	Check Calibration of TIT-0420 MF Filtrate Train C Cell 1	30340	Transmitter Temperature Indicating	210-PIP-MFE-MEMC1	2/7/2023	6	MONTHS	8/10/2023
3516	Check Calibration of TIT-0420 MF Filtrate Train C Cell 2	30382	Transmitter Temperature Indicating	210-PIP-MFE-MEMC2	2/7/2023	6	MONTHS	8/10/2023
3517	Check Calibration of TIT-0420 MF Filtrate Train C Cell 3	30424	Transmitter Temperature Indicating	210-PIP-MFE-MEMC3	2/7/2023	6	MONTHS	8/10/2023
3518	Check Calibration of TIT-0420 MF Filtrate Train C Cell 4	30466	Transmitter Temperature Indicating	210-PIP-MFE-MEMC4	2/7/2023	6	MONTHS	8/10/2023
3520	Check Calibration of TIT-0420 MF Filtrate Train C Cell 6	30550	Transmitter Temperature Indicating	210-PIP-MFE-MEMC6	2/9/2023	6	MONTHS	8/10/2023
3521	Check Calibration of TIT-0420 MF Filtrate Train C Cell 7	30592	Transmitter Temperature Indicating	210-PIP-MFE-MEMC7	2/9/2023	6	MONTHS	8/10/2023
3522	Check Calibration of TIT-0420 MF Filtrate Train C Cell 8	30634	Transmitter Temperature Indicating	210-PIP-MFE-MEMC8	2/9/2023	6	MONTHS	8/10/2023
3640	Check Calibration of TIT-0420 MF Filtrate Train E Cell 3	30211	Transmitter Temperature Indicating	210-PIP-MFE-MEME3	11/18/2022	6	MONTHS	5/23/2023
3641	Check Calibration of TIT-0420 MF Flitrate Train E Cell 4	30251	Transmitter Temperature Indicating	210-PIP-MFE-MEME4	11/18/2022	6	MONTHS	5/23/2023
7595	Check Calibration of TIT-0420, MF Filtrate Train A Cell 1	3056	Transmitter Temperature Indicating	210-PIP-MFE-MEMA1	1/3/2023	6	MONTHS	7/7/2023
7596	Check Calibration of TIT-0420, MF Filtrate Train A Cell 2	3107	Transmitter Temperature Indicating	210-PIP-MFE-MEMA2	9/9/2022	6	MONTHS	3/9/2023
7597	Check Calibration of TIT-0420, MF Filtrate Train A Cell 3	3158	Transmitter Temperature Indicating	210-PIP-MFE-MEMA3	9/9/2022	6	MONTHS	3/9/2023
7598	Check Calibration of TIT-0420, MF Filtrate Train A Cell 4	3209	Transmitter Temperature Indicating	210-PIP-MFE-MEMA4	9/9/2022	6	MONTHS	3/9/2023
7599	Check Calibration of TIT-0420, MF Filtrate Train A Cell 5	3260	Transmitter Temperature Indicating	210-PIP-MFE-MEMA5	10/4/2022	6	MONTHS	3/16/2023
7600	Check Calibration of TIT-0420, MF Filtrate Train A Cell 6	3311	Transmitter Temperature Indicating	210-PIP-MFE-MEMA6	10/7/2022	6	MONTHS	3/16/2023
7601	Check Calibration of TIT-0420, MF Filtrate Train A Cell 7	3362	Transmitter Temperature Indicating	210-PIP-MFE-MEMA7	10/7/2022	6	MONTHS	3/16/2023
7602	Check Calibration of TIT-0420, MF Filtrate Train A Cell 8	3413	Transmitter Temperature Indicating	210-PIP-MFE-MEMA8	10/7/2022	6	MONTHS	3/16/2023
7603	Check Calibration of TIT-0420, MF Filtrate Train B Cell 1	3486	Transmitter Temperature Indicating	210-PIP-MFE-MEMB1	9/27/2022	6	MONTHS	3/23/2023
7604	Check Calibration of TIT-0420, MF Filtrate Train B Cell 2	3537	Transmitter Temperature Indicating	210-PIP-MFE-MEMB2	9/27/2022	6	MONTHS	3/23/2023
7605	Check Calibration of TIT-0420, MF Filtrate Train B Cell 3	3588	Transmitter Temperature Indicating	210-PIP-MFE-MEMB3	9/27/2022	6	MONTHS	3/23/2023
7606	Check Calibration of TIT-0420, MF Filtrate Train B Cell 4	3639	Transmitter Temperature Indicating	210-PIP-MFE-MEMB4	9/27/2022	6	MONTHS	3/23/2023
7607	Check Calibration of TIT-0420, MF Filtrate Train B Cell 5	3690	Transmitter Temperature Indicating	210-PIP-MFE-MEMB5	10/4/2022	6	MONTHS	3/30/2023
7608	Check Calibration of TIT-0420, MF Filtrate Train B Cell 6	3741	Transmitter Temperature Indicating	210-PIP-MFE-MEMB6	10/4/2022	6	MONTHS	3/30/2023
7609	Check Calibration of TIT-0420, MF Filtrate Train B Cell 7	3792	Transmitter Temperature Indicating	210-PIP-MFE-MEMB7	10/4/2022	6	MONTHS	3/30/2023
7610	Check Calibration of TIT-0420, MF Filtrate Train B Cell 8	3843	Transmitter Temperature Indicating	210-PIP-MFE-MEMB8	1/3/2023	6	MONTHS	7/7/2023
7611	Check Calibration of TIT-0420, MF Filtrate Train D Cell 1	3916	Transmitter Temperature Indicating	210-PIP-MFE-MEMD1	10/7/2022	6	MONTHS	4/7/2023
7612	Check Calibration of TIT-0420, MF Filtrate Train D Cell 2	3967	Transmitter Temperature Indicating	210-PIP-MFE-MEMD2	10/7/2022	6	MONTHS	4/7/2023
7613	Check Calibration of TIT-0420, MF Filtrate Train D Cell 3	4018	Transmitter Temperature Indicating	210-PIP-MFE-MEMD3	10/7/2022	6	MONTHS	4/7/2023
7614	Check Calibration of TIT-0420, MF Filtrate Train D Cell 4	4069	Transmitter Temperature Indicating	210-PIP-MFE-MEMD4	10/7/2022	6	MONTHS	4/7/2023
7615	Check Calibration of TIT-0420, MF Filtrate Train D Cell 5	4120	Transmitter Temperature Indicating	210-PIP-MFE-MEMD5	10/14/2022	6	MONTHS	4/14/2023
7616	Check Calibration of TIT-0420, MF Filtrate Train D Cell 6	4171	Transmitter Temperature Indicating	210-PIP-MFE-MEMD6	10/14/2022	6	MONTHS	4/14/2023
7617	Check Calibration of TIT-0420, MF Filtrate Train D Cell 7	4222	Transmitter Temperature Indicating	210-PIP-MFE-MEMD7	10/14/2022	6	MONTHS	4/14/2023
7618	Check Calibration of TIT-0420, MF Filtrate Train D Cell 8	4273	Transmitter Temperature Indicating	210-PIP-MFE-MEMD8	10/14/2022	6	MONTHS	4/14/2023
7619	Check Calibration of TIT-0420, MF Filtrate Train E Cell 1	4336	Transmitter Temperature Indicating	210-PIP-MFE-MEME1	10/18/2022	6	MONTHS	4/21/2023
7620	Check Calibration of TIT-0420, MF Filtrate Train E Cell 2	4387	Transmitter Temperature Indicating	210-PIP-MFE-MEME2	10/21/2022	6	MONTHS	4/21/2023
7510	Check Calibration of Train Feed Valve A02-BFV-0320 MFE	4442	Valve Butterfly 60"	210-PIP-MFF-MEM	6/9/2022	12	MONTHS	6/11/2023
7511	Check Calibration of Train Feed Valve B02-BFV-0320 MFE	4445	Valve Butterfly 60"	210-PIP-MFF-MEM	6/9/2022	12	MONTHS	6/11/2023
3577	Check Calibration of Train Feed Valve C02-BFV-0320	34419	Actuator	210-PIP-MFF-MEM	6/8/2022	1	YEARS	6/1/2023
7512	Check Calibration of Train Feed Valve D02-BFV-0320 MFW	4448	Valve Butterfly 60"	210-PIP-MFF-MEM	6/9/2022	12	MONTHS	6/11/2023
7513	Check Calibration of Train Feed Valve E01-E02-BFV-0320 MFW	4451	Valve Butterfly 36"	210-PIP-MFF-MEM	6/9/2022	12	MONTHS	6/11/2023
7470	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 1 MFE	4460	Valve Butterfly 24"	210-PIP-MFF-MEMA1	3/9/2022	12	MONTHS	3/9/2023
7471	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 2 MFE	4470	Valve Butterfly 24"	210-PIP-MFF-MEMA2	3/9/2022	12	MONTHS	3/9/2023
7472	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 3 MFE	4480	Valve Butterfly 24"	210-PIP-MFF-MEMA3	3/9/2022	12	MONTHS	3/9/2023
7473	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 4 MFE	4490	Valve Butterfly 24"	210-PIP-MFF-MEMA4	3/9/2022	12	MONTHS	3/9/2023
7474	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 5 MFE	4500	Valve Butterfly 24"	210-PIP-MFF-MEMA5	3/18/2022	12	MONTHS	3/16/2023

PMNUM	DESCRIPTION	ASSETNUM	ASSETDESC	LOCATION	LASTCOMPDATE	FREQUENCY	FREQUNIT	NEXTDATE
7475	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 6 MFE	4510	Valve Butterfly 24"	210-PIP-MFF-MEMA6	3/18/2022	12	MONTHS	3/16/2023
7476	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 7 MFE	4520	Valve Butterfly 24"	210-PIP-MFF-MEMA7	3/18/2022	12	MONTHS	3/16/2023
7477	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 8 MFE	4530	Valve Butterfly 24"	210-PIP-MFF-MEMA8	3/18/2022	12	MONTHS	3/16/2023
7478	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 1 MFE	4542	Valve Butterfly 24"	210-PIP-MFF-MEMB1	4/5/2022	12	MONTHS	3/23/2023
7479	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 2 MFE	4550	Valve Butterfly 24"	210-PIP-MFF-MEMB2	4/5/2022	12	MONTHS	3/23/2023
7480	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 3 MFE	4558	Valve Butterfly 24"	210-PIP-MFF-MEMB3	4/5/2022	12	MONTHS	3/23/2023
7481	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 4 MFE	4568	Valve Butterfly 24"	210-PIP-MFF-MEMB4	4/5/2022	12	MONTHS	3/23/2023
7482	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 5 MFE	4578	Valve Butterfly 24"	210-PIP-MFF-MEMB5	4/4/2022	12	MONTHS	3/30/2023
7483	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 6 MFE	4588	Valve Butterfly 24"	210-PIP-MFF-MEMB6	4/4/2022	12	MONTHS	3/30/2023
7484	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 7 MFE	4598	Valve Butterfly 24"	210-PIP-MFF-MEMB7	4/4/2022	12	MONTHS	3/30/2023
7485	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 8 MFE	4608	Valve Butterfly 24"	210-PIP-MFF-MEMB8	4/4/2022	12	MONTHS	3/30/2023
3579	Check Calibration of Unit Feed Valve BFV-0330 Train C Cell 1	34399	Actuator	210-PIP-MFF-MEMC1	7/8/2022	1	YEARS	7/1/2023
3580	Check Calibration of Unit Feed Valve BFV-0330 Train C Cell 2	34400	Actuator	210-PIP-MFF-MEMC2	7/8/2022	1	YEARS	7/1/2023
3581	Check Calibration of Unit Feed Valve BFV-0330 Train C Cell 3	34401	Actuator	210-PIP-MFF-MEMC3	7/8/2022	1	YEARS	7/1/2023
3584	Check Calibration of Unit Feed Valve BFV-0330 Train C Cell 6	34404	Actuator	210-PIP-MFF-MEMC6	7/8/2022	1	YEARS	7/1/2023
3585	Check Calibration of Unit Feed Valve BFV-0330 Train C Cell 7	34405	Actuator	210-PIP-MFF-MEMC7	7/8/2022	1	YEARS	7/1/2023
3586	Check Calibration of Unit Feed Valve BFV-0330 Train C Cell 8	34406	Actuator	210-PIP-MFF-MEMC8	7/8/2022	1	YEARS	7/1/2023
3583	Check Calibration of Unit Feed Valve BFV-0330 Train C Cell5	34403	Actuator	210-PIP-MFF-MEMC5	7/8/2022	1	YEARS	7/1/2023
7486	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 1 MFW	4620	Valve Butterfly 24"	210-PIP-MFF-MEMD1	4/7/2022	12	MONTHS	4/7/2023
7487	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 2 MFW	4630	Valve Butterfly 24"	210-PIP-MFF-MEMD2	4/7/2022	12	MONTHS	4/7/2023
7488	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 3 MFW	4640	Valve Butterfly 24"	210-PIP-MFF-MEMD3	4/7/2022	12	MONTHS	4/7/2023
7489	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 4 MFW	4650	Valve Butterfly 24"	210-PIP-MFF-MEMD4	4/7/2022	12	MONTHS	4/7/2023
7490	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 5 MFW	4660	Valve Butterfly 24"	210-PIP-MFF-MEMD5	4/15/2022	12	MONTHS	4/14/2023
7491	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 6 MFW	4670	Valve Butterfly 24"	210-PIP-MFF-MEMD6	4/15/2022	12	MONTHS	4/14/2023
7492	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 7 MFW	4680	Valve Butterfly 24"	210-PIP-MFF-MEMD7	4/15/2022	12	MONTHS	4/14/2023
7493	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 8 MFW	4690	Valve Butterfly 24"	210-PIP-MFF-MEMD8	4/15/2022	12	MONTHS	4/14/2023
7494	Check Calibration of Unit Feed Valve BFV-0330 Train E Cell 1 MFW	4702	Valve Butterfly 24"	210-PIP-MFF-MEME1	4/27/2022	12	MONTHS	4/21/2023
7495	Check Calibration of Unit Feed Valve BFV-0330 Train E Cell 2 MFW	4712	Valve Butterfly 24"	210-PIP-MFF-MEME2	4/27/2022	12	MONTHS	4/21/2023
3646	Check Calibration of Unit Feed Valve BFV-0330 Train E Cell 3	34407	Actuator	210-PIP-MFF-MEME3	6/9/2022	1	YEARS	6/6/2023
3647	Check Calibration of Unit Feed Valve BFV-0330 Train E Cell 4	34408	Actuator	210-PIP-MFF-MEME4	6/9/2022	1	YEARS	6/6/2023
3554	Ckeck Calibration of PIT-0454, MF Effluent Train C Cell 3	30437	Transmitter Pressure Indicating	210-PIP-MFE-MEMC3	7/30/2021	2	YEARS	8/1/2023
9680	Clean & Calibrate MFE 250-AIT-0475 CL2 Analyzer	13934	MF Effluent Total Chlorine	250-PIP-MFE	2/22/2023	1	WEEKS	3/9/2023
2055	Element Analyzer Conductivity - RO Concentrate Train A Unit 1	12899	Element Analyzer Conductivity - RO Concentrate Train A Unit 1	510-A01-CPF-5101	12/28/2022	3	MONTHS	3/28/2023
2057	Element Analyzer Conductivity - RO Concentrate Train A Unit 2	12920	Element Analyzer Conductivity - RO Concentrate Train A Unit 2	510-A02-CPF-5101	2/14/2023	3	MONTHS	5/14/2023
2059	Element Analyzer Conductivity - RO Concentrate Train A Unit 3	12920	Element Analyzer Conductivity - RO Concentrate Train A Unit 2	510-A02-CPF-5101	2/14/2023	3	MONTHS	5/14/2023
2061	Element Analyzer Conductivity - RO Concentrate Train B Unit 1	12966	Element Analyzer Conductivity - RO Concentrate Train B Unit 1	510-B01-CPF-5101	1/4/2023	3	MONTHS	4/4/2023
2063	Element Analyzer Conductivity - RO Concentrate Train B Unit 2	12987	Element Analyzer Conductivity - RO Concentrate Train B Unit 2	510-B02-CPF-5101	2/14/2023	3	MONTHS	5/14/2023
2065	Element Analyzer Conductivity - RO Concentrate Train B Unit 3	13008	Element Analyzer Conductivity - RO Concentrate Train B Unit 3	510-B03-CPF-5101	2/23/2023	3	MONTHS	5/23/2023
2067	Element Analyzer Conductivity - RO Concentrate Train C Unit 1	13033	Element Analyzer Conductivity - RO Concentrate Train C Unit 1	510-C01-CPF-5101	1/12/2023	3	MONTHS	4/12/2023
2069	Element Analyzer Conductivity - RO Concentrate Train C Unit 2	13054	Element Analyzer Conductivity - RO Concentrate Train C Unit 2	510-C02-CPF-5101	12/28/2022	3	MONTHS	3/28/2023
2071	Element Analyzer Conductivity - RO Concentrate Train C Unit 3	13075	Element Analyzer Conductivity - RO Concentrate Train C Unit 3	510-C03-CPF-5101	2/14/2023	3	MONTHS	5/14/2023
2073	Element Analyzer Conductivity - RO Concentrate Train D Unit 1	13100	Element Analyzer Conductivity - RO Concentrate Train D Unit 1	510-D01-CPF-5101	2/14/2023	3	MONTHS	5/14/2023
2075	Element Analyzer Conductivity - RO Concentrate Train D Unit 2	13121	Element Analyzer Conductivity - RO Concentrate Train D Unit 2	510-D02-CPF-5101	1/4/2023	3	MONTHS	4/4/2023
2077	Element Analyzer Conductivity - RO Concentrate Train D Unit 3	13142	Element Analyzer Conductivity - RO Concentrate Train D Unit 3	510-D03-CPF-5101	2/23/2023	3	MONTHS	5/23/2023
2079	Element Analyzer Conductivity - RO Concentrate Train E Unit 1	13167	Element Analyzer Conductivity - RO Concentrate Train E Unit 1	510-E01-CPF-5101	2/24/2023	3	MONTHS	5/24/2023
2081	Element Analyzer Conductivity - RO Concentrate Train E Unit 2	13188	Element Analyzer Conductivity - RO Concentrate Train E Unit 2	510-E02-CPF-5101	2/14/2023	3	MONTHS	5/14/2023
2083	Element Analyzer Conductivity - RO Concentrate Train E Unit 3	13209	Element Analyzer Conductivity - RO Concentrate Train E Unit 3	510-E03-CPF-5101	2/14/2023	3	MONTHS	5/14/2023
3471	Element Analyzer Conductivity - RO Concentrate Train F Unit 1	31194	Element Analyzer Conductivity - RO Concentrate Train F Unit 1	510-F01-CPF-5101	1/19/2023	3	MONTHS	4/16/2023
3472	Element Analyzer Conductivity - RO Concentrate Train F Unit 2	31353	Element Analyzer Conductivity - RO Concentrate Train F Unit 2	510-F02-CPF-5101	1/19/2023	3	MONTHS	4/16/2023
3474	Element Analyzer Conductivity - RO Concentrate Train F Unit 3	31512	Element Analyzer Conductivity - RO Concentrate Train F Unit 3	510-F03-CPF-5101	1/19/2023	3	MONTHS	4/16/2023
3479	Element Analyzer Conductivity - RO Concentrate Train G Unit 1	31674	Element Analyzer Conductivity - RO Concentrate Train G Unit 1	510-G01-CPF-5101	1/19/2023	3	MONTHS	4/16/2023
3480	Element Analyzer Conductivity - RO Concentrate Train G Unit 2	31833	Element Analyzer Conductivity - RO Concentrate Train G Unit 2	510-G02-CPF-5101	1/19/2023	3	MONTHS	4/16/2023
3481	Element Analyzer Conductivity - RO Concentrate Train G Unit 3	31992	Element Analyzer Conductivity - RO Concentrate Train G Unit 3	510-G03-CPF-5101	1/19/2023	3	MONTHS	4/16/2023
2320	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 5 MFE	3211	Transmitter Level Indicating	210-A05-TNK-0340	1/25/2023	1	YEARS	1/25/2024
2321	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 6 MFE	3262	Transmitter Level Indicating	210-A06-TNK-0340	1/25/2023	1	YEARS	1/25/2024
2322	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 7 MFE	3313	Transmitter Level Indicating	210-A07-TNK-0340	1/25/2023	1	YEARS	1/25/2024
2339	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 5 MFW	4071	Transmitter Level Indicating	210-D05-TNK-0340	3/3/2022	1	YEARS	3/1/2024
2340	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 6 MFW	4122	Transmitter Level Indicating	210-D06-TNK-0340	3/3/2022	1	YEARS	3/1/2024
2341	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 7 MFW	4173	Transmitter Level Indicating	210-D07-TNK-0340	3/3/2022	1	YEARS	3/1/2024
2342	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 8 MFW	4224	Transmitter Level Indicating	210-D08-TNK-0340	3/3/2022	1	YEARS	3/1/2024
2326	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 1 MFE	3437	Transmitter Level Indicating	210-B01-TNK-0340	1/30/2023	1	YEARS	2/1/2024
2327	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 2 MFE	3488	Transmitter Level Indicating	210-B02-TNK-0340	1/30/2023	1	YEARS	2/1/2024
2328	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 3 MFE	3539	Transmitter Level Indicating	210-B03-TNK-0340	1/30/2023	1	YEARS	2/1/2024

PMNUM	DESCRIPTION	ASSETNUM	ASSETDESC	LOCATION	LASTCOMPDATE	FREQUENCY	FREQUNIT	NEXTDATE
2329	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 4 MFE	3590	Transmitter Level Indicating	210-B04-TNK-0340	1/30/2023	1	YEARS	2/1/2024
2330	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 5 MFE	3641	Transmitter Level Indicating	210-B05-TNK-0340	2/14/2023	1	YEARS	2/15/2024
2331	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 6 MFE	3692	Transmitter Level Indicating	210-B06-TNK-0340	2/14/2023	1	YEARS	2/15/2024
2332	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 7 MFE	3743	Transmitter Level Indicating	210-B07-TNK-0340	2/14/2023	1	YEARS	2/15/2024
2336	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 2 MFW	3918	Transmitter Level Indicating	210-D02-TNK-0340	3/1/2022	1	YEARS	2/22/2024
2337	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 3 MFW	3969	Transmitter Level Indicating	210-D03-TNK-0340	3/1/2022	1	YEARS	2/22/2024
2338	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 4 MFW	4020	Transmitter Level Indicating	210-D04-TNK-0340	3/1/2022	1	YEARS	2/22/2024
2343	Flush Feed Tubing Transmitter LIT-0345 Train E Cell 1 MFW	4287	Transmitter Level Indicating	210-E01-TNK-0340	3/9/2022	1	YEARS	3/1/2024
2344	Flush Feed Tubing Transmitter LIT-0345 Train E Cell 2 MFW	4338	Transmitter Level Indicating	210-E02-TNK-0340	3/9/2022	1	YEARS	3/1/2024
2319	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 4 MFE	3160	Transmitter Level Indicating	210-A04-TNK-0340	1/23/2023	1	YEARS	1/18/2024
2324	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 8 MFE	3364	Transmitter Level Indicating	210-A08-TNK-0340	1/25/2023	1	YEARS	1/25/2024
2333	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 8 MFE	3794	Transmitter Level Indicating	210-B08-TNK-0340	2/14/2023	1	YEARS	2/15/2024
2335	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 1 MFW	3794	Transmitter Level Indicating	210-B08-TNK-0340	3/1/2022	1	YEARS	2/22/2024
2334	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 1 MFW	3867	Transmitter Level Indicating	210-D01-TNK-0340	2/14/2023	1	YEARS	2/15/2024
2316	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 1 MFE	3007	Transmitter Level Indicating	210-A01-TNK-0340	1/23/2023	1	YEARS	1/18/2024
2317	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 2 MFE	3058	Transmitter Level Indicating	210-A02-TNK-0340	1/23/2023	1	YEARS	1/18/2024
2318	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 3 MFE	3109	Transmitter Level Indicating	210-A03-TNK-0340	1/23/2023	1	YEARS	1/18/2024
3587	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 1	30331	Transmitter Level Indicating	210-C01-TNK-0340	6/3/2022	1	YEARS	6/1/2023
3588	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 2	30373	Transmitter Level Indicating	210-C02-TNK-0340	6/3/2022	1	YEARS	6/1/2023
3589	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 3	30415	Transmitter Level Indicating	210-C03-TNK-0340	6/3/2022	1	YEARS	6/1/2023
3590	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 4	30457	Transmitter Level Indicating	210-C04-TNK-0340	6/3/2022	1	YEARS	6/1/2023
3591	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 5	30499	Transmitter Level Indicating	210-C05-TNK-0340	6/9/2022	1	YEARS	6/1/2023
3592	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 6	30541	Transmitter Level Indicating	210-C06-TNK-0340	6/9/2022	1	YEARS	6/1/2023
3593	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 7	30583	Transmitter Level Indicating	210-C07-TNK-0340	6/9/2022	1	YEARS	6/1/2023
3594	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 8	30625	Transmitter Level Indicating	210-C08-TNK-0340	6/9/2022	1	YEARS	6/1/2023
3650	Flush Feed Tubing Transmitter LIT-0345 Train E Cell 3	30202	Transmitter Level Indicating	210-E03-TNK-0340	6/9/2022	1	YEARS	6/6/2023
3651	Flush Feed Tubing Transmitter LIT-0345 Train E Cell 4	30242	Transmitter Level Indicating	210-E04-TNK-0340	6/9/2022	1	YEARS	6/6/2023
9715	Horiba Ammonia Electrode Replacement 1 YR	13410	MF Feed Transmitter Analyzer Indicating Ammonia	255-PIP-MFF-WQAS	5/19/2022	1	YEARS	5/17/2023
9307	Inspect and Clean SEFE Tank A01-LSH-130 Warrick	30095	Switch Level High	142-A01-TNK-0130	2/1/2023	1	YEARS	1/14/2024
9308	Inspect and Clean SEFE Tank A02-LSH-130 Warrick	30105	Switch Level High	142-A02-TNK-0130	2/1/2023	1	YEARS	1/14/2024
9681	M9 Portable TOC No. 1 Replace Consumables 3 MO.	13954	Portable M9 TOC Analyzer No.1 RO Feed	510-B02-RO-2200	12/22/2022	3	MONTHS	3/23/2023
9682	M9 Portable TOC No. 2 Replace Consumables 3 MO.	13955	M9 Portable TOC Analyzer No. 2 Permeate	510-PIP-ROP-ROB2	12/22/2022	3	MONTHS	3/23/2023
9242	MF Effluent Trubidity Wet Calibration HACH FT 660SC	13314	MF Process Effluent Turbidity	250-PIP-MFE	1/17/2023	3	MONTHS	4/16/2023
9179	Planner Order Trojan UV 100% T Standard Solution	8850	Element Analyzer UV Transmittance - Infeed	610-UVT-2220	5/27/2022	1	YEARS	6/4/2023
2982	Polymer Blend Controller 730-A01-FDR-7200 6 mo. PM	1832	Polymer Blend and Feed System Train A	730-A01-FDR-7200	2/23/2023	6	MONTHS	8/23/2023
2981	Polymer Blend Controller 730-B01-FDR-7200 6 mo. PM	1833	Polymer Blend and Feed System Train B	730-B01-FDR-7200	9/16/2022	6	MONTHS	3/13/2023
2980	Polymer Blend Controller 730-C01-FDR-7200 - 6 mo. PM	1834	Polymer Blend and Feed System Train C	730-C01-FDR-7200	10/20/2022	6	MONTHS	4/19/2023
3633	Polymer Blend Controller 730-D01-FDR-7200 6 MO. PM	32422	Polymer Blend and Feed System Train D	730-D01-FDR-7200	2/14/2023	6	MONTHS	8/8/2023
3467	Prominent H2O2 Sensor Calibration Method 3 Month	15073	Transmitter UV Feed PROMINENT Peroxide Analyzer	510-CPF-0010	2/15/2023	3	MONTHS	5/16/2023
3466	Prominent H2O2 Sensor Calibration Method 1 YR	15074	Transmitter UV Product PROMINENT Peroxide Analyzer	805-CPD-0002	5/24/2022	1	YEARS	5/16/2023
3463	Prominent H2O2 Sensor Standardization Method	15073	Transmitter UV Feed PROMINENT Peroxide Analyzer	510-CPF-0010	2/22/2023	2	WEEKS	3/8/2023
3465	Prominent H2O2 Sensor Standardization Method	15074	Transmitter UV Product PROMINENT Peroxide Analyzer	805-CPD-0002	2/22/2023	2	WEEKS	3/8/2023
9149	Replace Consumables ROF TOC M5310 Analyzer 3 MO.	1716	Analyzer Total Organic Compound	450-CPF-0001	1/11/2023	3	MONTHS	4/9/2023
9239	Replace Consumables ROF TOC M5310 Analyzer 3 MO.	13315	RO Feed TOC Analyzer	450-PIP-ROF	1/11/2023	3	MONTHS	4/9/2023
9150	Replace Consumables ROP TOC M5310 Analyzer 3 MO.	1717	Analyzer Total Organic Compound	510-CPF-0010	1/12/2023	3	MONTHS	4/9/2023
9240	Replace Consumables ROP TOC M5310 Analyzer 3 MO.	13316	RO Permate TOC Analyzer	510-CPF-0010	2/14/2023	3	MONTHS	5/15/2023
7003	Replace pH probe of I&E handheld	1745	pH meter, handheld (s/n 003366)	TOOLS	9/28/2022	1	YEARS	9/22/2023
7004	Replace pH probe of I&E handheld	1744	pH meter, handheld (s/n C03416)	TOOLS	9/28/2022	1	YEARS	9/22/2023
9795	RO Concentrate Train H Unit 1 - H01-AE-2322 Wednesday	43524	Element Analyzer Conductivity - RO Concentrate Train H Unit 1	510-H01-CPF-5101	2/23/2023	1	WEEKS	3/9/2023
9796	RO Concentrate Train H Unit 2 - H02-AE-2322 Wednesday	43716	Element Analyzer Conductivity - RO Concentrate Train H Unit 2	510-H02-CPF-5101	2/23/2023	1	WEEKS	3/2/2023
9797	RO Concentrate Train H Unit 3 - H03-AE-2322 Wednesday	43908	Element Analyzer Conductivity - RO Concentrate Train H Unit 3	510-H03-CPF-5101	2/24/2023	1	WEEKS	3/8/2023
9798	RO Concentrate Train I Unit 1 - I01-AE-2322 Wednesday	44101	Element Analyzer Conductivity - RO Concentrate Train I Unit 1	510-I01-CPF-5101	2/23/2023	1	WEEKS	3/9/2023
9799	RO Concentrate Train I Unit 2 - I02-AE-2322 Wednesday	44293	Element Analyzer Conductivity - RO Concentrate Train I Unit 2	510-I02-CPF-5101	2/23/2023	1	WEEKS	3/8/2023
9800	RO Concentrate Train I Unit 3 - I03-AE-2322 Wednesday	44485	Element Analyzer Conductivity - RO Concentrate Train I Unit 3	510-I03-CPF-5101	2/23/2023	1	WEEKS	3/2/2023
9801	RO Permeate EC Train H Unit 1 - H01-AE-2225 Wednesday	43545	Element Analyzer Conductivity - RO Product Train H Unit 1	510-H01-CPF-5101	2/23/2023	1	WEEKS	3/8/2023
9802	RO Permeate EC Train H Unit 2 - H02-AE-2225 Wednesday	43737	Element Analyzer Conductivity - RO Product Train H Unit 2	510-H02-CPF-5101	2/23/2023	1	WEEKS	3/8/2023
9804	RO Permeate EC Train H Unit 3 - H03-AE-2225 Wednesday	43929	Element Analyzer Conductivity - RO Product Train H Unit 3	510-H03-CPF-5101	2/23/2023	1	WEEKS	3/8/2023
9805	RO Permeate EC Train I Unit 1 - I01-AE-2225 Wednesday	44122	Element Analyzer Conductivity - RO Product Train I Unit 1	510-I01-CPF-5101	2/23/2023	1	WEEKS	3/8/2023
9806	RO Permeate EC Train I Unit 2 - I02-AE-2225 Wednesday	44314	Element Analyzer Conductivity - RO Product Train I Unit 2	510-I02-CPF-5101	2/23/2023	1	WEEKS	3/8/2023
9807	RO Permeate EC Train I Unit 3 - I03-AE-2225 Wednesday	44506	Element Analyzer Conductivity - RO Product Train I Unit 3	510-I03-CPF-5101	2/23/2023	1	WEEKS	3/8/2023
3135	ROP / UVP CL2 Analyzer Weekly Calibration	7341	ROP/UVP CL2 510-AIT-2250 Analyzer	510-CPF-0010	2/22/2023	1	WEEKS	3/7/2023
9044	ROP/UVP CL2 ANALYZER 1 YR	7341	ROP/UVP CL2 510-AIT-2250 Analyzer	510-CPF-0010	4/11/2022	1	YEARS	4/4/2023
7342	Rosemount Free Chlorine Maintenance 450-AE-2162	9073	Element Analyzer Free Chlorine and pH- RO Feed	450-CPF-0001	1/11/2023	3	MONTHS	4/11/2023

PMNUM	DESCRIPTION	ASSETNUM	ASSETDESC	LOCATION	LASTCOMPDATE	FREQUENCY	FREQUNIT	NEXTDATE
2231	Rosemount pH Analyzer 9 Month RO Feed: 450-AIT-2120	9062	Transmitter Analyzer Indicating pH	450-CPF-0001	2/8/2023	9	MONTHS	11/12/2023
2234	Rosemount pH Analyzer 9 Month RO Feed: 450-AIT-2140	9064	Transmitter Analyzer Indicating pH	450-CPF-0001	2/8/2023	9	MONTHS	11/10/2023
3595	Rosemount pH Analyzer Annual Element Analyzer pH MF Train C CIP-C01-AIT-0480	34114	Transmitter Analyzer Indicating pH	210-AS-0400C	6/9/2022	1	YEARS	6/6/2023
3596	Rosemount pH analyzer Annual Element Analyzer pH MF Train C02-AIT-0480	34115	Transmitter Analyzer Indicating pH	210-AS-0400C	6/9/2022	1	YEARS	6/1/2023
2238	Rosemount pH analyzer annual- MF Feedwater-B B01-AIT-0305	7041	Transmitter Analyzer Indicating pH - MF Feedwater B	255-PIP-MFF-WQAS	9/1/2022	1	YEARS	8/26/2023
2237	Rosemount pH analyzer annual-DPW 710-AIT-3310	8668	Transmitter Analyzer Indicating pH	710-CPF-0008	8/16/2022	1	YEARS	8/19/2023
2243	Rosemount pH analyzer annual-Element Analyzer pH - MF Train A CIP-A01-AIT-0480	4392	Transmitter Analyzer Indicating pH	210-AS-0400A	11/2/2022	1	YEARS	11/3/2023
2244	Rosemount pH analyzer annual-Element Analyzer pH - MF Train A CIP-A02-AIT-0480	7200	Transmitter Analyzer Indicating pH	210-AS-0400A	1/3/2023	1	YEARS	12/29/2023
2245	Rosemount pH analyzer annual-Element Analyzer pH - MF Train B CIP-B01-AIT-0480	4401	Transmitter Analyzer Indicating pH	210-AS-0400B	11/2/2022	1	YEARS	11/4/2023
2246	Rosemount pH analyzer annual-Element Analyzer pH - MF Train B CIP-B02-AIT-0480	7246	Transmitter Analyzer Indicating pH	210-AS-0400B	1/11/2023	1	YEARS	1/12/2024
2247	Rosemount pH analyzer annual-Element Analyzer pH - MF Train D CIP-D01-AIT-0480	4410	Transmitter Analyzer Indicating pH	210-AS-0400D	2/7/2023	1	YEARS	1/26/2024
2248	Rosemount pH analyzer annual-Element Analyzer pH - MF Train D CIP-D02-AIT-0480	7214	Transmitter Analyzer Indicating pH	210-AS-0400D	2/15/2023	1	YEARS	2/9/2024
2249	Rosemount pH analyzer annual-Element Analyzer pH - MF Train E CIP-E01-AIT-0480	4419	Transmitter Analyzer Indicating pH	210-AS-0400E	2/24/2023	1	YEARS	2/23/2024
2232	Rosemount pH analyzer annual-FPW: 710-AIT-3410	8673	Transmitter Analyzer Indicating pH	710-CPF-0009	8/5/2022	1	YEARS	8/5/2023
2235	Rosemount pH analyzer annual-RO PW: 510-AIT-2241	13229	Transmitter Analyzer Indicating pH	510-CPF-0010	8/18/2022	1	YEARS	8/12/2023
2236	Rosemount pH analyzer annual-SAR Bypass: 805-AIT-3580	10376	Transmitter Analyzer Indicating pH	805-CPD-0002	5/2/2022	1	YEARS	4/28/2023
70209	Schedule a Hach rep to calibrate the particle counter	14196	Transmitter Analyzer Indicating Particle Counter	710-CPF-0009	11/10/2022	1	YEARS	10/31/2023
9836	SEFE Plant 2 Weekly Ammonia Analyzer PM 1	41035	Element Analyzer Ammonia	144-PIP-EFF		1	WEEKS	3/20/2023
9838	SEFE Plant 2 Weekly Conductivity Analyzer PM 3	41021	Element Analyzer Conductivity	144-PIP-EFF		1	WEEKS	3/20/2023
9837	SEFE Plant 2 Weekly Total CL2 Analyzer PM 2	41028	Element Analyzer Total Chlorine	144-PIP-EFF		1	WEEKS	3/20/2023
9839	SEFE Plant 2 Weekly Turbidity SS 7 PM 4	41013	Element Analyzer Turbidity	144-PIP-EFF		1	WEEKS	3/20/2023
9302	SEFE Tank A01 Flush & Clean LIT-0130A Transmitter	30091	Transmitter Level Indicating	142-A01-TNK-0130	11/9/2022	1	YEARS	11/5/2023
9303	SEFE Tank A01 Flush & Clean LIT-0130B Transmitter	30093	Transmitter Level Indicating	142-A01-TNK-0130	10/31/2022	1	YEARS	11/5/2023
9304	SEFE Tank A02 Flush & Clean LIT-0130A Transmitter	30101	Transmitter Level Indicating	142-A02-TNK-0130	11/9/2022	1	YEARS	11/5/2023
9305	SEFE Tank A02 Flush & Clean LIT-0130B Transmitter	30103	Transmitter Level Indicating	142-A02-TNK-0130	10/31/2022	1	YEARS	11/5/2023
3017	Surge tank level control functional check - 830-A01-TNK-3410	1547	Tank steel 30430 gal	830-A01-TNK-3410	5/5/2022	1	YEARS	4/29/2023
2960	Surge tank level control functional check - 830-A02-TNK-3410	1548	Tank steel 30430 gal	830-A02-TNK-3410	5/5/2022	1	YEARS	4/29/2023
2961	Surge tank level control functional check - 830-A03-TNK-3410	1549	Tank steel 30430 gal	830-A03-TNK-3410	5/5/2022	1	YEARS	4/29/2023
2962	Surge tank level control functional check - 830-A04-TNK-3410	1550	Tank steel 30430 gal	830-A04-TNK-3410	5/5/2022	1	YEARS	4/29/2023
9789	Surge tank level control functional check - 830-A05-TNK-3410	1550	Tank steel 30430 gal	830-A04-TNK-3410		1	YEARS	4/29/2023
2963	Surge tank level control functional check - 830-B01-TNK-3410	1551	Tank steel 5984 gal	830-B01-TNK-3410	5/5/2022	1	YEARS	4/29/2023
7721	Test Overtemperature Thermocouple, TIT-1226 Train A01	5839	Transmitter Temperature Indicating	220-A01-TNK-1200	7/6/2022	1	YEARS	7/9/2023
7722	Test Overtemperature Thermocouple, TIT-1226 Train B01	5856	Transmitter Temperature Indicating	220-B01-TNK-1200	7/6/2022	1	YEARS	7/9/2023
7723	Test Overtemperature Thermocouple, TIT-1226 Train D01	5873	Transmitter Temperature Indicating	220-D01-TNK-1200	7/8/2022	1	YEARS	7/9/2023
7724	Test Overtemperature Thermocouple, TIT-1226 Train E01	5890	Transmitter Temperature Indicating	220-E01-TNK-1200	7/8/2022	1	YEARS	7/9/2023
2116	Transmitter Analyzer Indicating Chlorine	8303	Element Analyzer Chlorine - SAR Bypass	805-CPD-0002	2/22/2023	1	WEEKS	3/9/2023
7339	UV Transmittance Calibration Check 1 Yr. 610-AE-2220	8850	Element Analyzer UV Transmittance - Infeed	610-UVT-2220	5/12/2022	1	YEARS	5/15/2023
9241	UV Transmittance Calibration Check 1 Yr. 610-AE-2240	13317	UV Transmittance Analyzer	510-CPF-0010	5/2/2022	1	YEARS	4/22/2023
9296	UVT 2240 Optiview Cleaning & Transmittance Monthly	13317	UV Transmittance Analyzer	510-CPF-0010	2/2/2023	1	MONTHS	4/1/2023

Appendix G

Groundwater Quality Data at the Talbert Barrier

Orange County Water District
Groundwater Replenishment System
2022 Annual Report

GWRS 2022 Quarterly Sampling Dates

OCWD Water Quality Department

TALBERT BARRIER - GROUNDWATER

Monitoring Well	Qtr 1	Qtr 2	Qtr 3	Qtr 4
OCWD-M10/1-4	01/17/2022	04/25/2022	07/18/2022	10/05/2022
OCWD-M11/1-4	01/19/2022	04/27/2022	07/20/2022	10/17/2022
OCWD-M19/3	01/04/2022	04/12/2022	07/06/2022	10/04/2022
OCWD-M45/1-5	01/31/2022	05/09/2022	08/01/2022	10/31/2022
OCWD-M46/2-5	01/03/2022	04/11/2022	07/05/2022	10/03/2022
OCWD-M46A/1	01/03/2022	04/11/2022	07/05/2022	10/03/2022
OCWD-M47/1-5	01/18/2022	04/26/2022	07/19/2022	10/18/2022

Notes for Appendix G Tables:

► Water quality data are summarized for monitoring wells M10, M11, M19, M45, M46, M46A and M47 in the following tables. OCWD-M19/3 is a non-compliance monitoring well.

► Listed dates (above) are the quarterly compliance monitoring dates; other samples may have been collected during the year. Detections of organic chemicals are reported for all samples collected in 2021 and are not limited to the quarterly compliance samples.

► Results listed in the table for each quarter are the range of the minimum and maximum values detected at the well location, which may consist of one to five well casings. Figures and report text list the well ID (e.g. OCWD-M10), casing number (e.g., M10/1, M10/2, M10/3 and M10/4), as appropriate.

► Appendices B & C contain a list of all methods and reportable detection limits (RDL).

► Detailed data reports are available upon request.

► The more stringent value in the range of secondary MCLs is used in the tables (e.g., <MCL) for TDS, electrical conductivity (EC), chloride and sulfate.

► MCL: Maximum Contaminant Level

► N/A: Not applicable

► ND: Not detected at reportable detection limit (RDL)

► NL: SWRCB Division of Drinking Water (DDW) Notification Level

► NR: Not required

► nr: Not reported

► NS: Not sampled

► SMCL: Secondary Maximum Contaminant Level

► TR: Trace

Notes for Appendix G Tables (continued):

► A comprehensive suite of tests covering inorganics, metals, volatile organics (VOCs), synthetic organic compounds (SOCs), radiological and microbial parameters were analyzed at 35 permit-specified groundwater monitoring wells since the commencement of the GWRS treatment facility. In June 2010, OCWD proposed a revised groundwater monitoring frequency from quarterly to annually for selected analytes that have reported no detections. The proposed reduced frequency of testing was (1) based on real-time data for analytes reported as non-detect at the reporting detection limit, (2) supported by two Independent Advisory Panels having oversight for the GWRS project and the Santa Ana River (SARMON) long-term monitoring program, and (3) a condition of the GWRS permit to routinely review data and based on results, to modify the groundwater monitoring program every two years or sooner with approval by the RWQCB and SWRCB DDW (formerly CDPH - July 2014 CDPH moved to the SWRCB with a new name, Division of Drinking Water [DDW]).

The revised monitoring frequency was approved by the RWQCB (3/14/2011) and SWRCB DDW (9/20/2010) and consists of reduction in asbestos, dioxin, selected SOCs, and radionuclides monitoring from quarterly to annually (see Table 1) for monitoring well locations. Julio Lara/RWQCB advised that monitoring for these analytes are not permit required but OCWD voluntarily performed the monitoring. OCWD elected to conduct comprehensive testing at the start-up of GWRS; however, with years of a robust database for these non-compliance targets (asbestos, dioxin, EPA 625), OCWD concurred with the RWQCB and ceased testing for these analytes in January 2014. Samples may have been collected for other analytes (cyanide, some radionuclides, etc.) but consensus is to cease testing and use resources more effectively in the future. Comprehensive testing was performed during the first quarter 2011 and served as the “annual comprehensive testing” and "initial anchor date." Future “annual comprehensive testing” rotated sequentially through the quarters (e.g., 2Q2012, 3Q2013, 4Q2014, etc.).

Table 1

Talbert Barrier and Forebay Area GWRS Groundwater Monitoring Well
Approved Revised Monitoring Program[1]
Inorganic, Organic, and Radiological Analytes

Q - Year	Comprehensive	Reduced[3,4,5,6]	Q - Year	Comprehensive	Reduced[3,4,5,6]
Q1 - 2018		x	Q1 - 2021		x
Q2 - 2018		x	Q2 - 2021		x
Q3 - 2018		x	Q3 - 2021	x	
Q4 - 2018	x		Q4 - 2021		x
Q1 - 2019	x		Q1 - 2022		x
Q2 - 2019		x	Q2 - 2022		x
Q3 - 2019		x	Q3 - 2022		x
Q4 - 2019		x	Q4 - 2022	x	
Q1 - 2020		x	Q1 - 2023	x	
Q2 - 2020	x		Q2 - 2023		x
Q3 - 2020		x	Q3 - 2023		x
Q4 - 2020		x	Q4 - 2023		x

[1]Approved RWQCB (03/14/2011) and CDPH (09/20/2010)

[2]Comprehensive: OCWD voluntarily screens for inorganic and organic analytes and radionuclides beyond the permit specific analytes

[3]Reduced: Annual asbestos, cyanide, selected SOC's, EPA 625, and radionuclides

[4]GWRS IAP Meeting 08/27/2013: Panel Concurs to cease monitoring for asbestos and dioxin based on years of non-detections

[5]Reduced: Annual cyanide, selected SOC's and radionuclide

[6]GWRS IAP Meeting 08/29/2017: Panel concurs to reduce select inorganic and organic monitoring. In addition, Panel concurs to cease select inorganic and organic voluntary monitoring.

Summary of All 2022 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	OCWD-M10 Qtr 1	OCWD-M10 Qtr 2	OCWD-M10 Qtr 3	OCWD-M10 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	ND - 18.6	ND - 5.8	ND - 15.3	ND - 6.6
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 2.9	ND - 3.3	ND - 2.8	ND - 2.8
Barium (Ba), ug/L	OCWD	1000	14.9 - 132	12.4 - 145	11.5 - 171	10.2 - 139
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND	ND	ND - 1.3
Fluoride (F), mg/L	OCWD	2	0.18 - 0.62	0.19 - 0.59	0.2 - 0.66	0.18 - 0.63
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND	ND	ND	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 3	ND - 1.6	ND - 3	ND - 2.7
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 1.59	ND - 1.8	ND - 1.93	ND - 1.73
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	Not Required	ND - 0.008
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 2	ND - 1.8	ND - 1.9	ND - 2
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND	ND	ND	ND
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), um/cm	OCWD	900	246 - 1040	212 - 1070	204 - 1130	210 - 1210
Iron (Fe), ug/L	OCWD	300	ND - 34.9	ND - 25.1	ND - 34.8	ND - 25
Manganese (Mn), ug/L	OCWD	50	1.7 - 32.9	2 - 31.7	2 - 34.6	2.1 - 27.7
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	1.8 - 33.2	2 - 29.5	2.1 - 32	2.1 - 28.6
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND - 2	ND - 1	ND - 1	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	147 - 668	164 - 746	128 - 836	100 - 762
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	ND - 0.15	ND - 0.1	0.15 - 0.55	ND - 0.1
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND	ND	ND	ND
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.13 - 0.23	0.12 - 0.24	0.13 - 0.24	0.14 - 0.23
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	ND - 3.4	ND - 3.1	ND - 3.1	ND - 3.2
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND - 0.2	ND - 0.2	ND - 0.2
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	Not Required	ND
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2022 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	OCWD-M10 Qtr 1	OCWD-M10 Qtr 2	OCWD-M10 Qtr 3	OCWD-M10 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND < NL	ND < NL	ND < NL	ND < MCL
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	Not Required	ND
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	Not Required	ND
8015B	Nonhalogenated Organics	WeckLab	Not Required	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	Not Required	ND - Detections
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND	ND	ND	ND

OCWD-M10/1
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/17/2022	12:00	1,4-Dioxane (14DIOX)	1.3	ug/L	0.5

Year 2022, Quarter 2

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/25/2022	9:15	1,4-Dioxane (14DIOX)	0.7	ug/L	0.5

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/25/2022	9:15	cis-1,2-Dichloroethene (c12DCE)	TR	ug/L	0.5

Year 2022, Quarter 3

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/18/2022	12:05	1,4-Dioxane (14DIOX)	1	ug/L	0.5

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/18/2022	12:05	cis-1,2-Dichloroethene (c12DCE)	TR	ug/L	0.5

Year 2022, Quarter 4

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/5/2022	12:20	1,4-Dioxane (14DIOX)	0.8	ug/L	0.5

OCWD-M10/1
Organic Detections by Method

Year 2022, Quarter 4

METHOD: CEC

Sample Date & Time		*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
10/5/2022	12:20	Primidone (PRIMDN)	1.01	ng/L	1

OCWD-M10/2
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/17/2022	11:20	cis-1,2-Dichloroethene (c12DCE)	TR	ug/L	0.5

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/25/2022	11:05	cis-1,2-Dichloroethene (c12DCE)	TR	ug/L	0.5
4/25/2022	11:05	Methyl tert-butyl ether (MTBE)	0.2	ug/L	0.2

Year 2022, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/18/2022	11:25	cis-1,2-Dichloroethene (c12DCE)	TR	ug/L	0.5
7/18/2022	11:25	Methyl tert-butyl ether (MTBE)	0.2	ug/L	0.2

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/5/2022	11:35	cis-1,2-Dichloroethene (c12DCE)	TR	ug/L	0.5
10/5/2022	11:35	Methyl tert-butyl ether (MTBE)	0.2	ug/L	0.2

OCWD-M10/3
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/17/2022	10:35	1,4-Dioxane (14DIOX)	4.9	ug/L	0.5

Year 2022, Quarter 2

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/25/2022	10:30	1,4-Dioxane (14DIOX)	4.5	ug/L	0.5

Year 2022, Quarter 3

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/18/2022	10:40	1,4-Dioxane (14DIOX)	5.5	ug/L	0.5

Year 2022, Quarter 4

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/5/2022	10:55	1,4-Dioxane (14DIOX)	3.7	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/5/2022	10:55	Primidone (PRIMDN)	3.334	ng/L	1

OCWD-M10/4
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/17/2022	9:50	1,4-Dioxane (14DIOX)	2.1	ug/L	0.5

Year 2022, Quarter 2

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/25/2022	9:55	1,4-Dioxane (14DIOX)	1.2	ug/L	0.5

Year 2022, Quarter 3

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/18/2022	9:55	1,4-Dioxane (14DIOX)	1.8	ug/L	0.5

Year 2022, Quarter 4

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/5/2022	10:00	1,4-Dioxane (14DIOX)	1.1	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/5/2022	10:00	Carbamazepine (CBMAZP)	1.391	ng/L	1
10/5/2022	10:00	Gemfibrozil (GMFIBZ)	3.487	ng/L	1
10/5/2022	10:00	N,N-diethyl-m-toluamide (DEET)	5.873	ng/L	1
10/5/2022	10:00	Primidone (PRIMDN)	1.622	ng/L	1

Summary of All 2022 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	OCWD-M11 Qtr 1	OCWD-M11 Qtr 2	OCWD-M11 Qtr 3	OCWD-M11 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	1.1 - 4.5	ND - 4.4	ND - 4.9	ND - 4.2
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	1.2 - 2.6	1.2 - 2.6	1.1 - 2.4	1.2 - 2.9
Barium (Ba), ug/L	OCWD	1000	13.8 - 150	12.5 - 147	11.7 - 147	11.2 - 160
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.38 - 0.62	0.34 - 0.62	0.41 - 0.67	0.38 - 0.65
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND	ND	ND	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 3.7	ND - 3.4	ND - 2.5	ND - 2.5
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	1.33 - 1.96	1.17 - 2.12	1.28 - 2.01	1.29 - 2.07
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	Not Required	ND - 0.008
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 3.3	ND - 3.7	ND - 3	ND - 2.9
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND	ND	ND	ND
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	197 - 997	181 - 1020	154 - 957	162 - 994
Iron (Fe), ug/L	OCWD	300	ND - 8.3	ND	ND - 6.7	ND
Manganese (Mn), ug/L	OCWD	50	ND - 7.1	ND - 7	ND - 7.8	ND - 8.2
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 6.8	ND - 6.7	ND - 7.7	ND - 7.8
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	130 - 658	114 - 652	84 - 722	128 - 642
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	ND - 0.3	0.15 - 0.35	0.15 - 0.4	ND
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND	ND	ND	ND
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.11 - 0.23	0.11 - 0.24	0.11 - 0.24	0.12 - 0.23
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	2 - 3.1	2 - 3.1	2.2 - 3.4	2.1 - 3.5
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	Not Required	ND
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2022 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	OCWD-M11 Qtr 1	OCWD-M11 Qtr 2	OCWD-M11 Qtr 3	OCWD-M11 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND < NL	ND < NL	ND < NL	ND < MCL
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND	ND	ND	ND
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	Not Required	ND
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	Not Required	ND
8015B	Nonhalogenated Organics	WeckLab	Not Required	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	Not Required	ND - Detections
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND	ND	ND	ND

OCWD-M11/1
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/19/2022	9:40	1,4-Dioxane (14DIOX)	1.4	ug/L	0.5

Year 2022, Quarter 2

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/27/2022	11:25	1,4-Dioxane (14DIOX)	1	ug/L	0.5

Year 2022, Quarter 3

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/20/2022	11:40	1,4-Dioxane (14DIOX)	1.6	ug/L	0.5

Year 2022, Quarter 4

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/17/2022	12:20	1,4-Dioxane (14DIOX)	1.4	ug/L	0.5

OCWD-M11/2

Organic Detections by Method

Year 2022, Quarter 1

METHOD: 14DIOX

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
1/19/2022 11:05	1,4-Dioxane (14DIOX)	0.9	ug/L	0.5

Year 2022, Quarter 3

METHOD: 14DIOX

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
7/20/2022 11:10	1,4-Dioxane (14DIOX)	0.7	ug/L	0.5

Year 2022, Quarter 4

METHOD: 14DIOX

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
10/17/2022 11:40	1,4-Dioxane (14DIOX)	0.8	ug/L	0.5

OCWD-M11/3
Organic Detections by Method

Year 2022, Quarter 4

METHOD: CEC

Sample Date & Time		*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
10/17/2022	11:00	Sulfamethoxazole (SULTHZ)	1.267	ng/L	1

OCWD-M11/4
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/19/2022	10:30	1,4-Dioxane (14DIOX)	1.2	ug/L	0.5

Year 2022, Quarter 2

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/27/2022	9:55	1,4-Dioxane (14DIOX)	1.2	ug/L	0.5

Year 2022, Quarter 3

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/20/2022	10:35	1,4-Dioxane (14DIOX)	0.9	ug/L	0.5

Year 2022, Quarter 4

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/17/2022	10:15	1,4-Dioxane (14DIOX)	0.9	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/17/2022	10:15	Carbamazepine (CBMAZP)	1.193	ng/L	1
10/17/2022	10:15	Sulfamethoxazole (SULTHZ)	2.359	ng/L	1

Summary of All 2022 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	Permit Limit	OCWD-M19/3 Qtr 1	OCWD-M19/3 Qtr 2	OCWD-M19/3 Qtr 3	OCWD-M19/3 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	8.3	6.4	6.6	5.3
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	1.6	1.5	1.2	1.2
Barium (Ba), ug/L	OCWD	1000	10.7	11.2	13.1	13.1
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.17	0.13	0.12	ND
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND	0.21	ND	0.22
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND	ND	ND	ND
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	1.38	1.33	1.49	1.81
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	Not Required	ND
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND	ND	ND	ND
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Radioactivity						
Total Tritium (TTr), pCi/L	FGL	20,000	232 - 281	225	Not Required	Not Required
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	1.3	1.4	1.5	1.3
Primary Drinking Water Standards - Biological						
E. Coli (Colilert - MPN/100mL) (ECOLIQ), MPN	OCWD	N/A	ND	ND	ND	ND
Total Coliform (Colilert - MPN/100mL) (TCOLIQ), MPN	OCWD	N/A	ND	1	ND	ND
Total Coliform (Mult. Tube Fermentation) (TCOLIM), MPN	OCWD	N/A	ND	ND	ND	ND
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	110	98	104	124
Iron (Fe), ug/L	OCWD	300	ND	5.2	6.5	5.5
Manganese (Mn), ug/L	OCWD	50	3.9	2.6	4.6	3.9
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND	ND	2.8	ND
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	43	50.5	194	56
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	0.1	0.15	0.15	ND
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND	ND	ND	ND
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.24	0.23	0.27	0.29
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	3.7	3.5	3.2	3.3
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	Not Required	ND
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2022 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	OCWD-M19/3 Qtr 1	OCWD-M19/3 Qtr 2	OCWD-M19/3 Qtr 3	OCWD-M19/3 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND	ND	ND	ND
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	Not Required	ND
537.1	PFAS Compounds	OCWD	Not Required	ND	Not Required	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	Not Required	ND
8015B/ 8015D	Nonhalogenated Organics	WeckLab	Not Required	ND	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	Not Required	ND
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND	ND	ND < NL	ND

OCWD-M19/3
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/4/2022	11:25	Chloroform (CHCl3)	1.3	ug/L	0.5
1/4/2022	11:25	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/12/2022	10:15	Chloroform (CHCl3)	1.4	ug/L	0.5
4/12/2022	10:15	Total Trihalomethanes (TTHMs)	1.4	ug/L	0.5

Year 2022, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/6/2022	9:50	Chloroform (CHCl3)	1.5	ug/L	0.5
7/6/2022	9:50	Total Trihalomethanes (TTHMs)	1.5	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/6/2022	9:50	n-Nitrosodimethylamine (NDMA)	2.2	ng/L	2

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/4/2022	11:15	Chloroform (CHCl3)	1.3	ug/L	0.5
10/4/2022	11:15	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5

Summary of All 2022 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	OCWD-M45 Qtr 1	OCWD-M45 Qtr 2	OCWD-M45 Qtr 3	OCWD-M45 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	ND - 11.8	ND - 13	ND - 12.2	ND - 9.6
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 3.4	ND - 3	ND - 3	ND - 3.3
Barium (Ba), ug/L	OCWD	1000	8.8 - 62.4	8.2 - 60.6	8.4 - 68	7.6 - 66.9
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND - 1.2	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.28 - 0.85	0.26 - 0.86	0.28 - 0.87	0.28 - 0.85
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND	ND	ND	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 3.4	ND - 3	ND - 2.8	ND - 2.7
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 2.81	ND - 2.72	ND - 2.66	ND - 2.81
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	Not Required	ND - 0.152
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 3.5	ND - 3	ND - 2.8	ND - 3.2
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND	ND	ND	ND
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND - 110	ND - 100	ND - 90	ND - 90
Electrical Conductivity (EC), uS/cm	OCWD	900	190 - 1140	188 - 1130	170 - 1080	175 - 1120
Iron (Fe), ug/L	OCWD	300	ND - 136	ND - 110	ND - 120	ND - 112
Manganese (Mn), ug/L	OCWD	50	4.5 - 14.7	3.5 - 14.8	3.5 - 13.4	3.3 - 13.3
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	4.3 - 14	3.3 - 14.2	3.5 - 12.4	3.3 - 12.8
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND - 1	ND	ND - 1	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	106 - 710	120 - 706	152 - 726	104 - 712
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	ND - 0.25	ND - 0.2	ND - 0.15	ND - 0.15
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND - 1.8	ND - 4.5	ND - 3.1	ND - 2.9
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.11 - 0.3	0.1 - 0.33	0.11 - 0.32	0.12 - 0.32
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	ND - 3.9	ND - 3.9	ND - 3.6	ND - 3.6
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND - 0.2	ND	ND - 0.2	ND - 0.2
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	Not Required	ND
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2022 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	OCWD-M45 Qtr 1	OCWD-M45 Qtr 2	OCWD-M45 Qtr 3	OCWD-M45 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND < NL	ND < NL	ND < NL	ND < MCL
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	Not Required	ND
533	PFAS Compounds	OCWD	Not Required	Not Required	Not Required	ND > NL
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	OCWD	Not Required	Not Required	Not Required	ND
8015B	Nonhalogenated Organics	WeckLab	Not Required	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	Not Required	ND - Detections
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND	ND	ND	ND

OCWD-M45/1
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
1/31/2022	9:10	cis-1,2-Dichloroethene (c12DCE)	0.6	ug/L	0.5
1/31/2022	9:10	Methyl tert-butyl ether (MTBE)	0.2	ug/L	0.2
1/31/2022	9:10	Tetrachloroethene (PCE)	TR	ug/L	0.5
1/31/2022	9:10	Trichloroethene (TCE)	TR	ug/L	0.5

Year 2022, Quarter 2

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
5/9/2022	9:40	cis-1,2-Dichloroethene (c12DCE)	0.5	ug/L	0.5
5/9/2022	9:40	Tetrachloroethene (PCE)	TR	ug/L	0.5
5/9/2022	9:40	Trichloroethene (TCE)	TR	ug/L	0.5

Year 2022, Quarter 3

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
8/1/2022	11:15	cis-1,2-Dichloroethene (c12DCE)	0.6	ug/L	0.5
8/1/2022	11:15	Methyl tert-butyl ether (MTBE)	0.2	ug/L	0.2
8/1/2022	11:15	Tetrachloroethene (PCE)	TR	ug/L	0.5
8/1/2022	11:15	Trichloroethene (TCE)	TR	ug/L	0.5

Year 2022, Quarter 4

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
10/31/2022	12:50	cis-1,2-Dichloroethene (c12DCE)	0.7	ug/L	0.5
10/31/2022	12:50	Methyl tert-butyl ether (MTBE)	0.2	ug/L	0.2
10/31/2022	12:50	Tetrachloroethene (PCE)	TR	ug/L	0.5
10/31/2022	12:50	Trichloroethene (TCE)	TR	ug/L	0.5

OCWD-M45/1
Organic Detections by Method

Year 2022, Quarter 4

METHOD: 533

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
10/31/2022 12:50	Perfluoro butane sulfonic acid (PFBS)	3.8	ng/L	2
10/31/2022 12:50	Perfluoro hexane sulfonic acid (PFHxS)	9.1	ng/L	2
10/31/2022 12:50	Perfluoro octane sulfonic acid (PFOS)	5.7	ng/L	2
10/31/2022 12:50	Perfluorobutanoic acid (PFBA)	2.1	ng/L	2

OCWD-M45/2
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
1/31/2022 10:05	1,4-Dioxane (14DIOX)	0.6	ug/L	0.5

Year 2022, Quarter 2

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
5/9/2022 12:00	1,4-Dioxane (14DIOX)	0.6	ug/L	0.5

Year 2022, Quarter 3

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
8/1/2022 10:50	1,4-Dioxane (14DIOX)	0.6	ug/L	0.5

Year 2022, Quarter 4

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
10/31/2022 12:10	1,4-Dioxane (14DIOX)	0.6	ug/L	0.5

METHOD: 533

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
10/31/2022 12:10	Perfluoro hexane sulfonic acid (PFHxS)	2.1	ng/L	2

OCWD-M45/3
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/31/2022	10:40	1,4-Dioxane (14DIOX)	5.3	ug/L	0.5

Year 2022, Quarter 2

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/9/2022	10:30	1,4-Dioxane (14DIOX)	2.3	ug/L	0.5
5/23/2022	9:15	1,4-Dioxane (14DIOX)	3	ug/L	0.5

Year 2022, Quarter 3

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/1/2022	10:40	1,4-Dioxane (14DIOX)	3.5	ug/L	0.5

Year 2022, Quarter 4

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/31/2022	11:35	1,4-Dioxane (14DIOX)	2	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/31/2022	11:35	Gemfibrozil (GMFIBZ)	2.27	ng/L	1
10/31/2022	11:35	Primidone (PRIMDN)	2.077	ng/L	1

OCWD-M45/4
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
1/31/2022 11:20	1,4-Dioxane (14DIOX)	1.4	ug/L	0.5

Year 2022, Quarter 2

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
5/9/2022 11:20	1,4-Dioxane (14DIOX)	1.4	ug/L	0.5
6/23/2022 10:50	1,4-Dioxane (14DIOX)	1.2	ug/L	0.5

Year 2022, Quarter 3

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
8/1/2022 10:00	1,4-Dioxane (14DIOX)	1	ug/L	0.5

Year 2022, Quarter 4

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
10/31/2022 10:55	1,4-Dioxane (14DIOX)	0.8	ug/L	0.5

METHOD: CEC

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
10/31/2022 10:55	Carbamazepine (CBMAZP)	1.425	ng/L	1

Summary of All 2022 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	OCWD-M46 & 46A Qtr 1	OCWD-M46 & 46A Qtr 2	OCWD-M46 & 46A Qtr 3	OCWD-M46 & 46A Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	4.5 - 18.5	6.4 - 18.7	5.1 - 19.3	3.6 - 18.8
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 4.3	ND - 4.3	ND - 4.1	ND - 3.9
Barium (Ba), ug/L	OCWD	1000	5 - 17.1	4.5 - 15.7	4.2 - 17.3	4.1 - 16
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	ND - 0.73	ND - 0.68	ND - 0.71	ND - 0.75
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND - 0.27	ND - 0.32	ND - 0.31	ND - 0.35
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND	ND	ND	ND
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 1.3	ND - 1.33	ND - 1.36	ND - 1.49
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	Not Required	ND
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 2	ND - 1.8	ND - 2.3	ND - 2.5
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND - 1.7	ND - 1.6	ND - 1.3	ND - 1.2
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND - 60	ND - 65	ND - 70	ND - 70
Electrical Conductivity (EC), uS/cm	OCWD	900	120 - 373	114 - 339	117 - 346	123 - 359
Iron (Fe), ug/L	OCWD	300	ND - 21.1	ND - 27.9	5.2 - 28.1	ND - 28.2
Manganese (Mn), ug/L	OCWD	50	ND - 5.7	ND - 5.7	ND - 5.4	ND - 5.6
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 5.3	ND - 5.5	ND - 5.6	ND - 5.5
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND - 32	ND - 1	ND - 1	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	35 - 210	56 - 204	76 - 224	85.5 - 216
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	0.15 - 0.4	ND - 0.2	ND - 0.2	ND - 0.25
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND - 1.4	ND - 1.2	ND - 1.9	ND - 1.5
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	ND - 0.22	0.1 - 0.24	0.11 - 0.26	0.12 - 0.24
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	1.1 - 8.9	1 - 9.2	ND - 9.8	ND - 9
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	Not Required	ND
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2022 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	OCWD-M46 & 46A Qtr 1	OCWD-M46 & 46A Qtr 2	OCWD-M46 & 46A Qtr 3	OCWD-M46 & 46A Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND < NL	ND < NL	ND < NL	ND < MCL
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	Not Required	ND
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	Not Required	ND
8015B/ 8015D	Nonhalogenated Organics	Euro Buf/ WeckLab	Not Required	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	Not Required	ND - Detections
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND < NL	ND < NL	ND < NL	ND < NL

OCWD-M46A/1
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
1/3/2022	9:25	Chloroform (CHCl3)	1.7	ug/L	0.5
1/3/2022	9:25	Total Trihalomethanes (TTHMs)	1.7	ug/L	0.5

METHOD: NDMA-LOW

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
1/3/2022	9:25	n-Nitrosodimethylamine (NDMA)	3.3	ng/L	2

Year 2022, Quarter 2

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
4/11/2022	9:05	Chloroform (CHCl3)	1.6	ug/L	0.5
4/11/2022	9:05	Total Trihalomethanes (TTHMs)	1.6	ug/L	0.5

METHOD: NDMA-LOW

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
4/11/2022	9:05	n-Nitrosodimethylamine (NDMA)	3	ng/L	2

Year 2022, Quarter 3

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
7/5/2022	9:45	Chloroform (CHCl3)	1.2	ug/L	0.5
7/5/2022	9:45	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5

METHOD: NDMA-LOW

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
7/5/2022	9:45	n-Nitrosodimethylamine (NDMA)	3.4	ng/L	2

OCWD-M46A/1
Organic Detections by Method

Year 2022, Quarter 4

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
10/3/2022	9:05	Chloroform (CHCl3)	1.2	ug/L	0.5
10/3/2022	9:05	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5

METHOD: NDMA-LOW

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
10/3/2022	9:05	n-Nitrosodimethylamine (NDMA)	3.6	ng/L	2

OCWD-M46/2
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/3/2022	10:10	Chloroform (CHCl3)	1.7	ug/L	0.5
1/3/2022	10:10	Total Trihalomethanes (TTHMs)	1.7	ug/L	0.5

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/11/2022	9:50	Chloroform (CHCl3)	1.5	ug/L	0.5
4/11/2022	9:50	Total Trihalomethanes (TTHMs)	1.5	ug/L	0.5

Year 2022, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/5/2022	10:30	Chloroform (CHCl3)	1.3	ug/L	0.5
7/5/2022	10:30	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/3/2022	10:50	Chloroform (CHCl3)	1.2	ug/L	0.5
10/3/2022	10:50	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5

OCWD-M46/3
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/3/2022	10:55	Chloroform (CHCl3)	TR	ug/L	0.5
1/3/2022	10:55	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/11/2022	10:35	Chloroform (CHCl3)	TR	ug/L	0.5
4/11/2022	10:35	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

Year 2022, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/5/2022	11:20	Chloroform (CHCl3)	TR	ug/L	0.5
7/5/2022	11:20	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

OCWD-M46/5
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/3/2022	10:00	1,4-Dioxane (14DIOX)	3.4	ug/L	0.5

Year 2022, Quarter 2

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/11/2022	9:55	1,4-Dioxane (14DIOX)	3.6	ug/L	0.5

Year 2022, Quarter 3

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/5/2022	10:15	1,4-Dioxane (14DIOX)	2.8	ug/L	0.5

Year 2022, Quarter 4

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/3/2022	9:50	1,4-Dioxane (14DIOX)	1.5	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/3/2022	9:50	Primidone (PRIMDN)	2.334	ng/L	1

Summary of All 2022 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	OCWD-M47 Qtr 1	OCWD-M47 Qtr 2	OCWD-M47 Qtr 3	OCWD-M47 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	2.4 - 13.7	2.6 - 17.7	2.3 - 16.5	2.3 - 14.9
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 5.9	ND - 5.5	ND - 4.6	ND - 4.7
Barium (Ba), ug/L	OCWD	1000	3.8 - 34.6	3.6 - 32.4	3.4 - 33.1	3.5 - 32.2
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.29 - 0.85	0.28 - 0.85	0.29 - 0.89	0.3 - 0.86
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND - 0.39	ND - 0.4	ND - 1.1	ND - 0.37
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND	ND	ND	ND
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 1.42	ND - 1.45	ND - 1.48	ND - 1.52
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	Not Required	ND - 0.004
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 1.6	ND	ND	ND
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND - 1.3	ND - 1.3	ND - 1.1	ND - 1.2
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND - 70	ND - 75	ND - 80	ND - 70
Electrical Conductivity (EC), uS/cm	OCWD	900	168 - 359	167 - 360	156 - 340	163 - 356
Iron (Fe), ug/L	OCWD	300	5.2 - 35.7	6.1 - 37.8	7.8 - 26.2	6.6 - 33.7
Manganese (Mn), ug/L	OCWD	50	ND - 15.9	ND - 15.2	ND - 16.5	ND - 15.5
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 15.5	ND - 15.2	ND - 16.6	ND - 15.5
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND - 4	ND - 2	ND - 1
Total Dissolved Solids (TDS), mg/L	OCWD	500	115 - 211	112 - 242	108 - 232	100 - 204
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	0.15 - 0.35	0.15 - 0.35	0.15 - 0.55	ND - 0.2
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND - 1.6	ND - 1.5	ND - 3.3	ND - 1.2
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	ND - 0.23	ND - 0.23	ND - 0.24	ND - 0.23
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	ND - 3.4	ND - 3.7	ND - 3.8	ND - 3.7
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	Not Required	ND
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2022 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	OCWD-M47 Qtr 1	OCWD-M47 Qtr 2	OCWD-M47 Qtr 3	OCWD-M47 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND < NL	ND	ND < NL	ND < MCL
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	Not Required	ND
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	Not Required	ND
8015B	Nonhalogenated Organics	WeckLab	Not Required	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	Not Required	ND
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND	ND	ND	ND

OCWD-M47/1
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 14DIOX

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
1/18/2022	10:30	1,4-Dioxane (14DIOX)	0.5	ug/L	0.5

Year 2022, Quarter 3

METHOD: 14DIOX

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
7/19/2022	9:00	1,4-Dioxane (14DIOX)	0.5	ug/L	0.5

Year 2022, Quarter 4

METHOD: 14DIOX

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
10/18/2022	9:35	1,4-Dioxane (14DIOX)	0.5	ug/L	0.5

OCWD-M47/2
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/18/2022	9:45	1,4-Dioxane (14DIOX)	0.6	ug/L	0.5

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/18/2022	9:45	Chloroform (CHCl3)	1.3	ug/L	0.5
1/18/2022	9:45	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/26/2022	10:05	Chloroform (CHCl3)	1.3	ug/L	0.5
4/26/2022	10:05	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5

Year 2022, Quarter 3

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/19/2022	9:45	1,4-Dioxane (14DIOX)	0.6	ug/L	0.5

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/19/2022	9:45	Chloroform (CHCl3)	1.1	ug/L	0.5
7/19/2022	9:45	Total Trihalomethanes (TTHMs)	1.1	ug/L	0.5

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/18/2022	9:55	Chloroform (CHCl3)	1.2	ug/L	0.5

OCWD-M47/2
Organic Detections by Method

Year 2022, Quarter 4

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
10/18/2022	9:55	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5

Appendix H

Talbert Barrier Monitoring Well Groundwater Quality Data

1,4-Dioxane, NDMA and Selected Constituents

Orange County Water District
Groundwater Replenishment System
2022 Annual Report

TABLE H-1
MONITORING WELL OCWD-M10
1,4-dioxane and NDMA Concentrations, 2018 - 2022

M10/1 *Talbert, Alpha-III Aquifers* *Perforations: 80-160 ft bgs*			M10/2 *Beta-I,II Aquifers* *Perforations: 175-195 ft bgs*			M10/3 *Beta-III Aquifer* *Perforations: 215-240 ft bgs*			M10/4 *Lambda, Omicron, Upper Rho Aquifers* *Perforations: 280-305 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
1/22/2018	0.1	<2	1/22/2018	<1	<2	1/22/2018	4.7	<2	1/22/2018	<1	<2
4/23/2018	1.4	<2	4/23/2018	<1	<2	4/23/2018	5.4	<2	4/23/2018	<1	<2
7/23/2018	1.6	<2	7/23/2018	<1	<2	7/23/2018	5.9	<2	7/23/2018	<1	<2
10/22/2018	1.2	<2	10/22/2018	<1	<2	10/22/2018	6.5	<2	10/22/2018	<1	<2
1/21/2019	1.7	<2	1/21/2019	<1	<2	1/21/2019	6.8	<2	1/21/2019	<1	<2
4/15/2019	1.5	<2	4/15/2019	<1	<2	4/15/2019	6.4	<2	4/15/2019	<1	<2
7/22/2019	1.4	<2	7/22/2019	<1	<2	7/22/2019	6.4	<2	7/22/2019	1	<2
10/21/2019	1.5	<2	10/21/2019	<1	<2	10/21/2019	6.7	<2	10/21/2019	1.5	<2
1/20/2020	<1	<2	1/20/2020	<1	<2	1/20/2020	4.8	<2	1/20/2020	1.1	<2
4/20/2020	1	<2	4/20/2020	<1	<2	2/18/2020	5.8	<2	4/20/2020	1.4	<2
7/20/2020	0.8	<2	7/20/2020	<0.5	<2	4/20/2020	5.8	<2	7/20/2020	1.5	<2
10/19/2020	1	<2	10/19/2020	<0.5	<2	7/20/2020	5.2	<2	10/19/2020	1.9	<2
1/18/2021	0.8	<2	1/18/2021	<0.5	<2	10/19/2020	5.2	<2	1/18/2021	1.9	<2
4/19/2021	0.8	<2	4/19/2021	<0.5	<2	1/18/2021	4.5	<2	4/19/2021	1.8	<2
7/19/2021	1.1	<2	7/19/2021	<0.5	<2	4/19/2021	5	<2	7/19/2021	2	<2
10/18/2021	1.5	<2	10/18/2021	0.6	<2	7/19/2021	4.3	<2	10/18/2021	2.5	<2
1/17/2022	1.3	<2	1/17/2022	<0.5	<2	10/18/2021	4.7	<2	1/17/2022	2.1	<2
4/25/2022	0.7	<2	4/25/2022	<0.5	<2	1/17/2022	4.9	<2	4/25/2022	1.2	<2
7/18/2022	1	<2	7/18/2022	<0.5	<2	4/25/2022	4.5	<2	7/18/2022	1.8	<2
10/5/2022	0.8	<2	10/5/2022	<0.5	<2	7/18/2022	5.5	<2	10/5/2022	1.1	<2
						10/5/2022	3.7	<2			

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE H-2
MONITORING WELL OCWD-M11
1,4-dioxane and NDMA Concentrations, 2018 - 2022

M11/1 *Talbert Aquifer* *Perforations* *70-105 ft bgs*			**M11/2** *Talbert, Alpha-III Aquifers* *Perforations* *125-150 ft bgs*			**M11/3** *Beta-I, Beta-II, Beta-III Aquifers* *Perforations* *170-225 ft bgs*			**M11/4** *Lambda, Omicron Aquifers* *Perforations* *260-290 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
2/7/2018	<1	<2	2/7/2018	<1	<2	2/7/2018	<1	<2	2/7/2018	1.9	<2
4/25/2018	<1	<2	4/25/2018	<1	<2	4/25/2018	<1	<2	4/25/2018	1.3	<2
7/25/2018	<1	<2	7/25/2018	<1	<2	7/25/2018	<1	<2	7/25/2018	<1	<2
10/24/2018	<1	<2	10/24/2018	<1	<2	10/24/2018	<1	<2	10/24/2018	<1	<2
2/7/2019	1	na	2/7/2019	<1	na	2/7/2019	<1	na	2/7/2019	1.2	na
4/17/2019	<1	<2	4/17/2019	1	<2	4/17/2019	<1	<2	4/17/2019	1.3	<2
7/24/2019	1.5	<2	7/24/2019	1.2	<2	7/24/2019	<1	<2	7/24/2019	1.3	<2
11/5/2019	1.6	<2	11/5/2019	1.4	<2	11/5/2019	<1	<2	11/5/2019	1.3	<2
1/22/2020	1.6	<2	1/22/2020	<1	<2	1/22/2020	<1	<2	1/22/2020	<1	<2
4/22/2020	1.1	<2	4/22/2020	<1	<2	4/22/2020	<1	<2	4/22/2020	1	<2
7/22/2020	1.2	<2	7/22/2020	0.6	<2	7/22/2020	<0.5	<2	7/22/2020	0.9	<2
10/21/2020	1.3	<2	10/21/2020	0.8	<2	10/21/2020	<0.5	<2	10/21/2020	1.1	<2
1/20/2021	1.8	<2	1/20/2021	1	<2	1/20/2021	<0.5	<2	1/20/2021	1.3	<2
4/21/2021	1.4	<2	4/21/2021	0.6	<2	4/21/2021	<0.5	<2	4/21/2021	0.7	<2
7/21/2021	1.6	<2	7/21/2021	0.9	<2	7/21/2021	<0.5	<2	7/21/2021	0.9	<2
10/20/2021	1.5	<2	10/20/2021	0.9	<2	10/20/2021	<0.5	<2	10/20/2021	1	<2
1/19/2022	1.4	<2	1/19/2022	0.9	<2	1/19/2022	<0.5	<2	1/19/2022	1.2	<2
4/27/2022	1	<2	4/27/2022	<0.5	<2	4/27/2022	<0.5	<2	4/27/2022	1.2	<2
7/20/2022	1.6	<2	7/20/2022	0.7	<2	7/20/2022	<0.5	<2	7/20/2022	0.9	<2
10/17/2022	1.4	<2	10/17/2022	0.8	<2	10/17/2022	<0.5	<2	10/17/2022	0.9	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE H-3
MONITORING WELL OCWD-M19
1,4-dioxane and NDMA Concentrations, 2018 - 2022

M19/1 *Talbert Aquifer* *Perforations: 60-110 ft bgs*			**M19/2** *Alpha Aquifer* *Perforations: 130-195 ft bgs*			**M19/3** *Beta Aquifer* *Perforations: 215-265 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
04/11/18	<1	na	04/11/18	<1	na	02/08/18	<1	<2
10/10/18	<1	na	10/10/18	<1	na	04/11/18	<1	<2
						07/11/18	<1	<2
						10/10/18	<1	<2
						01/09/19	<1	<2
						04/03/19	<1	<2
						07/11/19	<1	<2
						10/10/19	<1	2.5
						01/07/20	<1	<2
						04/23/20	<1	<2
						07/07/20	<0.5	<2
						10/07/20	<0.5	<2
						01/05/21	<0.5	<2
						04/06/21	<0.5	<2
						07/07/21	<0.5	<2
						10/05/21	<0.5	<2
						01/04/22	<0.5	<2
						04/12/22	<0.5	<2
						07/06/22	<0.5	2.2
						10/04/22	<0.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE H-4
MONITORING WELL OCWD-M45
1,4-dioxane and NDMA Concentrations, 2018 - 2022

M45/1 *Alpha-III, Beta-I,II Perforations 195-205 ft bgs*			**M45/2** *Beta-III Aquifer Perforations 250-260 ft bgs*			**M45/3** *Omicron Aquifer Perforations 335-345 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
1/10/18	<1	<2	01/10/18	<1	<2	01/10/18	6.7	<2
4/10/18	<1	<2	04/10/18	<1	<2	04/10/18	4.9	<2
7/10/18	<1	<2	07/10/18	<1	<2	07/10/18	3.7	<2
10/9/18	<1	<2	10/09/18	<1	<2	10/09/18	5.1	<2
1/24/19	<1	<2	01/07/19	<1	<2	01/07/19	5.5	<2
5/7/19	<1	<2	05/07/19	<1	<2	05/07/19	3.5	<2
7/9/19	<1	<2	07/09/19	<1	<2	07/09/19	7.2	<2
10/8/19	<1	<2	10/08/19	<1	<2	10/08/19	3.8	<2
2/5/20	<1	<2	02/05/20	<1	<2	02/05/20	3.1	<2
5/4/20	<1	<2	05/04/20	<1	<2	05/04/20	7.4	<2
8/3/20	<0.5	<2	08/03/20	0.5	<2	08/03/20	5.6	<2
11/2/20	<0.5	<2	11/02/20	<0.5	<2	11/02/20	3.9	<2
2/1/21	<0.5	<2	02/01/21	<0.5	<2	02/01/21	2.7	<2
5/3/21	<0.5	<2	05/03/21	<0.5	<2	05/03/21	7.6	<2
8/9/21	<0.5	<2	08/09/21	0.5	<2	08/09/21	3.1	<2
11/1/21	<0.5	<2	11/01/21	<0.5	<2	11/01/21	4.2	<2
1/31/22	<0.5	<2	01/31/22	0.6	<2	01/31/22	5.3	<2
5/9/22	<0.5	<2	05/09/22	0.6	<2	05/09/22	2.3	<2
5/23/22	na	na	5/23/22	na	na	05/23/22	3	na
8/1/22	<0.5	<2	08/01/22	0.6	<2	08/01/22	3.5	<2
10/31/22	<0.5	<2	10/31/22	0.6	<2	10/31/22	2	<2

M45/4 *Upper Rho Aquifer Perforations 380-390 ft bgs*			**M45/5** *Main Aquifer Perforations 780-790 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
01/10/18	2.4	<2	01/10/18	<1	<2
04/10/18	1.8	<2	04/10/18	<1	<2
07/10/18	1.6	<2	07/10/18	<1	<2
10/09/18	1.2	<2	10/09/18	<1	<2
01/07/19	1.9	<2	01/07/19	<1	<2
05/07/19	<1	<2	05/07/19	<1	<2
07/09/19	<1	<2	07/09/19	<1	<2
10/08/19	<1	<2	10/08/19	<1	<2
02/05/20	1.3	<2	02/05/20	<1	<2
05/04/20	1.8	<2	05/04/20	<1	<2
08/03/20	1.6	<2	08/03/20	<0.5	<2
11/02/20	1.3	<2	11/02/20	<0.5	<2
02/01/21	1.2	<2	02/01/21	<0.5	<2
05/03/21	1.3	<2	05/03/21	<0.5	<2
08/09/21	1.1	<2	08/09/21	<0.5	<2
11/01/21	1.7	<2	11/01/21	<0.5	<2
01/31/22	1.4	<2	01/31/22	<0.5	<2
05/09/22	1.4	<2	05/09/22	<0.5	<2
06/23/22	1.2	na	06/23/22	na	na
08/01/22	1	<2	08/01/22	<0.5	<2
10/31/22	0.8	<2	10/31/22	<0.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE H-5
MONITORING WELL OCWD-M46
1,4-dioxane and NDMA Concentrations, 2018 - 2022

M46A/1 *Lambda/Omicron Aquifers Perforations 350-370 ft bgs*			**M46/2** *Upper Rho Aquifer Perforations 420-430 ft bgs*			**M46/3** *Lower Rho Aquifer Perforations 515-535 ft bgs*			**M46/4** *Main Aquifer Perforations 640-660 ft bgs*			**M46/5** *Main Aquifer Perforations 890-910 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
01/23/18	<1	2.2	01/23/18	<1	<2	01/23/18	<1	<2	01/23/18	<1	<2	01/23/18	<1	<2
05/07/18	<1	3.1	05/07/18	<1	<2	05/07/18	<1	<2	05/07/18	<1	<2	05/07/18	<1	<2
08/07/18	<1	2.5	08/07/18	<1	<2	08/07/18	<1	<2	08/07/18	<1	<2	08/07/18	1.1	<2
10/08/18	<1	2.8	10/08/18	<1	<2	10/08/18	<1	<2	10/08/18	<1	<2	10/08/18	1	<2
01/23/19	<1	3.5	01/23/19	<1	<2	01/23/19	<1	<2	01/23/19	<1	<2	01/23/19	1	<2
04/02/19	<1	3.3	04/02/19	<1	<2	04/02/19	<1	<2	04/02/19	<1	<2	04/02/19	1.9	<2
08/06/19	<1	3.1	08/06/19	<1	<2	08/06/19	<1	<2	08/06/19	<1	<2	08/06/19	2.5	<2
10/07/19	<1	2.2	10/07/19	<1	<2	10/07/19	<1	<2	10/07/19	<1	<2	10/07/19	2.6	<2
01/06/20	<1	3.1	01/06/20	<1	<2	01/06/20	<1	<2	01/06/20	<1	<2	01/06/20	2.8	<2
04/08/20	<1	3.5	04/08/20	<1	<2	04/08/20	<1	<2	04/08/20	<1	<2	04/08/20	3.5	<2
07/06/20	<0.5	2.8	07/06/20	<0.5	<2	07/06/20	<0.5	<2	07/06/20	<0.5	<2	07/06/20	3.5	<2
10/05/20	<0.5	2.8	10/05/20	<0.5	<2	10/05/20	<0.5	<2	10/05/20	<0.5	<2	10/05/20	3.5	<2
01/04/21	<0.5	3.5	01/04/21	<0.5	<2	01/04/21	<0.5	<2	01/04/21	<0.5	<2	01/04/21	3.1	<2
04/05/21	<0.5	3.4	04/05/21	<0.5	<2	04/05/21	<0.5	<2	04/05/21	<0.5	<2	04/05/21	3.1	<2
07/06/21	<0.5	2.6	07/06/21	<0.5	<2	07/06/21	<0.5	<2	07/06/21	<0.5	<2	07/06/21	2.6	<2
10/04/21	<0.5	3	10/04/21	<0.5	<2	10/04/21	<0.5	<2	10/04/21	<0.5	<2	10/04/21	2.7	<2
01/03/22	<0.5	3.3	01/03/22	<0.5	<2	01/03/22	<0.5	<2	01/03/22	<0.5	<2	01/03/22	3.4	<2
04/11/22	<0.5	3	04/11/22	<0.5	<2	04/11/22	<0.5	<2	04/11/22	<0.5	<2	04/11/22	3.6	<2
07/05/22	<0.5	3.4	07/05/22	<0.5	<2	07/05/22	<0.5	<2	07/05/22	<0.5	<2	07/05/22	2.8	<2
10/03/22	<0.5	3.6	10/03/22	<0.5	<2	10/03/22	<0.5	<2	10/03/22	<0.5	<2	10/03/22	1.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE H-6
MONITORING WELL OCWD-M47
1,4-dioxane and NDMA Concentrations
2018 - 2022

M47/1 *Beta-III Aquifer Perforations 355-375 bgs*			**M47/2** *Upper Rho Aquifer Perforations 470-480 ft bgs*			**M47/3** *Lower Rho Aquifer Perforations 580-600 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
01/24/18	<1	<2	01/24/18	<1	<2	01/24/18	<1	<2
04/24/18	<1	<2	04/24/18	<1	<2	04/24/18	<1	<2
07/24/18	<1	<2	07/24/18	<1	<2	07/24/18	<1	<2
10/23/18	<1	<2	10/23/18	<1	<2	10/23/18	<1	<2
01/22/19	<1	<2	01/22/19	<1	<2	01/22/19	<1	<2
04/16/19	<1	<2	04/16/19	<1	<2	04/16/19	<1	<2
07/23/19	<1	<2	07/23/19	<1	<2	07/23/19	<1	<2
10/22/19	<1	<2	10/22/19	<1	<2	10/22/19	<1	<2
01/21/20	<1	<2	01/21/20	<1	<2	01/21/20	<1	<2
04/21/20	<1	<2	04/21/20	<1	<2	04/21/20	<1	<2
07/21/20	0.6	<2	07/21/20	0.5	<2	07/21/20	<0.5	<2
10/20/20	0.7	<2	10/20/20	0.6	<2	10/20/20	<0.5	<2
01/19/21	0.7	<2	01/19/21	<0.5	<2	01/19/21	<0.5	<2
04/20/21	0.6	<2	04/20/21	<0.5	<2	04/20/21	<0.5	<2
07/20/21	0.5	<2	07/20/21	0.5	<2	07/20/21	<0.5	<2
10/19/21	0.6	<2	10/19/21	0.5	<2	10/19/21	<0.5	<2
01/18/22	0.5	<2	01/18/22	0.6	<2	01/18/22	<0.5	<2
04/26/22	<0.5	<2	04/26/22	<0.5	<2	04/26/22	<0.5	<2
07/19/22	0.5	<2	07/19/22	0.6	<2	07/19/22	<0.5	<2
10/18/22	0.5	<2	10/18/22	<0.5	<2	10/18/22	<0.5	<2

M47/4 *Main Aquifer Perforations 745-765 ft bgs*			**M47/5** *Main Aquifer Perforations 940-960 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
01/24/18	<1	<2	01/24/18	<1	<2
04/24/18	<1	<2	04/24/18	<1	<2
07/24/18	<1	<2	07/24/18	<1	<2
10/23/18	<1	<2	10/23/18	<1	<2
01/22/19	<1	<2	01/22/19	<1	<2
04/16/19	<1	<2	04/16/19	<1	<2
07/23/19	<1	<2	07/23/19	<1	<2
10/22/19	<1	<2	10/22/19	<1	<2
01/21/20	<1	<2	01/21/20	<1	<2
04/21/20	<1	<2	04/21/20	<1	<2
07/21/20	<0.5	<2	07/21/20	<0.5	<2
10/20/20	<0.5	<2	10/20/20	<0.5	<2
01/19/21	<0.5	<2	01/19/21	<0.5	<2
04/20/21	<0.5	<2	04/20/21	<0.5	<2
07/20/21	<0.5	<2	07/20/21	<0.5	<2
10/19/21	<0.5	<2	10/19/21	<0.5	<2
01/18/22	<0.5	<2	01/18/22	<0.5	<2
04/26/22	<0.5	<2	04/26/22	<0.5	<2
07/19/22	<0.5	<2	07/19/22	<0.5	<2
10/18/22	<0.5	<2	10/18/22	<0.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE H-7
MONITORING WELL OCWD-M10
General Water Quality Data
2018 - 2022

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M10/1 Talbert, Alpha-III Perforations 80-160 ft bgs	01/22/18	0.168	45.0	350	209	<0.2	<0.002	1.14	0.21
	04/23/18	0.208	51.5	424	255	na	na	1.14	0.24
	07/23/18	0.103	29.9	276	149	na	na	1.14	0.18
	10/22/18	0.048	16.4	184	85.4	<0.2	<0.002	1.38	0.17
	01/21/19	0.167	45.0	354	213	<0.2	0.004	1.14	0.14
	04/15/19	0.210	53.6	414	268	na	na	1.00	0.29
	07/22/19	0.246	61.3	474	288	na	na	1.17	0.39
	10/21/19	0.237	59.4	464	255	na	na	0.89	0.29
	01/20/20	0.299	72.1	562	437	na	na	1.06	0.39
	04/20/20	0.344	79.2	672	408	<0.2	0.004	1.52	0.44
	07/20/20	0.347	78.9	634	424	na	na	1.27	0.42
	10/19/20	0.357	74.3	612	381	na	na	1.10	0.38
	01/18/21	0.372	77.3	641	394	na	na	1.09	0.43
	04/19/21	0.397	81.6	660	422	na	na	1.06	0.45
	07/19/21	0.324	69.6	558	353	<0.2	0.003	0.81	0.39
	10/18/21	0.205	46.5	384	252	na	na	1.03	0.25
	01/17/22	0.337	70.0	620	360	na	na	1.13	0.39
	04/25/22	0.380	81.4	654	431	na	na	1.22	0.45
	07/18/22	0.395	84.6	674	448	na	na	1.06	0.44
	10/05/22	0.370	79.5	650	434	<0.2	<0.002	0.95	0.43
M10/2 Beta-I,II Perforations 175-195 ft bgs	01/22/18	0.029	11.4	130	48.8	<0.2	0.004	2.05	0.10
	04/23/18	0.222	53.2	387	227	na	na	1.45	0.28
	07/23/18	0.316	75.1	578	356	na	na	1.26	0.35
	10/22/18	0.124	32.0	270	164	0.3	<0.002	1.42	0.19
	01/21/19	0.108	30.3	238	149	<0.2	0.005	1.47	0.11
	04/15/19	0.320	79.9	580	380	na	na	1.07	0.36
	07/22/19	0.420	99.7	732	490	na	na	1.29	0.53
	10/21/19	0.407	97.5	694	418	na	na	1.05	0.45
	01/20/20	0.415	99.4	714	560	na	na	1.32	0.58
	04/20/20	0.369	86.6	662	430	<0.2	<0.002	1.66	0.46
	07/20/20	0.423	95.0	768	508	na	na	2.20	0.48
	10/19/20	0.474	96.8	778	511	na	na	1.99	0.46
	01/18/21	0.468	97.2	813	487	na	na	1.93	0.49
	04/19/21	0.468	97.3	794	493	na	na	2.02	0.51
	07/19/21	0.473	98.0	792	493	<0.2	<0.002	1.89	0.52
	10/18/21	0.212	46.5	376	248	na	na	1.35	0.23
	01/17/22	0.437	87.0	668	429	na	na	1.59	0.44
	04/25/22	0.436	94.1	746	480	na	na	1.80	0.48
	07/18/22	0.472	98.7	836	524	na	na	1.93	0.50
	10/05/22	0.479	103	762	553	<0.2	<0.002	1.73	0.54
M10/3 Beta-III Perforations 215-240 ft bgs	01/22/18	0.176	55.7	390	198	<0.2	0.010	0.12	0.29
	04/23/18	0.191	57.6	378	205	na	na	0.22	0.32
	07/23/18	0.142	47.8	322	149	na	na	0.13	0.29
	10/22/18	0.106	39.1	274	113	<0.2	0.013	0.17	0.27
	01/21/19	0.166	53.4	342	174	<0.2	0.014	0.15	0.20
	04/15/19	0.160	54.6	358	189	na	na	0.16	0.33
	07/22/19	0.140	47.5	326	147	na	na	<0.1	0.34
	10/21/19	0.144	46.2	274	145	na	na	<0.1	0.29
	01/20/20	0.139	46.1	316	177	na	na	<0.1	0.35
	04/20/20	0.137	44.0	326	141	<0.2	0.011	0.17	0.29
	07/20/20	0.136	42.6	320	148	na	na	0.14	0.27
	10/19/20	0.155	43.2	316	141	na	na	0.14	0.27
	01/18/21	0.150	42.3	320	146	na	na	0.2	0.32
	04/19/21	0.151	41.8	324	146	na	na	0.19	0.28
	07/19/21	0.137	40.2	284	133	<0.2	0.009	0.17	0.27
	10/18/21	0.116	35.1	250	115	na	na	<0.1	0.24
	01/17/22	0.144	39.8	285	134	na	na	0.11	0.26
	04/25/22	0.133	39.1	282	132	na	na	0.16	0.25
	07/18/22	0.128	38.0	264	129	na	na	0.12	0.24
	10/05/22	0.120	36.6	248	128	<0.2	0.008	0.10	0.24

TABLE H-7
MONITORING WELL OCWD-M10
General Water Quality Data
2018 - 2022

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M10/4 Lambda, Omicron, Upper Rho Perforations 280-305 ft bgs	01/22/18	0.018	9.4	92	31.7	0.2	<0.002	<0.1	0.17
	04/23/18	0.024	9.1	95	31.4	na	na	<0.1	0.17
	07/23/18	0.017	8.9	88	30.3	na	na	<0.1	0.19
	10/22/18	0.016	8.4	78	30.2	<0.2	<0.002	<0.1	0.18
	01/21/19	0.020	8.1	82	31.3	0.3	0.007	<0.1	0.16
	04/15/19	0.020	8.5	88	34.0	na	na	<0.1	0.19
	07/22/19	0.026	10.7	130	36.5	na	na	<0.1	0.21
	10/21/19	0.029	9.9	96	33.7	na	na	<0.1	0.17
	01/20/20	0.027	11.2	98	43.3	na	na	<0.1	0.20
	04/20/20	0.027	12.0	110	39.6	0.2	0.002	<0.1	0.20
	07/20/20	0.031	12.9	116	43.1	na	na	<0.1	0.20
	10/19/20	0.039	14.3	128	45.6	na	na	<0.1	0.20
	01/18/21	0.040	15.1	131	48.9	na	na	<0.1	0.21
	04/19/21	0.039	15.0	128	51.1	na	na	<0.1	0.21
	07/19/21	0.044	16.9	134	55.7	0.4	0.002	<0.1	0.22
	10/18/21	0.050	19.0	148	69.7	na	na	<0.1	0.21
	01/17/22	0.044	17.1	147	63.8	na	na	<0.1	0.21
	04/25/22	0.036	14.5	164	58.3	na	na	<0.1	0.22
	07/18/22	0.033	13.7	128	55.4	na	na	<0.1	0.22
	10/05/22	0.030	13.4	100	52.4	0.3	<0.002	<0.1	0.23

Note: Monitoring Well OCWD-M10 is located approximately 1,300 feet north of the nearest injection well site (I-19).

TABLE H-8
MONITORING WELL OCWD-M11
General Water Quality Data
2018 - 2022

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M11/1 Talbert Perforations 70-105 ft bgs	02/07/18	0.024	10.9	186	101	<0.2	<0.002	1.14	0.17
	04/25/18	0.030	11.8	172	103	na	na	1.04	0.20
	07/25/18	0.031	11.8	166	98.5	na	na	1.04	0.11
	10/24/18	0.082	23.8	166	130	<0.2	0.002	1.19	0.14
	02/07/19	0.091	28.3	226	136	<0.2	0.004	1.2	0.14
	04/17/19	0.096	29.5	232	153	na	na	1.2	0.22
	07/24/19	0.130	40.0	290	185	na	na	1.29	0.19
	11/05/19	0.132	42.4	304	169	na	na	1.24	0.20
	01/22/20	0.170	48.8	368	279	na	na	1.18	0.22
	04/22/20	0.202	54.3	438	317	<0.2	0.003	1.03	0.28
	07/22/20	0.233	60.3	494	329	na	na	1.16	0.26
	10/21/20	0.255	59.5	444	319	na	na	1.08	0.28
	01/20/21	0.261	63.6	501	314	na	na	1.18	0.28
	04/21/21	0.290	65.6	510	340	na	na	1.2	0.32
	07/21/21	0.299	68.3	510	338	<0.2	0.004	1.35	0.31
	10/20/21	0.305	68.3	468	347	na	na	1.32	0.34
	01/19/22	0.324	70.2	576	354	na	na	1.33	0.31
	04/27/22	0.306	69.9	562	370	na	na	1.17	0.33
	07/20/22	0.315	72.5	518	340	na	na	1.28	0.34
	10/17/22	0.315	74.2	578	389	<0.2	0.003	1.29	0.36
M11/2 Talbert, Alpha-III Perforations 125-150 ft bgs	02/07/18	0.236	64.3	526	333	<0.2	<0.002	2.05	0.34
	04/25/18	0.247	64.4	484	336	na	na	1.99	0.3
	07/25/18	0.233	63.2	488	310	na	na	1.93	0.23
	10/24/18	0.187	45.3	338	239	<0.2	<0.002	1.72	0.19
	02/07/19	0.222	56.3	426	271	<0.2	0.005	1.70	0.27
	04/17/19	0.250	62.7	520	308	na	na	1.37	0.35
	07/24/19	0.252	64.6	500	323	na	na	1.66	0.32
	11/05/19	0.226	61.1	466	315	na	na	1.63	0.46
	01/22/20	0.296	76.0	588	447	na	na	1.78	0.36
	04/22/20	0.295	78.6	618	407	<0.2	0.002	2.06	0.31
	07/22/20	0.306	80.1	602	404	na	na	2.03	0.30
	10/21/20	0.338	80.3	570	397	na	na	2.11	0.31
	01/20/21	0.345	81.9	612	382	na	na	1.85	0.33
	04/21/21	0.346	82.7	604	411	na	na	2.01	0.34
	07/21/21	0.347	81.4	626	394	<0.2	0.007	1.79	0.31
	10/20/21	0.340	80.0	574	399	na	na	1.80	0.36
	01/19/22	0.373	85.2	658	409	na	na	1.78	0.32
	04/27/22	0.352	88.8	652	430	na	na	2.12	0.30
	07/20/22	0.353	88.5	722	416	na	na	1.94	0.32
	10/17/22	0.341	87.8	642	440	<0.2	0.008	1.79	0.36
M11/3 Beta-I, -II, -III Perforations 170-225 ft bgs	02/07/18	0.017	8.1	96	8.1	<0.2	<0.002	2.54	0.12
	04/25/18	0.022	8.4	98	31.7	na	na	2.38	0.19
	07/25/18	0.021	8.2	102	30	na	na	2.27	0.06
	10/24/18	0.025	8.9	106	29.8	<0.2	<0.002	2.30	0.11
	02/07/19	0.028	10.3	90	33.9	<0.2	<0.002	2.25	0.07
	04/17/19	0.028	10.7	144	39.8	na	na	2.19	0.14
	07/24/19	0.030	10.7	98	40.8	na	na	2.05	0.10
	11/05/19	0.029	10.0	108	39.3	na	na	1.99	0.09
	01/22/20	0.029	9.8	116	47.7	na	na	1.99	0.09
	04/22/20	0.026	9.5	98	40.3	<0.2	<0.002	1.96	0.07
	07/22/20	0.026	9.9	106	41.2	na	na	1.90	0.07
	10/21/20	0.027	8.3	96	37.8	na	na	1.91	0.07
	01/20/21	0.058	15.8	149	62.2	na	na	1.96	0.09
	04/21/21	0.063	16.8	156	70.9	na	na	1.95	0.10
	07/21/21	0.058	15.7	158	65.6	<0.2	0.004	1.95	0.09
	10/20/21	0.048	12.9	120	56.0	na	na	1.92	0.14
	01/19/22	0.041	11.8	130	51.7	na	na	1.96	0.05
	04/27/22	0.034	10.1	114	48.2	na	na	1.95	<0.05
	07/20/22	0.027	8.9	84	42.8	na	na	2.01	<0.05
	10/17/22	0.023	8.8	128	42.5	<0.2	<0.002	2.07	0.06

TABLE H-8
MONITORING WELL OCWD-M11
General Water Quality Data
2018 - 2022

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M11/4 Lambda, Omicron Perforations 260-290 ft bgs	02/07/18	0.059	20.5	170	61.4	<0.2	<0.002	1.50	0.18
	04/25/18	0.044	15.2	134	49.1	na	na	1.51	0.23
	07/25/18	0.030	11.3	132	41.9	na	na	1.45	0.08
	10/24/18	0.034	10.9	104	40	<0.2	0.002	1.47	0.09
	02/07/19	0.047	15.6	126	46.5	<0.2	0.006	1.45	0.10
	04/17/19	0.046	16.2	152	58.3	na	na	1.63	0.18
	07/24/19	0.039	14.3	122	53.1	na	na	1.69	0.13
	11/05/19	0.032	12.7	130	50.8	na	na	1.70	0.12
	01/22/20	0.029	11.6	108	55.8	na	na	1.85	0.11
	04/22/20	0.029	12.1	114	49.6	<0.2	<0.002	1.82	0.09
	07/22/20	0.029	12.1	124	48.0	na	na	1.90	0.09
	10/21/20	0.036	12.4	118	45.7	na	na	1.78	0.09
	01/20/21	0.034	12.2	126	47.6	na	na	1.74	0.10
	04/21/21	0.031	11.1	128	45.5	na	na	1.75	0.09
	07/21/21	0.031	11.1	124	43.3	<0.2	0.004	1.81	0.09
	10/20/21	0.032	11.2	104	44.6	na	na	1.71	0.09
	01/19/22	0.033	12.1	138	44.3	na	na	1.58	0.08
	04/27/22	0.036	12.0	136	46.4	na	na	1.57	0.07
	07/20/22	0.030	11.0	126	42.2	na	na	1.61	0.08
	10/17/22	0.027	10.8	144	41.2	<0.2	<0.002	1.65	0.10

Note: OCWD-M11 is located approximately 950 feet north of the nearest injection well site (I-14).

TABLE H-9
MONITORING WELL OCWD-M19
General Water Quality Data
2018 - 2022

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M19/1 Talbert Perforations 60-110 ft bgs	04/11/18	0.3	77.8	512	389	<0.2	<0.002	3.01	na
	10/10/18	0.25	81.2	566	392	<0.2	<0.002	3.65	na
M19/2 Alpha Perforations 130-195 ft bgs	04/11/18	<0.1	29.6	202	136	<0.2	<0.002	1.58	na
	10/10/18	0.13	36.5	258	184	<0.2	<0.002	1.77	na
M19/3 Beta Perforations 215-265 ft bgs	02/08/18	0.011	4.8	64	31.3	<0.3	0.004	1.17	0.09
	04/11/18	<0.01	4.6	60	32.8	na	na	1.09	0.15
	07/11/18	<0.01	7.1	76	37.1	na	na	1.64	0.08
	10/10/18	0.018	7.4	79	42.9	<0.2	<0.002	1.43	0.06
	01/09/19	0.025	9.1	89	59.6	<0.2	<0.002	1.58	0.08
	04/03/19	0.017	6.1	64	41.0	na	na	1.38	0.09
	07/11/19	0.018	6.7	76	42.8	na	na	1.33	0.11
	10/10/19	0.017	6.6	76	31.2	na	<0.002	1.35	0.06
	01/07/20	0.016	5.1	54	34.1	na	na	1.13	0.23
	04/23/20	0.020	7.5	86	47.2	<0.2	0.004	1.29	0.08
	07/07/20	0.017	6.3	70	28.0	na	na	1.27	0.07
	10/07/20	0.017	6.4	68	35.0	na	na	1.29	0.06
	01/05/21	0.014	4.9	70	32.1	na	na	1.13	0.07
	04/06/21	0.011	4.5	60	32.1	na	na	1.00	0.06
	07/07/21	0.022	8.4	120	32.1	<0.2	<0.002	1.40	0.12
	10/05/21	0.018	7.7	92	32.1	na	na	1.44	0.09
	01/04/22	0.012	6.0	43	28.6	na	na	1.38	0.05
	04/12/22	0.010	5.7	51	30.8	na	na	1.33	0.06
	07/06/22	0.011	6.2	194	35.6	na	na	1.49	<0.05
	10/04/22	0.012	8.0	56	41.6	<0.2	<0.002	1.81	0.07

Note: OCWD-M19 is located approximately 500 feet north of the nearest injection well site (I-5).
na = not analyzed

TABLE H-10
MONITORING WELL OCWD-M45
2018 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
	01/23/18	0.387	91.0	732	466	<0.2	0.047	1.95	0.37
	05/07/18	0.395	90.2	720	459	na	na	1.83	0.37
	08/07/18	0.407	91.1	710	454	na	na	1.98	0.37
	10/08/18	0.405	90.3	708	417	<0.2	0.085	1.98	0.37
	01/24/19	0.394	92.2	680	453	0.2	0.117	1.71	0.57
	05/07/19	0.407	92.1	716	473	na	na	2.21	0.44
	07/09/19	0.417	92.8	750	511	na	na	2.34	0.48
M45/1	10/08/19	0.409	93.0	758	480	na	na	2.40	0.42
Alpha-III, Beta-I,II	02/05/20	0.397	92.9	608	510	na	na	2.70	0.47
Perforations	05/04/20	0.405	90.8	704	481	<0.2	0.069	2.74	0.44
195-205 ft bgs	08/03/20	0.409	92.5	718	490	na	na	3.23	0.37
	11/02/20	0.425	90.5	766	475	na	na	2.66	0.40
	02/01/21	0.422	90.5	683	469	na	na	2.58	0.40
	05/03/21	0.427	90.9	720	482	na	na	2.59	0.37
	08/09/21	0.441	91.5	736	482	<0.2	0.733	2.65	0.44
	11/01/21	0.428	92.5	702	492	na	na	2.61	0.36
	01/31/22	0.410	92.8	710	459	na	na	2.81	0.37
	05/09/22	0.417	92.7	706	470	na	na	2.72	0.37
	08/01/22	0.418	94.2	726	477	na	na	2.66	0.37
	10/31/22	0.414	94.3	712	520	<0.2	0.152	2.81	0.37
	01/10/18	0.041	14.8	130	60.2	<0.2	0.062	2.18	0.09
	04/10/18	0.038	14.4	126	60.4	na	na	2.19	0.12
	07/10/18	0.030	13.3	132	56.1	na	na	2.05	0.09
	10/09/18	0.040	13.3	132	58.7	<0.2	0.029	1.82	0.09
	01/24/19	0.045	14.1	131	60.4	<0.2	0.038	1.9	0.12
	05/07/19	0.053	16.1	142	65.8	na	na	1.87	0.16
	07/09/19	0.048	17.2	156	73.9	na	na	1.77	0.14
M45/2	10/08/19	0.049	16.0	154	71.1	na	na	1.66	0.11
Beta-III	02/05/20	0.049	15.5	154	78.0	na	na	1.61	0.11
Perforations	05/04/20	0.054	17.1	154	79.5	<0.2	0.028	1.54	0.13
250-260 ft bgs	08/03/20	0.087	24.7	220	113	na	na	1.72	0.13
	11/02/20	0.095	24.9	242	119	na	na	1.43	0.13
	02/01/21	0.097	25.3	204	117	na	na	1.43	0.14
	05/03/21	0.122	30.2	254	141	na	na	1.46	0.14
	08/09/21	0.155	37.9	278	175	<0.2	0.022	1.44	0.17
	11/01/21	0.152	38.3	246	184	na	na	1.40	0.18
	01/31/22	0.158	38.7	286	175	na	na	1.53	0.19
	05/09/22	0.158	40.2	312	191	na	na	1.50	0.16
	08/01/22	0.166	43.2	376	205	na	na	1.57	0.17
	10/31/22	0.177	45.8	324	221	<0.2	0.034	1.48	0.17
	01/10/18	0.086	31.5	248	91.8	<0.2	<0.002	<0.1	0.25
	04/10/18	0.067	26.5	232	81.1	na	na	<0.1	0.29
	07/10/18	0.044	18.5	204	64	na	na	<0.1	0.24
	10/09/18	0.058	22.0	196	70.6	<0.2	<0.002	<0.1	0.25
	01/24/19	0.068	24.6	212	75.6	<0.2	<0.002	<0.1	0.18
	05/07/19	0.049	18.7	182	57.7	na	na	<0.1	0.33
	07/09/19	0.095	31.9	246	92.8	na	na	<0.1	0.31
M45/3	10/08/19	0.041	18.6	194	56.9	na	na	<0.1	0.22
Omicron	02/05/20	0.043	17.7	188	61.2	na	na	<0.1	0.23
Perforations	05/04/20	0.093	32.3	236	94.9	<0.2	<0.002	<0.1	0.24
335-345 ft bgs	08/03/20	0.075	26.8	212	73.1	na	na	<0.1	0.24
	11/02/20	0.052	19.1	176	57.8	na	na	<0.1	0.20
	02/01/21	0.044	16.9	152	52.7	na	na	<0.1	0.22
	05/03/21	0.099	31.1	256	88.4	na	na	<0.1	0.22
	08/09/21	0.049	17.6	168	54.2	<0.2	<0.002	<0.1	0.25
	11/01/21	0.117	33.3	158	66.5	na	na	<0.1	0.20
	01/31/22	0.144	38.6	202	70.6	na	na	<0.1	0.20
	05/09/22	0.041	15.6	150	45.2	na	na	<0.1	0.19
	08/01/22	0.055	19.9	190	57.1	na	na	<0.1	0.16
	10/31/22	0.039	15.8	150	48.9	<0.2	<0.002	<0.1	0.17

TABLE H-10
MONITORING WELL OCWD-M45
2018 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
	01/10/18	0.035	15.8	154	57.1	0.3	<0.002	<0.1	0.10
	04/10/18	0.032	13.8	134	51.2	na	na	<0.1	0.21
	07/10/18	0.027	13.4	132	47.5	na	na	<0.1	0.22
	10/09/18	0.022	9.9	108	42.9	<0.2	<0.002	<0.1	0.20
	01/24/19	0.028	10.4	125	44.8	0.5	<0.002	<0.1	0.16
	05/07/19	0.018	8.3	102	40.5	na	na	<0.1	0.86
	07/09/19	0.021	8.7	120	45.3	na	na	<0.1	2.43
	10/08/19	0.020	9.2	114	42.2	na	na	<0.1	0.23
M45/4	02/05/20	0.023	10.3	110	52.0	na	na	<0.1	0.21
Upper Rho	05/04/20	0.026	12.0	130	52.4	0.3	<0.002	<0.1	0.33
Perforations	08/03/20	0.026	11.3	134	51.0	na	na	<0.1	0.37
380-390 ft bgs	11/02/20	0.025	9.9	122	45.0	na	na	<0.1	0.24
	02/01/21	0.025	9.9	87	45.9	na	na	<0.1	0.20
	05/03/21	0.026	9.2	118	44.7	na	na	<0.1	0.34
	08/09/21	0.027	9.6	110	46.2	0.3	<0.002	<0.1	0.24
	11/01/21	0.035	12.1	96	51.4	na	na	<0.1	0.31
	01/31/22	0.032	10.5	106	45.4	na	na	<0.1	0.15
	05/09/22	0.025	9.6	120	45.7	na	na	<0.1	0.16
	06/23/22	na	na	128	na	na	na	na	na
	06/23/22	na	na	120	na	na	na	na	na
	08/01/22	0.023	9.2	152	45.5	na	na	<0.1	0.19
	10/31/22	0.020	8.7	104	45.1	<0.2	<0.002	<0.1	0.17
	01/10/18	0.145	13.8	316	30.4	0.8	0.009	0.18	6.63
	04/10/18	0.194	13.5	290	30.9	na	na	<0.1	5.86
	07/10/18	0.149	13.8	298	30.5	na	na	<0.1	6.66
	10/09/18	0.153	13.5	302	29.9	0.6	0.007	<0.1	7.0
	01/24/19	0.154	13.7	272	31.1	0.8	0.008	<0.1	7.15
	05/07/19	0.161	15.0	304	37.4	na	na	<0.1	8.90
	07/09/19	0.155	14.1	306	34.8	na	na	<0.1	7.28
M45/5	10/08/19	0.157	14.3	316	31.5	na	na	<0.1	7.37
Main	02/05/20	0.151	14.9	306	34.8	na	na	<0.1	6.52
Perforations	05/04/20	0.161	14.0	316	33.4	0.6	0.008	<0.1	6.28
780-790 ft bgs	08/03/20	0.167	14.4	310	31.9	na	na	<0.1	7.54
	11/02/20	0.176	13.9	312	31.8	na	na	<0.1	6.79
	02/01/21	0.181	13.8	290	31.7	na	na	<0.1	7.49
	05/03/21	0.186	13.8	314	32.2	na	na	<0.1	6.23
	08/09/21	0.192	14.0	310	31.9	0.6	<0.002	<0.1	8.07
	11/01/21	0.187	14.2	284	32.2	na	na	<0.1	7.09
	01/31/22	0.191	14.5	326	31.3	na	na	<0.1	7.08
	05/09/22	0.187	14.2	320	32.9	na	na	<0.1	6.96
	08/01/22	0.187	14.7	320	32.0	na	na	<0.1	7.15
	10/31/22	0.188	14.5	298	33.3	0.6	<0.002	<0.1	6.83

Note: OCWD-M45 is located approximately 2,900 feet north of the nearest injection well site (I-15).

TABLE H-11
MONITORING WELL OCWD-M46
General Water Quality Data
2018 - 2022

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M46A/1 Lambda/Omicron Perforations 350-370 ft bgs	01/23/18	0.011	5.8	80	42.0	<0.2	<0.002	1.39	0.43
	05/07/18	0.018	6.4	92	39.9	na	na	1.45	0.05
	08/07/18	0.011	5.6	71	39.8	na	na	1.36	0.06
	10/08/18	0.014	5.3	76	38.8	<0.2	<0.002	1.18	0.06
	01/23/19	0.014	6.5	80	44.6	<0.2	<0.002	1.39	0.09
	04/02/19	0.016	5.9	75	41.0	na	na	1.30	0.12
	08/06/19	0.014	5.5	90	43.0	na	na	1.13	0.12
	10/07/19	0.013	6.1	82	40.6	na	<0.002	1.12	0.06
	01/06/20	0.017	5.7	82	41.7	na	na	1.11	0.20
	04/08/20	0.016	5.9	81	41.8	<0.2	<0.002	1.10	0.06
	07/06/20	0.017	5.4	78	43.1	na	na	1.05	<0.05
	10/05/20	0.017	5.6	78	42.0	na	na	0.98	<0.05
	01/04/21	0.019	6	78	41.7	na	na	1.19	<0.05
	04/05/21	0.019	6.2	76	43.1	na	na	1.20	<0.05
	07/06/21	0.015	5.7	120	43.3	<0.2	<0.002	1.17	<0.05
	10/04/21	0.013	5.1	79	42.2	na	na	1.04	0.05
	01/03/22	0.014	5.7	62	40.8	na	na	1.16	0.1
	04/11/22	0.014	5.7	56	41.9	na	na	1.24	0.07
	07/05/22	0.013	5.9	76	44.0	na	na	1.28	<0.05
	10/03/22	0.013	6.2	86	43.3	<0.2	<0.002	1.29	<0.05
M46/2 Upper Rho Perforations 420-430 ft bgs	01/23/18	0.014	6.0	74	34.6	<0.2	<0.002	1.27	0.12
	05/07/18	0.024	8.7	118	46	na	na	1.44	0.06
	08/07/18	0.017	8.6	82	46.7	na	na	1.61	0.06
	10/08/18	0.020	8.3	94	44.2	<0.2	<0.002	1.5	0.05
	01/23/19	0.013	5.6	64	32.3	<0.2	<0.002	1.16	<0.05
	04/02/19	0.015	5.4	74	32.1	na	na	1.04	0.08
	08/06/19	0.018	6.1	78	37.0	na	na	1.19	0.09
	10/07/19	0.017	6.9	96	40.0	na	<0.002	1.25	0.06
	01/06/20	0.019	6.5	85	40.8	na	na	1.18	0.12
	04/08/20	0.015	5.7	74	35.3	<0.2	<0.002	1.07	<0.05
	07/06/20	0.018	6.3	82	41.3	na	na	1.14	<0.05
	10/05/20	0.018	6.4	82	39.0	na	na	1.23	<0.05
	01/04/21	0.016	5.6	72	35.4	na	na	1.14	<0.05
	04/05/21	0.016	5.6	60	35.6	na	na	1.13	<0.05
	07/06/21	0.016	6.1	120	40.1	<0.2	<0.002	1.24	0.13
	10/04/21	0.016	6.2	87	41.2	na	na	1.22	0.05
	01/03/22	0.017	7.2	35	41.0	na	na	1.30	<0.05
	04/11/22	0.019	7.6	92	44.6	na	na	1.33	0.26
	07/05/22	0.020	7.7	80	47.0	na	na	1.36	0.06
	10/03/22	0.022	9.4	109	51.7	<0.2	<0.002	1.49	<0.05

TABLE H-11
MONITORING WELL OCWD-M46
General Water Quality Data
2018 - 2022

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M46/3 Lower Rho Perforations 515-535 ft bgs	01/23/18	0.025	11.3	160	37.0	<0.2	<0.002	0.17	0.12
	05/07/18	0.028	11.3	150	35.7	na	na	0.19	0.1
	08/07/18	0.023	11.6	144	34.8	na	na	0.24	0.11
	10/08/18	0.027	11.5	136	32.9	<0.2	<0.002	0.2	0.12
	01/23/19	0.024	11.5	120	37.3	<0.2	0.003	0.26	0.07
	04/02/19	0.023	11	132	34.6	na	na	0.27	0.13
	08/06/19	0.023	10.7	124	33.9	na	na	0.25	0.26
	10/07/19	0.023	11.2	144	32.3	na	<0.002	0.25	0.11
	01/06/20	0.022	10.6	150	29.2	na	na	0.24	0.17
	04/08/20	0.021	10.4	132	32.2	<0.2	<0.002	0.21	0.1
	07/06/20	0.023	10.8	130	34.1	na	na	0.19	0.12
	10/05/20	0.024	10.8	126	33.2	na	na	0.28	0.1
	01/04/21	0.026	10.6	130	33.1	na	na	0.28	0.09
	04/05/21	0.026	10.9	130	33.1	<0.2	<0.002	0.29	0.24
	07/06/21	0.025	11	180	34.4	na	na	0.32	0.09
	10/04/21	0.024	10.6	130	33.9	na	na	0.26	0.12
	01/03/22	0.025	10.7	118	31.8	na	na	0.26	0.09
	04/11/22	0.023	10.4	119	32.2	na	na	0.21	0.11
	07/05/22	0.024	10.3	124	33	na	na	0.26	0.09
	10/03/22	0.022	10.7	124	34.5	<0.2	<0.002	0.27	0.1
M46/4 Main Perforations 640-660 ft bgs	01/23/18	0.056	14.4	200	16.4	<0.2	<0.002	<0.1	0.96
	05/07/18	0.061	14.5	226	15.6	na	na	<0.1	1.08
	08/07/18	0.053	14.6	196	16.3	na	na	<0.1	1.11
	10/08/18	0.059	14.5	204	16.5	<0.2	<0.002	<0.1	1.02
	01/23/19	0.056	14.6	200	15.8	0.3	0.003	<0.1	0.92
	04/02/19	0.057	14.4	176	16.7	na	na	<0.1	1.11
	08/06/19	0.054	14.4	218	16.3	na	na	<0.1	0.97
	10/07/19	0.052	14.5	234	15.0	na	0.002	<0.1	1.18
	01/06/20	0.049	14.1	230	16.4	na	na	<0.1	1.16
	04/08/20	0.048	13.6	222	16.1	<0.2	<0.002	<0.1	1.03
	07/06/20	0.049	13.6	220	16.2	na	na	<0.1	1.03
	10/05/20	0.05	13.5	226	15.9	na	na	<0.1	0.97
	01/04/21	0.056	13.4	219	15.8	na	na	<0.1	0.95
	04/05/21	0.052	13.6	198	15.9	na	<0.002	<0.1	0.89
	07/06/21	0.053	13.7	266	16.6	0.2	na	<0.1	0.91
	10/04/21	0.05	13.5	206	16.1	na	na	<0.1	1.0
	01/03/22	0.052	13.6	194	15.7	na	na	<0.1	0.93
	04/11/22	0.051	13.5	194	16.2	na	na	<0.1	1.06
	07/05/22	0.05	13.5	206	16.4	na	na	<0.1	1.03
	10/03/22	0.047	13.6	202	16.9	0.2	<0.002	<0.1	0.98

TABLE H-11
MONITORING WELL OCWD-M46
General Water Quality Data
2018 - 2022

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M46/5 Main Perforations 890-910 ft bgs	01/23/18	0.046	14.5	208	13.7	0.4	0.004	<0.1	1.41
	05/07/18	0.01	14.6	228	13	na	na	<0.1	1.91
	08/07/18	0.051	14.8	194	13.6	na	na	<0.1	1.87
	10/08/18	0.01	14.9	216	14	0.4	<0.002	<0.1	1.64
	01/23/19	0.051	16.2	216	13.4	0.5	0.004	<0.1	1.91
	04/02/19	0.056	17.3	200	14.5	na	na	<0.1	1.93
	08/06/19	0.06	18.7	240	14.3	na	na	<0.1	1.64
	10/07/19	0.06	19.1	218	12.7	na	0.003	<0.1	2.05
	01/06/20	0.059	19.0	238	15.3	na	na	<0.1	1.95
	04/08/20	0.062	19.1	242	14.5	0.5	0.003	<0.1	1.98
	07/06/20	0.065	19.4	236	14.7	na	na	<0.1	2.25
	10/05/20	0.068	18.9	242	14.9	na	na	<0.1	2.09
	01/04/21	0.073	19.0	252	15.1	na	na	<0.1	2.02
	04/05/21	0.07	19.0	224	15	na	na	<0.1	1.83
	07/06/21	0.073	18.7	282	15.3	0.5	0.004	<0.1	1.88
	10/04/21	0.068	17.9	230	15	na	na	<0.1	2.50
	01/03/22	0.07	18	210	14.4	na	na	<0.1	2.13
	04/11/22	0.067	17.5	204	14.8	na	na	<0.1	2.5
	07/05/22	0.065	16.6	224	14.7	na	na	<0.1	2.33
	10/03/22	0.062	16	216	14.9	0.4	<0.002	<0.1	3.63

Notes: OCWD-M46 is located approximately 900 feet northeast of the nearest injection well site (I-26).
na = not analyzed

TABLE H-12
MONITORING WELL OCWD-M47
2018 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M47/1 Beta-III Perforations 355-375 ft bgs	01/24/18	0.023	11	124	38.1	<0.2	<0.002	<0.1	0.14
	04/24/18	0.025	11.5	130	38.8	na	na	<0.1	0.2
	07/24/18	0.025	11.8	140	40.1	na	na	<0.1	0.13
	10/23/18	0.029	12	112	39.9	<0.2	<0.002	<0.1	0.16
	01/22/19	0.027	12.4	110	40.3	<0.2	<0.002	<0.1	0.1
	04/16/19	0.025	12.1	106	39.2	na	na	<0.1	0.15
	07/23/19	0.025	11.7	126	39.4	na	na	<0.1	0.15
	10/22/19	0.023	9.3	138	36	na	na	<0.1	0.19
	01/21/20	0.021	9.9	128	43.1	na	na	<0.1	0.15
	04/21/20	0.018	9.4	108	36.2	<0.2	<0.002	<0.1	0.11
	07/21/20	0.018	9.1	108	36.3	na	na	<0.1	0.13
	10/20/20	0.021	8.6	116	34.3	na	na	<0.1	0.11
	01/19/21	0.02	8.2	115	34.2	na	na	<0.1	0.13
	04/20/21	0.021	8.2	118	34.4	<0.2	na	<0.1	0.12
	07/20/21	0.018	7.5	132	34.2	na	0.002	<0.1	0.13
	10/19/21	0.019	7.6	92	34.7	na	na	<0.1	0.12
	01/18/22	0.021	7.5	115	35.2	na	na	<0.1	0.18
	04/26/22	0.021	7.3	112	34.5	na	na	<0.1	0.1
	07/19/22	0.018	7.1	108	34.8	na	na	<0.1	0.1
	10/18/22	0.016	7	100	34	<0.2	<0.002	<0.1	0.11
M47/2 Upper Rho Perforations 470-480 ft bgs	01/24/18	0.024	10.6	124	58.4	<0.2	0.004	1.66	0.09
	04/24/18	0.027	10.7	120	57.7	na	na	1.61	0.07
	07/24/18	0.027	10.1	132	55.8	na	na	1.5	0.08
	10/23/18	0.030	10.9	92	58.9	<0.2	0.002	1.51	0.09
	01/22/19	0.026	10.7	100	55.9	<0.2	0.006	1.53	0.08
	04/16/19	0.024	10.2	102	55.9	na	na	1.52	0.10
	07/23/19	0.026	10.2	104	56	na	na	1.36	0.13
	10/22/19	0.027	8.8	140	52.6	na	na	1.13	0.12
	01/21/20	0.027	9.5	140	62.9	na	na	1.26	0.12
	04/21/20	0.025	9.7	118	54.7	<0.2	0.003	1.27	0.07
	07/21/20	0.026	9.4	110	55.5	na	na	1.23	0.07
	10/20/20	0.028	8.7	114	52.0	na	na	1.19	0.06
	01/19/21	0.026	8.6	111	50.5	na	na	1.29	0.07
	04/20/21	0.031	9.5	140	53.0	na	na	1.31	0.08
	07/20/21	0.041	12.3	132	61.6	<0.2	0.002	1.34	0.09
	10/19/21	0.049	14.7	136	72.2	na	na	1.34	0.06
	01/18/22	0.054	16.4	153	79.0	na	na	1.42	0.09
	04/26/22	0.042	13.4	134	72.3	na	na	1.45	0.06
	07/19/22	0.043	14.2	142	69.2	na	na	1.48	0.05
	10/18/22	0.031	11.9	118	66.6	<0.2	<0.002	1.52	0.06

TABLE H-12
MONITORING WELL OCWD-M47
2018 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M47/3 Lower Rho Perforations 580-600 ft bgs	01/24/18	0.038	14.5	210	65.5	<0.2	<0.002	<0.1	0.06
	04/24/18	0.040	14.6	196	65.6	na	na	<0.1	0.09
	07/24/18	0.055	14.2	208	64.4	na	na	<0.1	0.08
	10/23/18	0.043	14.6	188	65.4	<0.2	<0.002	<0.1	0.09
	01/22/19	0.038	13.6	184	65.1	0.2	<0.002	<0.1	<0.05
	04/16/19	0.035	13.7	176	66.6	na	na	<0.1	0.1
	07/23/19	0.037	13.7	212	66	na	na	<0.1	0.12
	10/22/19	0.037	12.5	210	63.8	na	na	<0.1	0.07
	01/21/20	0.035	13.1	204	69.2	na	na	<0.1	0.16
	04/21/20	0.033	13.1	206	60.8	<0.2	<0.002	<0.1	0.08
	07/21/20	0.035	13.3	208	63.2	na	na	<0.1	0.06
	10/20/20	0.042	12.9	210	62.2	na	na	<0.1	0.01
	01/19/21	0.041	12.6	214	61.8	na	na	<0.1	0.13
	04/20/21	0.04	12.6	234	61.4	<0.2	na	<0.1	0.09
	07/20/21	0.04	12.6	242	61.4	na	0.002	<0.1	0.06
	10/19/21	0.039	12.3	206	61.7	na	na	<0.1	0.07
	01/18/22	0.038	12.7	194	63	na	na	<0.1	0.06
	04/26/22	0.04	12.5	202	63	na	na	<0.1	<0.05
	07/19/22	0.037	12.5	210	62.3	na	na	<0.1	<0.05
	10/18/22	0.035	12.6	196	65.6	<0.2	<0.002	<0.1	0.05
M47/4 Main Perforations 745-765 ft bgs	01/24/18	0.037	12.1	224	22.9	0.2	<0.002	<0.1	0.75
	04/24/18	0.038	12.2	228	22.3	na	na	<0.1	0.8
	07/24/18	0.048	12.1	226	23	na	na	<0.1	0.76
	10/23/18	0.043	12.3	194	23	<0.2	0.002	<0.1	0.8
	1/22/19	0.039	12.4	192	23.2	0.2	0.005	<0.1	0.74
	4/16/19	0.038	12.4	194	23.6	na	na	<0.1	0.98
	7/23/19	0.038	12.5	228	23.6	na	na	<0.1	0.91
	10/22/19	0.041	11.3	212	23.7	na	na	<0.1	0.86
	1/21/20	0.038	12.1	206	25.2	na	na	<0.1	0.84
	4/21/20	0.037	12.2	222	22.8	<0.2	0.003	<0.1	0.94
	7/21/20	0.038	12.4	220	23.1	na	na	<0.1	0.82
	10/20/20	0.044	12.3	220	22.7	na	na	<0.1	0.83
	1/19/21	0.043	12.2	223	22.3	na	na	<0.1	0.83
	4/20/21	0.042	12.2	232	22.7	na	na	<0.1	0.77
	7/20/21	0.042	12.3	246	22.6	0.3	0.004	<0.1	0.73
	10/19/21	0.041	12.1	204	22.6	na	na	<0.1	0.73
	1/18/22	0.04	12.3	211	22.5	na	na	<0.1	0.7
	4/26/22	0.041	12.3	214	23.2	na	na	<0.1	0.67
	7/19/22	0.04	12.4	214	22.6	na	na	<0.1	0.72
	10/18/22	0.04	12.5	194	23.8	<0.2	<0.002	<0.1	0.73

TABLE H-12
MONITORING WELL OCWD-M47
2018 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M47/5 Main Perforations 940-960 ft bgs	01/24/18	0.054	12.6	222	11.4	0.4	0.005	<0.1	2.81
	04/24/18	0.057	12.6	226	11.3	na	na	<0.1	2.97
	07/24/18	0.073	12.6	232	11.4	na	na	<0.1	2.2
	10/23/18	0.065	12.8	204	11.6	0.3	0.005	<0.1	2.3
	01/22/19	0.058	12.8	202	11.6	0.3	0.008	<0.1	2.89
	04/16/19	0.056	12.8	200	12	na	na	<0.1	3.24
	07/23/19	0.06	12.9	222	11.9	na	na	<0.1	2.91
	10/22/19	0.06	11.5	238	10.6	na	na	<0.1	2.54
	01/21/20	0.056	12.6	218	12.9	na	na	<0.1	2.7
	04/21/20	0.056	12.6	226	11.6	0.4	0.005	<0.1	3.22
	07/21/20	0.057	12.8	232	11.3	na	na	<0.1	3.34
	10/20/20	0.066	12.7	226	11.2	na	na	<0.1	3.25
	01/19/21	0.064	12.6	231	11.5	na	na	<0.1	3.26
	04/20/21	0.064	12.7	244	11.5	na	na	<0.1	3.49
	07/20/21	0.065	12.6	226	11.6	0.5	0.007	<0.1	3.19
	10/19/21	0.064	12.5	214	11.2	na	na	<0.1	3.19
	01/18/22	0.064	12.7	207	11.2	na	na	<0.1	3.56
	04/26/22	0.065	12.6	242	11.4	na	na	<0.1	3.28
	07/19/22	0.062	12.9	232	11.1	na	na	<0.1	3.35
	10/18/22	0.06	12.9	204	12	0.4	0.004	<0.1	3.59

Note: OCWD-M47 is located approximately 2,250 feet northeast of the nearest injection well site (I-26).

Appendix I

Groundwater Quality Data at the Anaheim Forebay

Orange County Water District
Groundwater Replenishment System
2022 Annual Report

GWRS 2022 Quarterly Sampling Dates
OCWD Water Quality Department
ANAHEIM FOREBAY - GROUNDWATER

Monitoring Well	Qtr 1	Qtr 2	Qtr 3	Qtr 4
AM-7/1	03/15/2022	06/21/2022	08/30/2022	11/29/2022
AM-8/1	03/15/2022	06/21/2022	08/30/2022	11/29/2022
AM-10/1	03/15/2022	06/21/2022	08/30/2022	11/29/2022
AMD-10/1-5	02/16/2022	05/24/2022	08/16/2022	11/15/2022
AMD-12/1-5	02/15/2022	05/23/2022	08/15/2022	11/14/2022
OCWD-KB1/1	03/15/2022	06/21/2022	08/30/2022	11/29/2022

Notes for Appendix I Tables:

► Water quality data are summarized for compliance monitoring wells AM-7, AM-8, AM-10, AMD-10, AMD-12, and also a non-compliance monitoring well OCWD-KB1 in the following tables.

► Listed dates (above) are the quarterly compliance monitoring dates; other samples may have been collected during the year. Detections of organic chemicals are reported for all samples collected in 2021 and are not limited to the quarterly compliance samples.

► Results listed in the table for each quarter are the range of the minimum to maximum value detected at the well location, which may consist of one to five well casings. Figures and report text list the well ID (e.g., AMD-10) and casing number (e.g., AMD-10 has five well casings: AMD-10/1, AMD-10/2, AMD-10/3, AMD-10/4 and AMD10/5), as appropriate.

► Appendices B & C contain a list of all methods and reportable detection limits (RDL).

► Detailed data reports are available upon request.

► The more stringent value in the range of secondary MCLs is used in the tables (e.g., <MCL) for TDS, electrical conductivity (EC), chloride and sulfate.

► MCL: Maximum Contaminant Level

► N/A: Not applicable

► ND: Not detected at reportable detection limit (RDL)

► NL: SWRCB DDW (formerly CDPH) Notification Level

► NR: Not required

► NS: Not sampled

► TR: Trace

Notes for Appendix I Tables (continued):

► A comprehensive suite of tests covering inorganics, metals, volatile organics (VOCs), synthetic organic compounds (SOCs), radiological and microbial parameters were analyzed at 35 permit-specified groundwater monitoring wells since the commencement of the GWRS treatment facility. In June 2010, OCWD proposed a revised groundwater monitoring frequency from quarterly to annually for selected analytes that have reported no detections. The proposed reduced frequency of testing was (1) based on real-time data for analytes reported as non-detect at the reporting detection limit, (2) supported by two Independent Advisory Panels having oversight for the GWRS project and the Santa Ana River (SARMON) long-term monitoring program, and (3) a condition of the GWRS permit to routinely review data and based on results, to modify the groundwater monitoring program every two years or sooner with approval by the RWQCB and SWRCB DDW (formerly CDPH - July 2014 CDPH moved to the SWRCB with a new name, Division of Drinking Water [DDW]).

The revised monitoring frequency was approved by the RWQCB (3/14/2011) and SWRCB DDW (9/20/2010) and consists of reduction in asbestos, dioxin, selected SOCs, and radionuclides monitoring from quarterly to annually (see Table 1) for monitoring well locations. Julio Lara/RWQCB advised that monitoring for these analytes are not permit required but OCWD voluntarily performed the monitoring. OCWD elected to conduct comprehensive testing at the start-up of GWRS; however, with years of a robust database for these non-compliance targets (asbestos, dioxin, EPA 625), OCWD concurred with the RWQCB and ceased testing for these analytes in January 2014. Samples may have been collected for other analytes (cyanide, some radionuclides, etc.) but consensus is to cease testing and use resources more effectively in the future. Comprehensive testing was performed during the first quarter 2011 and served as the “annual comprehensive testing” and "initial anchor date." Future “annual comprehensive testing” rotated sequentially through the quarters (e.g., 2Q2012, 3Q2013, 4Q2014, etc.).

Table 1					
Talbert Barrier and Forebay Area GWRS Groundwater Monitoring Well Approved Revised Monitoring Program[1] Inorganic, Organic, and Radiological Analytes					
Q - Year	**Comprehensive**	**Reduced[3,4,5,6]**	**Q - Year**	**Comprehensive**	**Reduced[3,4,5,6]**
Q1 - 2018		x	Q1 - 2021		x
Q2 - 2018		x	Q2 - 2021		x
Q3 - 2018		x	Q3 - 2021	x	
Q4 - 2018	x		Q4 - 2021		x
Q1 - 2019	x		Q1 - 2022		x
Q2 - 2019		x	Q2 - 2022		x
Q3 - 2019		x	Q3 - 2022		x
Q4 - 2019		x	Q4 - 2022	x	
Q1 - 2020		x	Q1 - 2023	x	
Q2 - 2020	x		Q2 - 2023		x
Q3 - 2020		x	Q3 - 2023		x
Q4 - 2020		x	Q4 - 2023		x

[1]Approved RWQCB (03/14/2011) and CDPH (09/20/10)

[2]Comprehensive: OCWD voluntarily screens for inorganic and organic analytes and radionuclides beyond the permit specific analytes

[3]Reduced: Annual asbestos, cyanide, selected SOC's, EPA 625, and radionuclides

[4]GWRS IAP Meeting 08/27/13: Panel Concurs to cease monitoring for asbestos and dioxin based on years of non-detections

[5]Reduced: Annual cyanide, selected SOC's and radionuclide

[6]GWRS IAP Meeting 08/29/17: Panel concurs to reduce select inorganic and organic monitoring. In addition, Panel concurs to cease select inorganic and organic voluntary monitoring.

Summary of All 2022 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	AM-7 Qtr 1	AM-7 Qtr 2	AM-7 Qtr 3	AM-7 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	2.5	2.7	3.8	2.8
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	2.2	2.1	2.2	2.7
Arsenic (dissolved) (As-DIS), ug/L	OCWD	N/A	1.8	1.6	2	2.3
Barium (Ba), ug/L	OCWD	1000	48	43.5	29	36.6
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	1.3	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.14	0.14	0.18	0.16
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND	ND	ND	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	2	1.4	ND	1.3
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	0.87	0.87	1.08	1.26
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	Not Required	0.006
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	1.1	1	ND	ND
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	1.7	1.9	1.5	0.8
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	654	580	479	564
Iron (Fe), ug/L	OCWD	300	311	639	838	725
Manganese (Mn), ug/L	OCWD	50	8.3	10.8	12.6	10.1
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	7.7	9	6.9	6.9
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	368	360	288	314
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	1	1.7	1.7	1.2
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	2.1	1.4	1.1	1
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.21	0.24	0.24	0.19
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	3.1	3	3	3.6
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
4,4'-DDE (DDE), ug/L	OCWD / WeckLab	N/A	Not Required	Not Required	Not Required	ND
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
DCPA-Dacthal (DCPA), ug/L	OCWD/ WeckLab	N/A	Not Required	Not Required	Not Required	ND
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	Not Required	ND
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2021 Volatile and Semi-Volatile Water Quality Chemicals

Method	**Description**	**Lab**	**AM-7 Qtr 1**	**AM-7 Qtr 2**	**AM-7 Qtr 3**	**AM-7 Qtr 4**
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	Not Required	Not Required	Not Required	ND
508.1	Chlorinated Pesticides	WeckLab	Not Required	Not Required	Not Required	ND
515.4	Chlorinated Acids	WeckLab	Not Required	Not Required	Not Required	ND
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	Not Required	ND
533	PFAS Compounds	OCWD	Not Required	Not Required	Not Required	ND > NL
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	Not Required	ND
8015D	Nonhalogenated Organics	Eurofins Buf	Not Required	ND	Not Required	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	Not Required	ND - Detections
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	Not Required	Not Required	Not Required	ND

AM-7/1
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
3/15/2022	12:30	Chloroform (CHCl3)	1.7	ug/L	0.5
3/15/2022	12:30	Total Trihalomethanes (TTHMs)	1.7	ug/L	0.5

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
6/21/2022	9:05	Chloroform (CHCl3)	1.7	ug/L	0.5
6/21/2022	9:05	Total Trihalomethanes (TTHMs)	1.9	ug/L	0.5

Year 2022, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/30/2022	11:05	Chloroform (CHCl3)	1.5	ug/L	0.5
8/30/2022	11:05	Total Trihalomethanes (TTHMs)	1.5	ug/L	0.5

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/29/2022	10:15	Chloroform (CHCl3)	0.8	ug/L	0.5
11/29/2022	10:15	Total Trihalomethanes (TTHMs)	0.8	ug/L	0.5

METHOD: 533

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/29/2022	10:15	Perfluoro butane sulfonic acid (PFBS)	7.1	ng/L	2
11/29/2022	10:15	Perfluoro heptanoic acid (PFHpA)	8.5	ng/L	2
11/29/2022	10:15	Perfluoro hexane sulfonic acid (PFHxS)	3.7	ng/L	2
11/29/2022	10:15	Perfluoro nonanoic acid (PFNA)	2.7	ng/L	2
11/29/2022	10:15	Perfluoro octane sulfonic acid (PFOS)	11.3	ng/L	2
11/29/2022	10:15	Perfluoro octanoic acid (PFOA)	16.8	ng/L	2

AM-7/1
Organic Detections by Method

Year 2022, Quarter 4

METHOD: 533

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/29/2022	10:15	Perfluorobutanoic acid (PFBA)	6.9	ng/L	2
11/29/2022	10:15	Perfluorohexanoic acid (PFHxA)	22.6	ng/L	2
11/29/2022	10:15	Perfluoropentanoic acid (PFPeA)	25.2	ng/L	2

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/29/2022	10:15	Carbamazepine (CBMAZP)	17.341	ng/L	1
11/29/2022	10:15	Dilantin (DILANT)	10.626	ng/L	10
11/29/2022	10:15	Primidone (PRIMDN)	25.299	ng/L	1
11/29/2022	10:15	Simazine (SIMAZ)	0.0085	ug/L	0.005
11/29/2022	10:15	Sucralose (SUCRAL)	7340	ng/L	100
11/29/2022	10:15	Sulfamethoxazole (SULTHZ)	25.299	ng/L	1

Summary of All 2022 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	AM-8 Qtr 1	AM-8 Qtr 2	AM-8 Qtr 3	AM-8 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	ND	ND	ND	ND
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	1.3	1.1	1	1.3
Arsenic (dissolved) (As-DIS), ug/L	OCWD	N/A	ND	ND	ND	1
Barium (Ba), ug/L	OCWD	1000	50.1	64.1	50.9	45.5
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	1.3	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.18	0.14	0.16	0.18
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND	ND	ND	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	2	2	1.6	1.3
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	1.05	0.91	1.05	1.23
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	Not Required	0.015
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND	ND	ND	ND
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	1.2	1.3	1	0.9
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	3	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	635	708	663	601
Iron (Fe), ug/L	OCWD	300	647	570	269	426
Manganese (Mn), ug/L	OCWD	50	8.9	11.8	7.9	7
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	7.8	10	7.8	6.2
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	356	438	392	338
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	1.2	1.3	1.2	0.55
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	2	1.4	1.3	ND
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.2	0.22	0.2	0.18
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	2.2	2	2	2.3
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
4,4'-DDE (DDE), ug/L	OCWD / WeckLab	N/A	Not Required	Not Required	Not Required	ND
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
DCPA-Dacthal (DCPA), ug/L	OCWD/ WeckLab	N/A	Not Required	Not Required	Not Required	ND
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	Not Required	ND
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2022 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	AM-8 Qtr 1	AM-8 Qtr 2	AM-8 Qtr 3	AM-8 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	Not Required	Not Required	Not Required	ND
508.1	Chlorinated Pesticides	WeckLab	Not Required	Not Required	Not Required	ND
515.4	Chlorinated Acids	WeckLab	Not Required	Not Required	Not Required	ND
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	Not Required	ND
533	PFAS Compounds	OCWD	Not Required	Not Required	Not Required	ND > NL
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	Not Required	ND
8015B / 8015D	Nonhalogenated Organics	WeclLab /Euro Buf	Not Required	ND	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	Not Required	ND - Detections
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	Not Required	Not Required	Not Required	ND

AM-8/1
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
3/15/2022	11:40	Chloroform (CHCl3)	1.2	ug/L	0.5
3/15/2022	11:40	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
6/21/2022	10:10	Chloroform (CHCl3)	1.3	ug/L	0.5
6/21/2022	10:10	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5

Year 2022, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/30/2022	10:25	Chloroform (CHCl3)	1	ug/L	0.5
8/30/2022	10:25	Total Trihalomethanes (TTHMs)	1	ug/L	0.5

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/29/2022	11:40	Chloroform (CHCl3)	0.9	ug/L	0.5
11/29/2022	11:40	Total Trihalomethanes (TTHMs)	0.9	ug/L	0.5

METHOD: 533

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/29/2022	11:40	Perfluoro butane sulfonic acid (PFBS)	6	ng/L	2
11/29/2022	11:40	Perfluoro heptanoic acid (PFHpA)	3.9	ng/L	2
11/29/2022	11:40	Perfluoro hexane sulfonic acid (PFHxS)	3.7	ng/L	2
11/29/2022	11:40	Perfluoro octane sulfonic acid (PFOS)	10.4	ng/L	2
11/29/2022	11:40	Perfluoro octanoic acid (PFOA)	8.3	ng/L	2
11/29/2022	11:40	Perfluorobutanoic acid (PFBA)	5.7	ng/L	2

AM-8/1
Organic Detections by Method

Year 2022, Quarter 4

METHOD: 533

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/29/2022	11:40	Perfluorohexanoic acid (PFHxA)	10.7	ng/L	2
11/29/2022	11:40	Perfluoropentanoic acid (PFPeA)	13.1	ng/L	2

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/29/2022	11:40	Carbamazepine (CBMAZP)	14.983	ng/L	1
11/29/2022	11:40	Primidone (PRIMDN)	22.929	ng/L	1
11/29/2022	11:40	Simazine (SIMAZ)	0.0127	ug/L	0.005
11/29/2022	11:40	Sucralose (SUCRAL)	4980	ng/L	100
11/29/2022	11:40	Sulfamethoxazole (SULTHZ)	23.959	ng/L	1

Summary of All 2022 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	AM-10 Qtr 1	AM-10 Qtr 2	AM-10 Qtr 3	AM-10 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	1.5	1.8	1.5	1.5
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	1.5	1.3	1.1	1.5
Arsenic (dissolved) (As-DIS), ug/L	OCWD	N/A	1.5	1.3	1.2	1.4
Barium (Ba), ug/L	OCWD	1000	8.8	8.5	8.4	9.1
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.13	0.12	0.1	0.1
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND	ND	ND	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND	ND	ND	ND
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	1.34	1.47	1.59	1.77
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	Not Required	ND
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND	ND	ND	ND
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Radioactivity						
Total Tritium (TTr), pCi/L	FGL	20,000	251	Not Required	Not Required	Not Required
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	0.8	1.4	1.1	0.9
Primary Drinking Water Standards - Biological						
E. Coli (Colilert - MPN/100mL) (ECOLIQ), MPN	OCWD	N/A	ND	ND	ND	ND
Total Coliform (Colilert - MPN/100mL) (TCOLIQ), MPN	OCWD	N/A	ND	ND	2	ND
Total Coliform (Mult. Tube Fermentation) (TCOLIM), MPN	OCWD	N/A	ND	ND	ND	ND
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	118	106	115	123
Iron (Fe), ug/L	OCWD	300	52.7	113	43.9	40.9
Manganese (Mn), ug/L	OCWD	50	1.8	1.7	1.3	1.4
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	1.6	1.4	1.2	1.3
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	62	60	80	68
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	0.6	0.45	0.25	0.15
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND	ND	ND	ND
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.24	0.24	0.25	0.31
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	3.4	3.2	3	3.2
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
4,4'-DDE (DDE), ug/L	OCWD/ WeckLab	N/A	Not Required	Not Required	Not Required	ND
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
DCPA-Dacthal (DCPA), ug/L	OCWD/ WeckLab	N/A	Not Required	Not Required	Not Required	ND
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	Not Required	ND
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2022 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	AM-10 Qtr 1	AM-10 Qtr 2	AM-10 Qtr 3	AM-10 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	Not Required	Not Required	Not Required	ND
508.1	Chlorinated Pesticides	WeckLab	Not Required	Not Required	Not Required	ND
515.4	Chlorinated Acids	WeckLab	Not Required	Not Required	Not Required	ND
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	Not Required	ND
533	PFAS Compounds	OCWD	Not Required	Not Required	Not Required	ND
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	Not Required	ND
8015D	Nonhalogenated Organics	Eurofins Buf	Not Required	ND	Not Required	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	Not Required	ND - Detections
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	Not Required	Not Required	Not Required	ND

AM-10/1
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
3/15/2022	10:30	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
3/15/2022	10:30	Chloroform (CHCl3)	0.8	ug/L	0.5
3/15/2022	10:30	Total Trihalomethanes (TTHMs)	0.8	ug/L	0.5

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
6/21/2022	11:10	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
6/21/2022	11:10	Chloroform (CHCl3)	1	ug/L	0.5
6/21/2022	11:10	Total Trihalomethanes (TTHMs)	1.4	ug/L	0.5

Year 2022, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/30/2022	9:10	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
8/30/2022	9:10	Chloroform (CHCl3)	1.1	ug/L	0.5
8/30/2022	9:10	Total Trihalomethanes (TTHMs)	1.1	ug/L	0.5

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/29/2022	9:20	Chloroform (CHCl3)	0.9	ug/L	0.5
11/29/2022	9:20	Total Trihalomethanes (TTHMs)	0.9	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/29/2022	9:20	Diuron (DIURON)	0.0052	ug/L	0.005
11/29/2022	9:20	Simazine (SIMAZ)	0.0057	ug/L	0.005

Summary of All 2022 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	AMD-10 Qtr 1	AMD-10 Qtr 2	AMD-10 Qtr 3	AMD-10 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	ND - 1.4	ND - 2.1	ND - 1.9	ND - 3.4
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	1 - 2.5	ND - 2.4	ND - 3.9	ND - 5.7
Arsenic (dissolved)* (As-DIS), ug/L	OCWD	N/A	1.1 - 2.5	1.2 - 2.3	1.3 - 3.9	1.3 - 5.7
Barium (Ba), ug/L	OCWD	1000	23.9 - 65.6	14.6 - 70.3	11.2 - 64.1	6.5 - 67.7
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND - 4.5	ND - 2.2	ND
Fluoride (F), mg/L	OCWD	2	ND - 0.51	0.11 - 0.47	0.14 - 0.51	0.19 - 0.51
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND	ND - 0.23	ND	ND - 0.22
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	1.7 - 5.4	1.8 - 6.7	ND - 7.2	ND - 6.3
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	0.81 - 1.3	0.82 - 1.35	0.88 - 1.56	0.96 - 1.55
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	Not Required	0.018 - 0.135
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 1.5	ND - 1.2	ND - 1.2	ND - 1.3
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND - 1.3	ND - 1.3	ND - 1	ND - 0.8
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND - 20	ND - 20	ND - 20	ND - 20
Electrical Conductivity (EC), uS/cm	OCWD	900	247 - 996	135 - 1010	130 - 980	153 - 1040
Iron (Fe), ug/L	OCWD	300	77.5 - 1000	35.1 - 959	67.7 - 1800	74.5 - 1020
Manganese (Mn), ug/L	OCWD	50	11.3 - 48.2	2.1 - 59.6	2.1 - 51.7	3.9 - 47
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	3.7 - 46.4	1.4 - 47.6	1.2 - 47.8	1.8 - 45.4
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	1 - 16	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	124 - 596	86 - 618	60 - 642	80 - 624
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	0.2 - 6.6	0.15 - 3.3	0.1 - 3.5	0.15 - 5.3
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND - 1.7	ND - 1.6	ND - 1.5	ND - 1.1
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.14 - 0.28	0.14 - 0.24	0.16 - 0.29	0.16 - 0.28
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	ND - 3.6	ND - 5.3	ND - 4.9	ND - 3.8
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
4,4'-DDE (DDE), ug/L	OCWD / WeckLab	N/A	Not Required	Not Required	Not Required	ND
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
DCPA-Dacthal (DCPA), ug/L	OCWD/ WeckLab	N/A	Not Required	Not Required	Not Required	ND
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	Not Required	ND
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2021 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	AMD-10 Qtr 1	AMD-10 Qtr 2	AMD-10 Qtr 3	AMD-10 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	Not Required	Not Required	Not Required	ND
508.1	Chlorinated Pesticides	WeckLab	Not Required	Not Required	Not Required	ND
515.4	Chlorinated Acids	WeckLab	Not Required	Not Required	Not Required	ND
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	Not Required	ND
533	PFAS Compounds	OCWD	Not Required	Not Required	Not Required	ND > NL
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	Not Required	ND
8015D	Nonhalogenated Organics	WeckLab	Not Required	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	Not Required	ND - Detections
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	Not Required	Not Required	Not Required	ND

AMD-10/1
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/16/2022	9:55	Chloroform (CHCl3)	1.3	ug/L	0.5
2/16/2022	9:55	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/24/2022	11:35	Chloroform (CHCl3)	0.8	ug/L	0.5
5/24/2022	11:35	Total Trihalomethanes (TTHMs)	0.8	ug/L	0.5

Year 2022, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/16/2022	9:15	Chloroform (CHCl3)	0.9	ug/L	0.5
8/16/2022	9:15	Total Trihalomethanes (TTHMs)	0.9	ug/L	0.5

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/15/2022	10:05	Chloroform (CHCl3)	0.7	ug/L	0.5
11/15/2022	10:05	Total Trihalomethanes (TTHMs)	0.7	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/15/2022	10:05	Diuron (DIURON)	0.0095	ug/L	0.005

AMD-10/2
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/16/2022	12:35	Chloroform (CHCl3)	1	ug/L	0.5
2/16/2022	12:35	Total Trihalomethanes (TTHMs)	1	ug/L	0.5

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/24/2022	12:40	Chloroform (CHCl3)	1.3	ug/L	0.5
5/24/2022	12:40	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5

Year 2022, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/16/2022	10:20	Chloroform (CHCl3)	1	ug/L	0.5
8/16/2022	10:20	Total Trihalomethanes (TTHMs)	1	ug/L	0.5

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/15/2022	12:55	Chloroform (CHCl3)	0.8	ug/L	0.5
11/15/2022	12:55	Total Trihalomethanes (TTHMs)	0.8	ug/L	0.5

METHOD: 533

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/15/2022	12:55	Perfluoro butane sulfonic acid (PFBS)	2.1	ng/L	2
11/15/2022	12:55	Perfluoro octane sulfonic acid (PFOS)	7.4	ng/L	2
11/15/2022	12:55	Perfluoropentanoic acid (PFPeA)	2.2	ng/L	2

AMD-10/2
Organic Detections by Method

Year 2022, Quarter 4

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/15/2022	12:55	Carbamazepine (CBMAZP)	1.313	ng/L	1
11/15/2022	12:55	Diuron (DIURON)	0.0099	ug/L	0.005
11/15/2022	12:55	Primidone (PRIMDN)	3.804	ng/L	1
11/15/2022	12:55	Simazine (SIMAZ)	0.0075	ug/L	0.005
11/15/2022	12:55	Sucralose (SUCRAL)	461.919	ng/L	100
11/15/2022	12:55	Sulfamethoxazole (SULTHZ)	5.217	ng/L	1

AMD-10/3
Organic Detections by Method

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/15/2022	13:30	Chloroform (CHCl3)	TR	ug/L	0.5
11/15/2022	13:30	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

METHOD: 533

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/15/2022	13:30	Perfluoro butane sulfonic acid (PFBS)	8	ng/L	2
11/15/2022	13:30	Perfluoro heptanoic acid (PFHpA)	4.7	ng/L	2
11/15/2022	13:30	Perfluoro hexane sulfonic acid (PFHxS)	4.4	ng/L	2
11/15/2022	13:30	Perfluoro nonanoic acid (PFNA)	3.3	ng/L	2
11/15/2022	13:30	Perfluoro octane sulfonic acid (PFOS)	16.2	ng/L	2
11/15/2022	13:30	Perfluoro octanoic acid (PFOA)	11.7	ng/L	2
11/15/2022	13:30	Perfluorobutanoic acid (PFBA)	7.6	ng/L	2
11/15/2022	13:30	Perfluorohexanoic acid (PFHxA)	13.2	ng/L	2
11/15/2022	13:30	Perfluoropentanoic acid (PFPeA)	16.1	ng/L	2

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/15/2022	13:30	Carbamazepine (CBMAZP)	37.229	ng/L	1
11/15/2022	13:30	Dilantin (DILANT)	12.756	ng/L	10
11/15/2022	13:30	Diuron (DIURON)	0.0101	ug/L	0.005
11/15/2022	13:30	Oxybenzone (BP3)	1.742	ng/L	1
11/15/2022	13:30	Primidone (PRIMDN)	41.144	ng/L	1
11/15/2022	13:30	Simazine (SIMAZ)	0.0157	ug/L	0.005
11/15/2022	13:30	Sucralose (SUCRAL)	8980	ng/L	1000
11/15/2022	13:30	Sulfamethoxazole (SULTHZ)	32.118	ng/L	1

AMD-10/4
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/16/2022	11:30	Chloroform (CHCl3)	TR	ug/L	0.5
2/16/2022	11:30	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/24/2022	10:40	Chloroform (CHCl3)	TR	ug/L	0.5
5/24/2022	10:40	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

Year 2022, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/16/2022	12:05	Chloroform (CHCl3)	TR	ug/L	0.5
8/16/2022	12:05	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

Year 2022, Quarter 4

METHOD: 533

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/15/2022	12:05	Perfluoro butane sulfonic acid (PFBS)	15.1	ng/L	2
11/15/2022	12:05	Perfluoro heptanoic acid (PFHpA)	4.5	ng/L	2
11/15/2022	12:05	Perfluoro hexane sulfonic acid (PFHxS)	11.6	ng/L	2
11/15/2022	12:05	Perfluoro octane sulfonic acid (PFOS)	11.4	ng/L	2
11/15/2022	12:05	Perfluoro octanoic acid (PFOA)	11.6	ng/L	2
11/15/2022	12:05	Perfluorobutanoic acid (PFBA)	15.2	ng/L	2
11/15/2022	12:05	Perfluorohexanoic acid (PFHxA)	10.9	ng/L	2
11/15/2022	12:05	Perfluoropentanesulfonic acid (PFPeS)	2.2	ng/L	2
11/15/2022	12:05	Perfluoropentanoic acid (PFPeA)	14.7	ng/L	2

AMD-10/4
Organic Detections by Method

Year 2022, Quarter 4

METHOD: CEC

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
11/15/2022 12:05	Atrazine (ATRAZ)	0.0018	ug/L	0.001
11/15/2022 12:05	Carbamazepine (CBMAZP)	7.885	ng/L	1
11/15/2022 12:05	Diuron (DIURON)	0.0103	ug/L	0.005
11/15/2022 12:05	Primidone (PRIMDN)	19.337	ng/L	1
11/15/2022 12:05	Simazine (SIMAZ)	0.0242	ug/L	0.005
11/15/2022 12:05	Sucralose (SUCRAL)	846.434	ng/L	100
11/15/2022 12:05	Sulfamethoxazole (SULTHZ)	22.573	ng/L	1

AMD-10/5
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/16/2022	11:10	Chloroform (CHCl3)	0.5	ug/L	0.5
2/16/2022	11:10	Total Trihalomethanes (TTHMs)	0.5	ug/L	0.5

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/24/2022	10:55	Chloroform (CHCl3)	TR	ug/L	0.5
5/24/2022	10:55	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

Year 2022, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/16/2022	10:40	Chloroform (CHCl3)	TR	ug/L	0.5
8/16/2022	10:40	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/15/2022	11:40	Chloroform (CHCl3)	TR	ug/L	0.5
11/15/2022	11:40	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

METHOD: 533

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/15/2022	11:40	Perfluoro butane sulfonic acid (PFBS)	12.2	ng/L	2
11/15/2022	11:40	Perfluoro heptanoic acid (PFHpA)	3.6	ng/L	2
11/15/2022	11:40	Perfluoro hexane sulfonic acid (PFHxS)	14.4	ng/L	2
11/15/2022	11:40	Perfluoro nonanoic acid (PFNA)	2.1	ng/L	2
11/15/2022	11:40	Perfluoro octane sulfonic acid (PFOS)	22.2	ng/L	2
11/15/2022	11:40	Perfluoro octanoic acid (PFOA)	11.9	ng/L	2

AMD-10/5
Organic Detections by Method

Year 2022, Quarter 4

METHOD: 533

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/15/2022	11:40	Perfluorobutanoic acid (PFBA)	12.8	ng/L	2
11/15/2022	11:40	Perfluorohexanoic acid (PFHxA)	10.4	ng/L	2
11/15/2022	11:40	Perfluoropentanesulfonic acid (PFPeS)	3.1	ng/L	2
11/15/2022	11:40	Perfluoropentanoic acid (PFPeA)	11	ng/L	2

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/15/2022	11:40	Atrazine (ATRAZ)	0.0021	ug/L	0.001
11/15/2022	11:40	Carbamazepine (CBMAZP)	2.412	ng/L	1
11/15/2022	11:40	Diuron (DIURON)	0.0111	ug/L	0.005
11/15/2022	11:40	Primidone (PRIMDN)	9.222	ng/L	1
11/15/2022	11:40	Simazine (SIMAZ)	0.0319	ug/L	0.005
11/15/2022	11:40	Sucralose (SUCRAL)	208.131	ng/L	100
11/15/2022	11:40	Sulfamethoxazole (SULTHZ)	14.805	ng/L	1

Summary of All 2022 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	AMD-12 Qtr 1	AMD-12 Qtr 2	AMD-12 Qtr 3	AMD-12 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	ND - 1.4	ND - 2.1	ND - 1.9	ND - 3.4
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	1 - 2.5	ND - 2.4	ND - 3.9	ND - 5.7
Arsenic (dissolved)* (As-DIS), ug/L	OCWD	N/A	1.1 - 2.5	1.2 - 2.3	1.3 - 3.9	1.3 - 5.7
Barium (Ba), ug/L	OCWD	1000	23.9 - 65.6	14.6 - 70.3	11.2 - 64.1	6.5 - 67.7
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND - 4.5	ND - 2.2	ND
Fluoride (F), mg/L	OCWD	2	ND - 0.51	0.11 - 0.47	0.14 - 0.51	0.19 - 0.51
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND	ND - 0.23	ND	ND - 0.22
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	1.7 - 5.4	1.8 - 6.7	ND - 7.2	ND - 6.3
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	0.81 - 1.3	0.82 - 1.35	0.88 - 1.56	0.96 - 1.55
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	Not Required	ND
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 1.1	ND	ND	ND - 1.2
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND - 1.7	ND - 1.5	ND - 1.4	ND - 0.9
Primary Drinking Water Standards - Biological						
E. Coli (Colilert - MPN/100mL) (ECOLIQ), MPN	OCWD	N/A	ND	ND	ND	ND
Total Coliform (Colilert - MPN/100mL) (TCOLIQ), MPN	OCWD	N/A	ND	ND	ND	ND
Total Coliform (Mult. Tube Fermentation) (TCOLIM), MPN	OCWD	N/A	ND	ND	ND	ND
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	390 - 842	212 - 852	191 - 825	132 - 868
Iron (Fe), ug/L	OCWD	300	ND - 10.6	ND - 19.9	ND - 12.7	ND - 10.3
Manganese (Mn), ug/L	OCWD	50	ND - 1.3	ND - 1.6	ND - 1.4	ND - 1.8
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 1.3	ND - 1.6	ND - 1.5	ND - 1.7
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	222 - 512	134 - 522	114 - 532	68 - 516
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	ND - 0.15	ND - 0.15	ND - 0.1	ND - 0.1
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND - 2.1	ND - 1.7	ND - 1.8	ND - 1.8
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.15 - 0.27	0.14 - 0.31	0.15 - 0.26	0.14 - 0.23
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	2.3 - 3.4	2.4 - 4.4	2.5 - 6	2.2 - 7.7
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
4,4'-DDE (DDE), ug/L	OCWD / WeclkLab	N/A	Not Required	Not Required	Not Required	ND
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
DCPA-Dacthal (DCPA), ug/L	OCWD/ WeckLab	N/A	Not Required	Not Required	Not Required	ND
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	Not Required	ND
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2022 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	AMD-12 Qtr 1	AMD-12 Qtr 2	AMD-12 Qtr 3	AMD-12 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	Not Required	Not Required	Not Required	ND
508.1	Chlorinated Pesticides	WeckLab	Not Required	Not Required	Not Required	ND
515.4	Chlorinated Acids	WeckLab	Not Required	Not Required	Not Required	ND
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	Not Required	ND
533	PFAS Compounds	OCWD	Not Required	Not Required	Not Required	ND > NL
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	Not Required	ND
8015D	Nonhalogenated Organics	WeckLab	Not Required	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	Not Required	ND - Detections
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	Not Required	Not Required	Not Required	ND

AMD-12/1
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
2/15/2022	9:20	Chloroform (CHCl3)	1.7	ug/L	0.5
2/15/2022	9:20	Total Trihalomethanes (TTHMs)	1.7	ug/L	0.5

Year 2022, Quarter 2

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
5/23/2022	11:55	Chloroform (CHCl3)	1.5	ug/L	0.5
5/23/2022	11:55	Total Trihalomethanes (TTHMs)	1.5	ug/L	0.5

Year 2022, Quarter 3

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
8/15/2022	10:05	Chloroform (CHCl3)	1	ug/L	0.5
8/15/2022	10:05	Total Trihalomethanes (TTHMs)	1	ug/L	0.5

Year 2022, Quarter 4

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
11/14/2022	9:40	Chloroform (CHCl3)	0.9	ug/L	0.5
11/14/2022	9:40	Total Trihalomethanes (TTHMs)	0.9	ug/L	0.5

METHOD: 533

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
11/14/2022	9:40	Perfluoro octane sulfonic acid (PFOS)	2.6	ng/L	2

AMD-12/1
Organic Detections by Method

Year 2022, Quarter 4

METHOD: CEC

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
11/14/2022	9:40	Diuron (DIURON)	0.0118	ug/L	0.005
11/14/2022	9:40	Sulfamethoxazole (SULTHZ)	1.049	ng/L	1

AMD-12/2
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/15/2022	10:10	Chloroform (CHCl3)	0.8	ug/L	0.5
2/15/2022	10:10	Total Trihalomethanes (TTHMs)	0.8	ug/L	0.5

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/23/2022	11:15	Chloroform (CHCl3)	1.1	ug/L	0.5
5/23/2022	11:15	Total Trihalomethanes (TTHMs)	1.1	ug/L	0.5

Year 2022, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/15/2022	11:10	Chloroform (CHCl3)	1.4	ug/L	0.5
8/15/2022	11:10	Total Trihalomethanes (TTHMs)	1.4	ug/L	0.5

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/14/2022	10:40	Chloroform (CHCl3)	0.9	ug/L	0.5
11/14/2022	10:40	Total Trihalomethanes (TTHMs)	0.9	ug/L	0.5

METHOD: 533

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/14/2022	10:40	Perfluoro octane sulfonic acid (PFOS)	2.1	ng/L	2
11/14/2022	10:40	Perfluoro octanoic acid (PFOA)	2.9	ng/L	2
11/14/2022	10:40	Perfluoropentanoic acid (PFPeA)	2.2	ng/L	2

AMD-12/2

Organic Detections by Method

Year 2022, Quarter 4

METHOD: CEC

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
11/14/2022	10:40	Diuron (DIURON)	0.0093	ug/L	0.005
11/14/2022	10:40	Primidone (PRIMDN)	3.454	ng/L	1
11/14/2022	10:40	Simazine (SIMAZ)	0.008	ug/L	0.005
11/14/2022	10:40	Sucralose (SUCRAL)	154.071	ng/L	100
11/14/2022	10:40	Sulfamethoxazole (SULTHZ)	3.724	ng/L	1

AMD-12/3
Organic Detections by Method

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/14/2022 11:50	Chloroform (CHCl3)	TR	ug/L	0.5
11/14/2022 11:50	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

METHOD: 533

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/14/2022 11:50	Perfluoro butane sulfonic acid (PFBS)	10.6	ng/L	2
11/14/2022 11:50	Perfluoro heptanoic acid (PFHpA)	5.5	ng/L	2
11/14/2022 11:50	Perfluoro hexane sulfonic acid (PFHxS)	6.1	ng/L	2
11/14/2022 11:50	Perfluoro nonanoic acid (PFNA)	2.3	ng/L	2
11/14/2022 11:50	Perfluoro octane sulfonic acid (PFOS)	10.8	ng/L	2
11/14/2022 11:50	Perfluoro octanoic acid (PFOA)	13.3	ng/L	2
11/14/2022 11:50	Perfluorobutanoic acid (PFBA)	10.1	ng/L	2
11/14/2022 11:50	Perfluorohexanoic acid (PFHxA)	15.2	ng/L	2
11/14/2022 11:50	Perfluoropentanoic acid (PFPeA)	19.9	ng/L	2

METHOD: CEC

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/14/2022 11:50	Atrazine (ATRAZ)	0.0011	ug/L	0.001
11/14/2022 11:50	Carbamazepine (CBMAZP)	33.537	ng/L	1
11/14/2022 11:50	Dilantin (DILANT)	12.002	ng/L	10
11/14/2022 11:50	Diuron (DIURON)	0.0101	ug/L	0.005
11/14/2022 11:50	Primidone (PRIMDN)	42.123	ng/L	1
11/14/2022 11:50	Simazine (SIMAZ)	0.0194	ug/L	0.005
11/14/2022 11:50	Sucralose (SUCRAL)	10000	ng/L	1000
11/14/2022 11:50	Sulfamethoxazole (SULTHZ)	40.085	ng/L	1

AMD-12/4
Organic Detections by Method

Year 2022, Quarter 4

METHOD: 533

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/14/2022	11:35	Perfluoro butane sulfonic acid (PFBS)	13.3	ng/L	2
11/14/2022	11:35	Perfluoro heptanoic acid (PFHpA)	7.6	ng/L	2
11/14/2022	11:35	Perfluoro hexane sulfonic acid (PFHxS)	7.5	ng/L	2
11/14/2022	11:35	Perfluoro nonanoic acid (PFNA)	2.6	ng/L	2
11/14/2022	11:35	Perfluoro octane sulfonic acid (PFOS)	13.1	ng/L	2
11/14/2022	11:35	Perfluoro octanoic acid (PFOA)	20.2	ng/L	2
11/14/2022	11:35	Perfluorobutanoic acid (PFBA)	13.5	ng/L	2
11/14/2022	11:35	Perfluorohexanoic acid (PFHxA)	22.1	ng/L	2
11/14/2022	11:35	Perfluoropentanoic acid (PFPeA)	28	ng/L	2

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/14/2022	11:35	Atrazine (ATRAZ)	0.0015	ug/L	0.001
11/14/2022	11:35	Carbamazepine (CBMAZP)	32.749	ng/L	1
11/14/2022	11:35	Diuron (DIURON)	0.0137	ug/L	0.005
11/14/2022	11:35	Primidone (PRIMDN)	44.029	ng/L	1
11/14/2022	11:35	Simazine (SIMAZ)	0.0266	ug/L	0.005
11/14/2022	11:35	Sucralose (SUCRAL)	10100	ng/L	1000
11/14/2022	11:35	Sulfamethoxazole (SULTHZ)	40.051	ng/L	1

AMD-12/5
Organic Detections by Method

Year 2022, Quarter 4

METHOD: 533

Sample Date & Time		*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
11/14/2022	10:25	Perfluoro butane sulfonic acid (PFBS)	10.4	ng/L	2
11/14/2022	10:25	Perfluoro heptanoic acid (PFHpA)	2.3	ng/L	2
11/14/2022	10:25	Perfluoro hexane sulfonic acid (PFHxS)	6.3	ng/L	2
11/14/2022	10:25	Perfluoro octane sulfonic acid (PFOS)	8.7	ng/L	2
11/14/2022	10:25	Perfluoro octanoic acid (PFOA)	6	ng/L	2
11/14/2022	10:25	Perfluorobutanoic acid (PFBA)	9.3	ng/L	2
11/14/2022	10:25	Perfluorohexanoic acid (PFHxA)	4.7	ng/L	2
11/14/2022	10:25	Perfluoropentanoic acid (PFPeA)	6.5	ng/L	2

METHOD: CEC

Sample Date & Time		*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
11/14/2022	10:25	Atrazine (ATRAZ)	0.0029	ug/L	0.001
11/14/2022	10:25	Carbamazepine (CBMAZP)	13.034	ng/L	1
11/14/2022	10:25	Diuron (DIURON)	0.0092	ug/L	0.005
11/14/2022	10:25	Primidone (PRIMDN)	17.25	ng/L	1
11/14/2022	10:25	Simazine (SIMAZ)	0.0619	ug/L	0.005
11/14/2022	10:25	Sucralose (SUCRAL)	2390	ng/L	100
11/14/2022	10:25	Sulfamethoxazole (SULTHZ)	25.357	ng/L	1

Summary of All 2022 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	OCWD-KB1 Qtr 1	OCWD-KB1 Qtr 2	OCWD-KB1 Qtr 3	OCWD-KB1 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	2.6	6.5	5.1	2.1
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND	1.5	1.4	1.1
Arsenic (dissolved)* (As-DIS), ug/L	OCWD	N/A	ND	1.5	1.4	1
Barium (Ba), ug/L	OCWD	1000	39.1	10.2	11.9	77.5
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	1.4	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.18	0.34	0.27	0.22
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND	0.3	0.36	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	2.6	ND	ND	1.7
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	1.15	1.73	1.95	0.27
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	Not Required	ND
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND	ND	ND	1.8
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	0.7	0.9	0.8	2
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	3	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	682	229	263	991
Iron (Fe), ug/L	OCWD	300	ND	7.2	5.1	ND
Manganese (Mn), ug/L	OCWD	50	ND	ND	ND	ND
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND	ND	ND	ND
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	378	144	164	604
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	0.1	0.5	ND	ND
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	4	1	ND	1.3
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.18	0.27	0.24	0.14
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	2	3.3	3.7	2.6
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
4,4'-DDE (DDE), ug/L	OCWD / WeckLab	N/A	Not Required	Not Required	Not Required	ND
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
DCPA-Dacthal (DCPA), ug/L	OCWD/ WeckLab	N/A	Not Required	Not Required	Not Required	ND
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	Not Required	ND
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2022 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	OCWD-KB1 Qtr 1	OCWD-KB1 Qtr 2	OCWD-KB1 Qtr 3	OCWD-KB1 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	Not Required	ND	Not Required	ND
508.1	Chlorinated Pesticides	WeckLab	Not Required	Not Required	Not Required	ND
515.4	Chlorinated Acids	WeckLab	Not Required	Not Required	Not Required	ND
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	Not Required	ND
533	PFAS Compounds	OCWD	Not Required	Not Required	Not Required	ND > NL
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	Not Required	ND
8015D	Nonhalogenated Organics	Eurofins Buf	Not Required	ND	Not Required	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	Not Required	ND - Detections
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	Not Required	Not Required	Not Required	ND

OCWD-KB1/1
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
3/15/2022	9:45	Chloroform (CHCl3)	0.7	ug/L	0.5
3/15/2022	9:45	Total Trihalomethanes (TTHMs)	0.7	ug/L	0.5

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
6/21/2022	9:40	Chloroform (CHCl3)	0.9	ug/L	0.5
6/21/2022	9:40	Total Trihalomethanes (TTHMs)	0.9	ug/L	0.5

Year 2022, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/30/2022	11:55	Chloroform (CHCl3)	0.8	ug/L	0.5
8/30/2022	11:55	Total Trihalomethanes (TTHMs)	0.8	ug/L	0.5

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/29/2022	12:40	Chloroform (CHCl3)	2	ug/L	0.5
11/29/2022	12:40	Total Trihalomethanes (TTHMs)	2	ug/L	0.5

METHOD: 533

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/29/2022	12:40	Perfluoro octane sulfonic acid (PFOS)	2.8	ng/L	2

OCWD-KB1/1
Organic Detections by Method

Year 2022, Quarter 4

METHOD: CEC

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
11/29/2022	12:40	Primidone (PRIMDN)	1.67	ng/L	1
11/29/2022	12:40	Sucralose (SUCRAL)	813.624	ng/L	100
11/29/2022	12:40	Sulfamethoxazole (SULTHZ)	1.881	ng/L	1

Appendix J

Anaheim Forebay Monitoring Well Groundwater Quality

1,4-Dioxane, NDMA and Selected Constituents

Orange County Water District
Groundwater Replenishment System
2022 Annual Report

TABLE J-1
OCWD MONITORING WELL AM-7
1,4-dioxane and NDMA
Concentrations
2018 - 2022

AM-7/1 *Shallow Aquifer* *Perforations: 210-225 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)
11/7/2018	<1	<2
2/20/2019	<1	<2
1/28/2020	<1	na
3/17/2020	<1	na
6/16/2020	<1	<2
9/15/2021	<0.5	<2
11/29/2022	<0.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-2
OCWD MONITORING WELL AM-8
Concentrations
2018 - 2022

AM-8/1 *Shallow Aquifer* *Perforations: 268-285 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)
11/7/2018	<1	<2
2/20/2019	<1	<2
3/17/2020	<1	na
6/16/2020	<1	<2
9/15/2021	<0.5	<2
11/29/2022	<0.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-3
OCWD MONITORING WELL AMD-10
1,4-dioxane and NDMA Concentrations
2018 - 2022

AMD-10/1 *Principal Aquifer* *Perforations: 292-312 ft bgs*			**AMD-10/2** *Principal Aquifer* *Perforations: 440-460 ft bgs*			**AMD-10/3** *Principal Aquifer* *Perforations: 550-570 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
04/16/18	<1	na	04/16/18	<1	na	04/16/18	na	na
11/05/18	<1	<2	11/05/18	<1	<2	11/05/18	<1	<2
02/04/19	<1	na	02/04/19	<1	na	02/04/19	<1	na
05/08/19	na	<2	05/08/19	na	<2	05/08/19	na	<2
05/19/20	<1	<2	05/19/20	<1	<2	05/19/20	<1	<2
08/24/21	<0.5	<2	08/24/21	<0.5	<2	08/24/21	<0.5	<2
11/15/22	<0.5	<2	11/15/22	<0.5	<2	11/15/22	<0.5	<2

AMD-10/4 *Principal Aquifer* *Perforations: 774-794 ft bgs*			**AMD-10/5** *Principal Aquifer* *Perforations: 934-954 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
04/16/18	na	na	04/16/18	na	na
11/05/18	<1	<2	11/05/18	<1	<2
02/04/19	<1	na	02/04/19	<1	na
05/08/19	na	<2	05/08/19	na	<2
05/19/20	<1	<2	05/19/20	<1	<2
08/24/21	<0.5	<2	08/24/21	<0.5	<2
11/15/22	<0.5	<2	11/15/22	<0.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-4
OCWD MONITORING WELL AMD-12
1,4-dioxane and NDMA Concentrations
2018 - 2022

AMD-12/1 *Principal Aquifer* *Perforations: 330-350 ft bgs*			**AMD-12/2** *Principal Aquifer* *Perforations: 490-520 ft bgs*			**AMD-12/3** *Principal Aquifer* *Perforations: 595-615 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
11/06/18	<1	<2	11/06/18	<1	<2	11/06/18	<1	<2
02/19/19	<1	<2	02/19/19	<1	<2	02/19/19	<1	<2
05/18/20	<1	<2	05/18/20	<1	<2	05/18/20	<1	<2
08/23/21	<0.5	<2	08/23/21	<0.5	<2	08/23/21	<0.5	<2
11/14/22	<0.5	<2	11/14/22	<0.5	<2	11/14/22	<0.5	<2

AMD-12/4 *Principal Aquifer* *Perforations: 725-745 ft bgs*			**AMD-12/5** *Principal Aquifer* *Perforations: 940-960 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
11/06/18	<1	<2	11/06/18	<1	<2
02/19/19	<1	<2	02/19/19	<1	<2
05/18/20	<1	<2	05/18/20	<1	<2
08/23/21	<0.5	<2	08/23/21	<0.5	<2
11/14/22	<0.5	<2	11/14/22	<0.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-5
OCWD MONITORING WELL AM-10
1,4-dioxane and NDMA
Concentrations
2018 - 2022

AM-10/1 *Shallow Aquifer* *Perforations: 217-235 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)
11/07/18	<1	<2
02/20/19	<1	<2
03/17/20	<1	na
06/16/20	<1	<2
09/15/21	<0.5	<2
11/29/22	<0.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-6
OCWD MONITORING WELL KB1
1,4-dioxane and NDMA
Concentrations
2018 - 2022

KB1 *Shallow Aquifer* *Perforations: 180-200 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)
11/05/18	<1	<2
02/04/19	<1	na
05/06/19	na	<2
03/17/20	<1	na
06/16/20	<1	<2
09/15/21	<0.5	<2
06/21/22	<0.5	na
11/29/22	<0.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-7
OCWD MONITORING WELL AM-7
2018 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
AM-7/1 Shallow Perforations 210-225 ft bgs	02/21/18	0.064	42.5	240	136	<0.2	0.004	0.51	0.48
	04/18/18	na	29.9	184	na	na	0.004	0.66	0.31
	05/21/18	0.189	32.8	202	106	na	na	0.64	0.32
	06/14/18	na	53.9	330	na	na	0.003	0.52	0.38
	08/22/18	0.081	46.4	282	150	na	na	0.64	0.35
	10/17/18	na	88.4	564	na	na	0.003	0.27	0.66
	11/07/18	0.065	89.6	570	303	<0.2	0.004	0.26	0.68
	12/11/18	na	81.4	548	na	na	0.006	0.25	0.66
	02/20/19	0.056	75.0	460	252	<0.2	0.005	0.36	0.54
	04/11/19	na	58.7	400	na	na	0.006	0.51	0.45
	05/21/19	0.045	56.4	372	184	na	na	0.57	0.43
	06/11/19	na	36.8	268	na	na	0.004	0.72	0.29
	07/15/19	na	29.3	218	na	na	0.003	0.71	0.25
	08/19/19	0.042	47.2	322	166	na	na	0.7	0.37
	11/26/19	0.019	54.6	328	135	na	na	0.96	0.4
	01/28/20	na	42.2	296	na	na	0.005	0.7	0.36
	03/17/20	0.067	52.8	332	144	na	na	0.63	0.4
	05/20/20	na	67.0	366	na	na	0.004	0.9	0.52
	06/16/20	0.119	71.4	396	174	<0.2	0.004	1.04	0.59
	07/28/20	na	83.4	440	na	na	0.007	1.5	0.8
	09/16/20	0.137	82.6	440	221	na	na	1.62	0.86
	10/27/20	na	69.8	392	na	na	0.007	1.38	0.65
	12/15/20	0.113	66.6	346	158	na	na	1.35	0.66
	03/16/21	0.146	78.0	420	202	na	na	1.46	0.78
	06/22/21	0.131	79.6	408	197	na	na	1.2	0.79
	09/15/21	0.1	64.7	324	175	<0.2	0.007	1.71	0.55
	12/13/21	0.117	80.9	388	215	na	na	1.87	0.61
	03/15/22	0.064	62.9	368	183	na	na	0.87	0.56
	06/21/22	0.055	60.1	360	171	na	na	0.87	0.48
	08/30/22	0.042	43.8	288	130	na	na	1.08	0.34
	11/29/22	0.079	60.8	314	144	<0.2	0.006	1.26	0.57

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-8
OCWD MONITORING WELL AM-8
2018 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
AM-8/1 Shallow Perforations 268-285 ft bgs	02/21/18	0.046	28.0	150	75.6	<0.2	0.017	1.01	0.34
	04/18/18	na	42.9	228	na	na	0.018	0.78	0.54
	05/21/18	0.078	46.0	256	114	na	na	0.86	0.38
	06/14/18	na	45.6	272	na	na	0.015	0.89	0.39
	08/22/18	0.068	39.6	240	109	na	na	0.99	0.36
	10/17/18	na	41.8	252	na	na	0.02	0.83	0.38
	11/07/18	0.075	42.2	214	114	<0.2	0.017	0.70	0.37
	12/11/18	na	43.3	276	na	na	0.017	0.51	0.52
	02/20/19	0.068	64.0	376	219	<0.2	0.016	0.35	0.42
	04/10/19	na	69.0	446	na	na	0.022	0.36	0.52
	05/21/19	0.062	61.4	390	212	na	na	0.41	0.49
	08/19/19	0.073	59.8	356	179	na	na	0.65	0.45
	11/19/19	0.054	50.7	334	156	na	na	0.62	0.32
	03/17/20	0.07	73.0	454	241	na	na	0.46	0.46
	06/16/20	0.101	69.0	434	224	<0.2	0.01	0.53	0.43
	09/16/20	0.106	85.4	478	254	na	na	0.96	0.47
	12/15/20	0.109	70.3	388	201	na	na	1.07	0.48
	03/16/21	0.076	43.4	284	126	na	na	1.15	0.32
	06/22/21	0.119	73.7	362	180	na	na	1.12	0.51
	09/15/21	0.123	77.0	382	202	<0.2	0.022	1.27	0.68
	12/13/21	0.109	68.7	338	177	na	na	1.33	0.5
	03/15/22	0.091	67.0	356	170	na	na	1.05	0.51
	06/21/22	0.101	80.8	438	221	na	na	0.91	0.59
	08/30/22	0.091	69.7	392	190	na	na	1.05	0.56
	11/29/22	0.077	60.8	338	155	<0.2	0.015	1.23	0.47

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-9
OCWD MONITORING WELL AMD-10
2018 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
AMD-10/1 Principal Perforations 292-312 ft bgs	02/07/18	0.017	10.2	118	49.8	<0.2	0.016	1.17	0.15
	04/16/18	na	4.8	50	na	na	0.017	0.95	0.06
	05/08/18	0.016	4.7	64	23.2	na	na	0.92	0.1
	06/11/18	na	33.6	196	na	na	0.017	0.74	0.24
	08/08/18	0.062	88.8	598	361	na	na	0.281	0.69
	10/15/18	na	88.1	562	na	na	0.004	0.31	0.64
	11/05/18	0.070	90	588	297	<0.2	0.005	0.27	0.7
	12/11/18	na	86.7	588	na	na	0.006	0.17	0.7
	02/04/19	0.037	46	330	144	<0.2	0.009	0.74	0.3
	04/10/19	na	6.8	80	na	na	0.013	0.94	0.11
	05/08/19	0.016	6.5	84	17.6	na	na	0.91	0.09
	06/11/19	na	9.8	82.5	na	na	0.013	0.92	0.12
	07/15/19	na	17.1	96	na	na	0.013	0.86	0.15
	08/07/19	0.040	26.5	126	46.7	na	na	1.05	0.19
	11/04/19	0.041	48.6	286	124	na	na	0.62	0.37
	01/13/20	na	18.6	173	na	na	0.015	1	0.16
	02/19/20	0.018	8.4	100	34.2	na	na	0.99	0.07
	04/07/20	na	13.3	108	na	na	0.017	0.97	0.09
	05/19/20	0.052	34.6	210	107	<0.2	0.019	1.16	0.24
	07/15/20	na	25	178	na	na	0.018	1.19	0.24
	08/19/20	0.066	39.3	236	120	na	na	1.26	0.24
	11/02/20	na	67.3	382	na	na	0.021	1.51	0.47
	11/18/20	0.119	73.7	402	234	na	na	1.47	0.47
	02/17/21	0.158	87.7	444	287	na	na	1.11	0.49
	05/18/21	0.054	29.9	166	128	na	na	0.98	0.49
	08/24/21	0.034	18.9	120	60.2	<0.2	0.014	1.13	0.49
	11/16/21	0.015	8.2	62	31.2	na	na	1.37	0.49
	02/16/22	0.021	19.3	143	56.5	na	na	1.21	0.16
	05/24/22	0.015	8.6	86	26.4	na	na	1.23	0.05
	08/16/22	0.014	9.6	60	28.2	na	na	1.34	0.06
	11/15/22	0.016	12	80	37.9	<0.2	0.018	1.71	0.07

TABLE J-9
OCWD MONITORING WELL AMD-10
2018 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
	02/07/18	0.021	10.2	92	36.6	<0.2	0.042	1.21	0.13
	04/16/18	na	16.6	124	na	na	0.049	1.01	0.15
	05/08/18	0.032	17.4	122	54.8	na	na	1.05	0.15
	06/11/18	na	15.9	140	na	na	0.045	1.03	0.13
	08/08/18	0.012	6.0	110	32.9	na	na	0.95	0.08
	10/15/18	na	35.2	196	na	na	0.034	0.81	0.24
	11/05/18	0.054	56.2	334	183	<0.2	0.038	0.61	0.38
	12/11/18	na	62.7	432	na	na	0.049	0.51	0.46
	02/04/19	0.045	51.5	366	205	<0.2	0.042	0.78	0.32
	04/10/19	na	59.6	382	na	na	0.046	0.64	0.4
	05/08/19	0.047	55.5	390	229	na	na	0.7	0.36
AMD-10/2	06/11/19	na	40.8	342	na	na	0.04	0.87	0.28
Principal	07/15/19	na	34.0	258	na	na	0.043	0.84	0.22
Perforations	08/07/19	0.035	32.6	234	151	na	na	0.93	0.2
440-460 ft bgs	11/04/19	0.021	10.9	132	57.2	na	na	0.92	0.1
	01/13/20	na	32.8	194	na	na	1.18	1.18	0.2
	02/19/20	0.033	22.0	194	96.3	na	na	1.13	0.13
	04/07/20	na	21.1	158	na	na	0.038	0.96	0.14
	05/19/20	0.032	20.9	178	86.1	<0.2	0.046	1.07	0.14
	07/15/20	na	19.2	144	na	na	0.038	0.99	0.12
	08/19/20	0.040	25.1	166	83.9	na	na	0.94	0.15
	11/02/20	na	36.7	222	na	na	0.04	1.12	0.25
	11/18/20	0.058	37.5	226	111	na	na	1.1	0.20
	02/17/21	0.086	51.7	297	157	na	na	1.25	0.28
	05/18/21	0.138	77.9	448	240	na	na	1.07	0.51
	08/24/21	0.178	103.0	540	290	0.3	0.067	1.1	0.84
	11/16/21	0.146	87.7	402	248	na	na	1.03	0.65
	02/16/22	0.044	24.5	124	80	na	na	1.34	0.19
	05/24/22	0.024	13.9	116	45	na	na	1.32	0.15
	08/16/22	0.032	25.3	162	74	na	na	1.20	0.16
	11/15/22	0.034	29.5	196	88	<0.2	0.031	1.22	0.18
	02/07/18	0.091	73.7	498	221	<0.2	0.076	1.2	0.72
	04/16/18	na	na	na	na	na	na	na	na
	05/08/18	0.092	50.4	328	139	na	na	0.94	0.6
	06/11/18	na	na	na	na	na	na	na	na
	08/08/18	0.060	36.6	256	88.3	na	na	0.4	0.5
	10/15/18	na	na	na	na	na	na	na	na
	11/05/18	0.066	45	300	111	<0.2	0.034	0.55	0.52
	02/04/19	0.094	78.4	422	190	<0.2	0.043	0.64	0.53
	04/10/19	na	na	na	na	na	na	na	na
AMD-10/3	05/08/19	0.087	90.4	598	254	na	na	0.36	0.75
Principal	06/11/19	na	na	na	na	na	na	na	na
Perforations	07/15/19	na	na	na	na	na	na	na	na
550-570 ft bgs	08/07/19	0.079	91.4	584	279	na	na	0.34	0.73
	11/04/19	0.099	99.1	602	287	na	na	0.71	0.7
	02/19/20	0.108	80.5	534	216	na	na	1.37	0.60
	05/19/20	0.113	73.8	448	199	<0.2	0.066	1.36	0.59
	08/19/20	0.107	67.4	394	186	na	na	1.11	0.53
	11/18/20	0.113	76.9	432	209	na	na	1.02	0.56
	02/17/21	0.136	85.8	464	215	na	na	1.17	0.63
	05/18/21	0.142	85.6	480	225	na	na	1.19	0.73
	08/24/21	0.148	86.3	432	223	<0.2	0.099	1.05	0.80
	11/16/21	0.159	95.2	414	234	na	na	0.94	0.86
	02/16/22	0.168	107	504	259	na	na	1.66	0.94
	05/24/22	0.164	103	500	252	na	na	1.44	0.86
	08/16/22	0.147	99.9	482	249	na	na	1.14	0.83
	11/15/22	0.125	103	524	269	0.3	0.072	0.72	0.86

TABLE J-9
OCWD MONITORING WELL AMD-10
2018 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
AMD-10/4 Principal Perforations 774-794 ft bgs	02/07/18	0.086	97.8	640	308	<0.2	0.099	0.45	0.61
	04/16/18	na	na	na	na	na	na	na	na
	05/08/18	0.094	97.1	626	288	na	na	0.34	0.59
	06/11/18	na	na	na	na	na	na	na	na
	08/08/18	0.078	89.5	626	254	na	na	0.23	0.57
	10/15/18	na	na	na	na	na	na	na	na
	11/05/18	0.088	87.4	572	273	<0.2	0.093	0.48	0.57
	02/04/19	0.093	76.5	490	226	<0.2	0.097	0.61	0.4
	04/10/19	na	na	na	na	na	na	na	na
	05/08/19	0.091	59.2	384	166	na	na	0.45	0.49
	06/11/19	na	na	na	na	na	na	na	na
	07/15/19	na	na	na	na	na	na	na	na
	08/07/19	0.086	58.8	398	155	na	na	0.23	0.54
	11/04/19	0.083	68	438	171	na	na	0.12	0.61
	02/19/20	0.090	80.3	508	208	na	na	0.11	0.66
	05/19/20	0.088	89.7	572	256	<0.2	0.039	0.14	0.62
	08/19/20	0.099	93.5	578	269	na	na	0.27	0.61
	11/18/20	0.107	93.2	566	270	na	na	0.53	0.63
	02/17/21	0.120	88.4	550	240	na	na	0.69	0.57
	05/18/21	0.127	86.5	534	237	na	na	0.82	0.55
	08/24/21	0.138	90.4	496	234	0.2	0.071	0.85	0.54
	11/16/21	0.141	94.6	440	242	na	na	0.86	0.49
	02/16/22	0.153	97.9	514	243	na	na	0.98	0.46
	05/24/22	0.153	98	528	246	na	na	0.99	0.44
	08/16/22	0.153	103	538	252	na	na	1.06	0.45
	11/15/22	0.178	108	538	277	<0.2	0.076	1.21	0.45
AMD-10/5 Principal Perforations 934-954 ft bgs	02/07/18	0.122	99.2	612	284	<0.2	0.221	0.48	0.47
	04/16/18	na	na	na	na	na	na	na	na
	05/08/18	0.123	94.8	520	275	na	na	0.41	0.46
	06/11/18	na	na	na	na	na	na	na	na
	08/08/18	0.099	93.5	608	255	na	na	0.21	0.47
	10/15/18	na	na	na	na	na	na	na	na
	11/05/18	0.094	95.6	614	295	<0.2	0.145	0.32	0.49
	02/04/19	0.099	94.1	578	276	<0.2	0.147	0.36	0.36
	04/10/19	na	na	na	na	na	na	na	na
	05/08/19	0.099	87.2	576	270	na	na	0.48	0.48
	06/11/19	na	na	na	na	na	na	na	na
	07/15/19	na	na	na	na	na	na	na	na
	08/07/19	0.095	82.9	566	254	na	na	0.47	0.46
	11/04/19	0.088	79.0	562	243	na	na	0.41	0.46
	02/19/20	0.091	73.6	530	225	na	na	0.33	0.43
	05/19/20	0.010	72.8	510	218	<0.2	0.108	0.28	0.4
	08/19/20	0.010	73.4	476	212	na	na	0.19	0.4
	11/18/20	0.090	75.3	478	209	na	na	0.29	0.45
	02/17/21	0.130	80.5	499	209	na	na	0.3	0.39
	05/18/21	0.166	90.0	542	260	na	na	0.3	0.4
	08/24/21	0.196	97.2	552	272	0.2	0.118	0.4	0.38
	11/16/21	0.207	98.8	550	270	na	na	0.54	0.38
	02/16/22	0.233	107	596	283	na	na	0.72	0.4
	05/24/22	0.231	110	618	299	na	na	0.76	0.39
	08/16/22	0.224	114	642	310	na	na	0.79	0.39
	11/15/22	0.235	116	624	325	<0.2	0.135	0.86	0.39

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-10
OCWD MONITORING WELL AMD-12
2018 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
AMD-12/1 Principal Perforations 330-350 ft bgs	02/20/18	0.056	56.3	350	191	<0.2	<0.002	0.54	0.49
	04/18/18	na	20.8	154	na	na	<0.002	0.99	0.20
	05/22/18	0.021	9.4	114	41	na	na	1.02	0.17
	06/14/18	na	6.7	84	na	na	<0.002	1.01	0.06
	08/21/18	0.059	69.2	418	228	na	na	0.36	0.46
	10/15/18	na	92.7	586	na	na	<0.002	0.28	0.65
	11/06/18	0.069	92.4	626	342	<0.2	<0.002	0.27	0.67
	12/11/18	na	87.1	568	na	na	0.004	0.22	0.67
	02/19/19	0.065	91.2	570	310	<0.2	<0.002	0.26	0.53
	05/20/19	0.019	16	190	61.7	na	na	0.99	0.27
	06/11/19	na	9.9	128	na	na	<0.002	1.01	0.13
	07/15/19	na	7.6	72	na	na	<0.002	0.88	0.11
	08/20/19	0.019	9	120	17.4	na	na	0.97	0.13
	11/18/19	0.024	12.9	112	25	na	na	1.02	0.10
	01/13/20	na	58.6	304	na	na	<0.002	0.53	0.34
	02/18/20	0.051	59.8	424	171	na	na	0.50	0.39
	05/18/20	0.058	38.6	208	74.6	<0.2	<0.002	1.02	0.19
	07/15/20	na	35.4	204	na	na	<0.002	1.24	0.21
	08/17/20	0.054	34.4	206	84.8	na	na	1.33	0.20
	11/02/20	na	39.8	236	na	na	<0.002	1.38	0.29
	11/16/20	0.071	43	246	107	na	na	1.37	0.29
	02/16/21	0.115	67.7	337	176	na	na	1.48	0.34
	05/17/21	0.151	85.3	470	253	na	na	1.31	0.48
	08/23/21	0.067	41.4	260	152	<0.2	<0.002	1.31	0.27
	11/15/21	0.028	15.7	112	59.4	na	na	1.28	0.16
	02/15/22	0.043	38	222	101	na	na	0.95	0.23
	05/23/22	0.038	36.9	256	111	na	na	1.07	0.21
	08/15/22	0.018	14	114	46.5	na	na	1.33	0.08
	11/14/22	0.013	8.7	68	24.8	<0.2	<0.002	1.5	<0.05
AMD-12/2 Principal Perforations 490-520 ft bgs	02/20/18	0.016	9.4	102	38	<0.2	<0.002	1.40	0.20
	04/18/18	na	na	na	na	na	na	na	na
	05/22/18	0.027	12.3	104	36.1	na	na	1.22	0.14
	06/14/18	na	na	na	na	na	na	na	na
	08/21/18	0.021	11.4	98	44	na	na	1.13	0.13
	10/15/18	na	na	na	na	na	na	na	na
	11/06/18	0.02	10.3	120	38.6	<0.2	0.003	1.10	0.11
	02/19/19	0.026	25.1	142	75.1	<0.2	<0.002	1.20	0.15
	05/20/19	0.034	39.6	248	129	na	na	0.98	0.31
	06/11/19	na	na	na	na	na	na	na	na
	07/15/19	na	na	na	na	na	na	na	na
	08/20/19	0.036	40.9	296	136	na	na	0.91	0.29
	11/18/19	0.027	26.7	208	118	na	na	0.85	0.17
	02/18/20	0.037	28	206	91.4	na	na	1.02	0.20
	05/18/20	0.036	29.4	194	107	<0.2	<0.002	1.08	0.14
	08/17/20	0.026	16.8	138	74.2	na	na	1.03	0.10
	11/16/20	0.036	21.5	152	74.3	na	na	1.13	0.21
	02/16/21	0.058	33.9	188	105	na	na	1.27	0.15
	05/17/21	0.067	40.6	214	122	<0.2	na	1.27	0.20
	08/23/21	0.131	74.7	376	230	na	<0.002	1.22	0.36
	11/15/21	0.142	85.2	402	271	na	na	1.17	0.46
	02/15/22	0.057	31.0	232	127	na	na	1.14	0.17
	05/23/22	0.025	14.2	134	61	na	na	1.33	0.09
	08/15/22	0.025	15.4	118	58	na	na	1.37	0.08
	11/14/22	0.025	18.6	116	62	<0.2	<0.002	1.35	0.10

TABLE J-10
OCWD MONITORING WELL AMD-12
2018 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
AMD-12/3 Principal Perforations 595-615 ft bgs	02/20/18	0.076	79.7	484	235	<0.2	<0.002	0.86	0.55
	04/18/18	na	na	na	na	na	na	na	na
	05/22/18	0.096	65.3	432	181	na	na	1.15	0.47
	06/14/18	na	na	na	na	na	na	na	na
	08/21/18	0.069	41.7	314	142	na	na	1.06	0.36
	10/15/18	na	na	na	na	na	na	na	na
	11/06/18	0.064	36.1	284	102	<0.2	0.003	1.00	0.35
	02/19/19	0.055	34.4	242	91.2	<0.2	<0.002	0.86	0.26
	05/20/19	0.065	53.1	334	126	na	na	0.85	0.39
	06/11/19	na	na	na	na	na	na	na	na
	07/15/19	na	na	na	na	na	na	na	na
	08/20/19	0.073	68.5	412	163	na	na	0.70	0.52
	11/18/19	0.071	80.5	472	217	na	na	0.41	0.48
	02/18/20	0.073	78.1	544	246	na	na	0.60	0.50
	05/18/20	0.083	77.6	472	229	<0.2	<0.002	0.89	0.45
	08/17/20	0.091	71.9	410	199	na	na	1.17	0.46
	11/16/20	0.089	61.9	378	188	na	na	1.35	0.41
	02/16/21	0.088	54.9	333	145	na	na	1.28	0.34
	05/17/21	0.102	66.9	396	168	na	na	1.14	0.39
	08/23/21	0.128	80.3	438	213	<0.2	<0.002	1.35	0.48
	11/15/21	0.14	86.4	394	232	na	na	1.28	0.61
	02/15/22	0.163	91.6	466	242	na	na	1.26	0.70
	05/23/22	0.153	96.2	480	248	na	na	1.35	0.75
	08/15/22	0.146	95.4	482	252	na	na	1.56	0.73
	11/14/22	0.121	83.2	406	218	<0.2	<0.002	1.55	0.58
AMD-12/4 Principal Perforations 725-745 ft bgs	02/20/18	0.09	92.1	578	281	<0.2	<0.002	0.62	0.83
	04/18/18	na	na	na	na	na	na	na	na
	05/22/18	0.106	93	598	260	na	na	0.60	0.79
	06/14/18	na	na	na	na	na	na	na	na
	08/21/18	0.091	85.5	548	273	na	na	0.82	0.72
	10/15/18	na	na	na	na	na	na	na	na
	11/06/18	0.093	77.4	532	236	<0.2	0.003	1.01	0.74
	02/19/19	0.086	58.9	398	173	<0.2	<0.002	0.84	0.55
	05/20/19	0.076	53.3	340	148	na	na	0.67	0.58
	06/11/19	na	na	na	na	na	na	na	na
	07/15/19	na	na	na	na	na	na	na	na
	08/20/19	0.079	59.1	382	135	na	na	0.62	0.67
	11/18/19	0.078	73	412	170	na	na	0.37	0.57
	02/18/20	0.083	81.2	514	219	na	na	0.44	0.66
	05/18/20	0.087	89.3	550	244	<0.2	<0.002	0.52	0.68
	08/17/20	0.102	91.2	530	247	na	na	0.81	0.66
	11/16/20	0.108	85.8	496	230	na	na	1.07	0.63
	02/16/21	0.12	83	473	212	na	na	1.22	0.61
	05/17/21	0.123	81	480	207	na	na	1.14	0.57
	08/23/21	0.133	86.4	472	215	<0.2	0.002	1.21	0.58
	11/15/21	0.135	88.9	434	214	na	na	1.32	0.59
	02/15/22	0.147	88.7	462	212	na	na	1.30	0.62
	05/23/22	0.148	91.5	478	216	na	na	1.28	0.65
	08/15/22	0.141	95.7	492	230	na	na	1.38	0.73
	11/14/22	0.151	101	464	217	<0.2	<0.002	1.52	0.72

TABLE J-10
OCWD MONITORING WELL AMD-12
2018 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
AMD-12/5 Principal Perforations 940-960 ft bgs	02/20/18	0.124	92.5	560	263	<0.2	<0.002	0.63	0.69
	04/18/18	na	na	na	na	na	na	na	na
	05/22/18	0.134	93.5	552	244	na	na	0.59	0.60
	06/14/18	na	na	na	na	na	na	na	na
	08/21/18	0.112	92.7	570	276	na	na	0.59	0.60
	10/15/18	na	na	na	na	na	na	na	na
	11/06/18	0.112	94.9	263	269	<0.2	0.002	0.62	0.70
	02/19/19	0.107	97	580	278	<0.2	<0.002	0.61	0.57
	05/20/19	0.1	96.8	592	284	na	na	0.56	0.69
	06/11/19	na	na	na	na	na	na	na	na
	07/15/19	na	na	na	na	na	na	na	na
	08/20/19	0.099	93.5	600	263	na	na	0.63	0.75
	11/18/19	0.091	91.6	578	251	na	na	0.46	0.62
	02/18/20	0.095	84.9	588	244	na	na	0.55	0.64
	05/18/20	0.091	82.9	526	235	<0.2	<0.002	0.48	0.60
	08/17/20	0.094	82.7	504	230	na	na	0.42	0.59
	11/16/20	0.093	83.4	524	249	na	na	0.42	0.61
	02/16/21	0.100	84.2	533	229	na	na	0.49	0.58
	05/17/21	0.102	82.5	542	228	na	na	0.63	0.60
	08/23/21	0.110	81.5	516	223	<0.2	<0.002	0.73	0.57
	11/15/21	0.111	84	432	211	na	na	0.78	0.56
	02/15/22	0.124	86.8	512	223	na	na	0.81	0.55
	05/23/22	0.118	90	522	228	na	na	0.82	0.53
	08/15/22	0.119	92.1	532	243	na	na	0.88	0.55
	11/14/22	0.125	94.9	516	242	0.3	<0.002	0.96	0.51

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-11
OCWD MONITORING WELL AM-10
2018 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
AM-10/1 Shallow Perforations 217-235 ft bgs	2/21/2018	0.011	5.1	62	26	<0.2	0.003	1.07	0.07
	5/22/2018	0.022	5.5	62	27.5	na	na	1.13	0.07
	8/23/2018	0.015	7.4	69	35.3	na	na	1.55	0.05
	9/12/2018	na	7.4	75	na	na	0.003	1.53	0.06
	11/7/2018	0.023	16.4	105	57.6	<0.2	0.004	1.48	0.11
	2/20/2019	0.012	5.3	58	33.1	<0.2	0.004	1.06	<0.05
	5/21/2019	0.014	5.3	55	33.5	na	na	0.95	0.08
	8/19/2019	0.015	5.9	32	36.5	na	na	1.12	0.08
	11/26/2019	0.064	5	73	29.8	na	na	1.18	<0.05
	3/17/2020	0.017	5.5	68	33.1	na	na	0.99	0.11
	6/16/2020	0.014	5.2	66	34.4	<0.2	0.002	1	0.07
	9/16/2020	0.016	6.5	78	39.3	na	na	1.41	<0.05
	12/15/2020	0.017	5.9	70	36.5	na	na	1.2	<0.05
	3/16/2021	0.014	5.1	79	33.3	na	na	1.05	0.12
	6/22/2021	0.012	4.6	69	34	na	na	0.91	<0.05
	9/15/2021	0.02	9.2	83	44.2	<0.2	0.003	1.2	0.09
	12/13/2021	0.043	24.5	149	101	na	na	1.62	0.28
	3/15/2022	0.011	6.5	62	38.3	na	na	1.34	0.3
	6/21/2022	0.01	6.6	60	38.3	na	na	1.47	0.08
	8/30/2022	0.011	6.8	80	38.6	na	na	1.59	0.06
	11/29/2022	0.011	7.3	68	40.4	<0.2	<0.002	1.77	0.07

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-12
OCWD MONITORING WELL KB1
2018 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
OCWD-KB1 Shallow Perforations 180-200 ft bgs	2/6/2018	0.05	29	208	86	<0.2	<0.002	1.24	0.40
	5/8/2018	0.025	7.7	78	22	na	na	1.39	0.22
	8/8/2018	0.063	91.1	612	289	na	na	0.01	0.78
	11/5/2018	0.063	92.7	620	273	<0.2	<0.002	0.24	0.96
	2/4/2019	0.072	85.5	514	254	<0.2	<0.002	0.47	0.78
	5/6/2019	0.04	25.4	168	62	na	na	1.25	0.54
	8/7/2019	0.017	5.9	72	16	na	na	1.23	0.28
	11/4/2019	0.063	92.6	606	270	na	na	0.01	0.97
	3/17/2020	0.101	73.1	404	195	na	na	1.39	1.40
	6/16/2020	0.134	76.1	450	210	<0.2	0.014	0.80	1.86
	9/16/2020	0.021	8.7	98	29	na	na	1.54	0.35
	12/15/2020	0.017	6.1	70	21	na	na	1.30	0.16
	3/16/2021	0.162	109.0	531	268	na	na	2.41	1.81
	6/22/2021	0.028	14.6	138	40	na	na	1.11	1.04
	9/15/2021	0.014	5.6	87	14	<0.2	<0.002	1.33	0.38
	12/13/2021	0.064	92.8	552	274	na	na	0.31	1.01
	3/15/2022	0.113	78.4	378	164	na	na	1.15	1.42
	6/21/2022	0.033	17.8	144	41	na	na	1.73	0.26
	8/30/2022	0.035	18.8	164	49	na	na	1.95	0.15
	11/29/2022	0.069	105.0	604	301	<0.2	<0.002	0.27	0.94

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

Appendix K

Groundwater Quality Data
at the Mid-Basin Area

Orange County Water District
Groundwater Replenishment System
2022 Annual Report

GWRS 2022 Quarterly Sampling Dates

OCWD Water Quality Department

MID-BASIN INJECTION (MBI) PROJECT

GROUNDWATER

Monitoring Well	Qtr 1	Qtr 2	Qtr 3	Qtr 4
SAR-10/1-4	03/14/2022	06/15/2022	08/29/2022	11/28/2022
SAR-11/1-3	03/14/2022	06/15/2022	08/29/2022	11/28/2022
SAR-12/1-4	02/01/2022	04/12/2022	08/02/2022	11/01/2022
SAR-13/1-4	02/02/2022	05/11/2022	08/03/2022	11/01/2022

Notes for Appendix K Tables:

► Water quality data are summarized in the following tables for monitoring wells SAR-10/1-4, SAR-11/1-3, SAR-12/1-4 and SAR-13/1-4. These wells were constructed as part of OCWD's Mid-Basin Injection (MBI) Project to comply with existing SWRCB DDW's (formerly CDPH) draft recycled water recharge project regulations. The monitoring wells will provide water quality data located between the point of injection (Mid-Basin Injection Well MBI-1 is located 80 feet upgradient of SAR-10) and the nearest downgradient municipal production wells IRWD-12 and IRWD-17. The multi-depth nested wells are to monitor multiple zones within the Principal aquifer receiving GWRS FPW injected water at MBI-1. SAR-10/1-4 was constructed in May 2012 and SAR-11/1-3 in November 2011; SAR-12/1-4 was constructed in January 2018; SAR-13/1-4 was constructed in December 2017 . Dedicated pumps were installed in each casing prior to routine monitoring. Baseline monitoring continued in 2015 to establish ambient groundwater conditions before and after injection of FPW at MBI-1. MBI-1 began injection FPW on April 15, 2015. The MBI project became fully operational during March 2020.

► Listed dates (above) are the 2021 dates of quarterly baseline monitoring activities.

► Results listed in the table for each quarter are the range of the minimum and maximum values detected at the well location, which may consist of one to four well casings. Figures and report text list the well ID (e.g. SAR-10) and casing number (e.g., SAR-10/1, SAR-10/2, SAR-10/3 and SAR-10/4), as appropriate.

► Appendices B & C contain a list of all methods and reportable detection limits (RDL).

► Detailed data reports are available upon request.

► The more stringent value in the range of secondary MCLs is used in the tables (e.g., <MCL) for TDS, electrical conductivity (EC), chloride and sulfate.

► MCL: Maximum Contaminant Level

► N/A: Not applicable

► ND: Not detected at reportable detection limit (RDL)

► NL: SWRCB DDW (formerly CDPH) Notification Level

► NS: Not sampled

Summary of All 2022 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	SAR-10 Qtr 1	SAR-10 Qtr 2	SAR-10 Qtr 3	SAR-10 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	7.5 - 92.2	7.5 - 60	6.4 - 419	6.8 - 303
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 5.6	ND - 4.8	ND - 5	ND - 5.2
Arsenic (dissolved) (As-DIS), ug/L	OCWD	N/A	ND - 5.4	ND - 4.8	ND - 5.3	ND - 5.2
Barium (Ba), ug/L	OCWD	1000	11.2 - 21.4	11 - 21.2	12.1 - 21.7	11.4 - 20.2
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	ND - 0.11	ND - 0.11	ND	ND
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND - 0.3	ND - 0.26	ND	ND - 0.37
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 1.2	ND - 1.3	ND - 1.2	ND
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 1.31	ND - 1.66	ND - 1.87	ND - 1.51
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	Not Required	ND - 0.005
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND	ND	ND	ND
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND - 1.2	ND - 2.4	ND - 1.3	ND - 1.3
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	107 - 194	106 - 206	122 - 229	111 - 239
Iron (Fe), ug/L	OCWD	300	ND - 89.1	ND - 51.6	ND - 99.1	ND - 176
Manganese (Mn), ug/L	OCWD	50	ND - 5.7	ND - 6.7	ND - 6.9	ND - 6.9
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 5.7	ND - 6.5	ND - 7	ND - 6.9
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND - 1	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	60 - 119	62 - 132	54 - 124	42 - 140
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	ND - 0.65	0.2 - 0.85	ND - 2.2	0.1 - 1.7
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND	ND	ND	ND
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.22 - 0.24	0.22 - 0.27	0.22 - 0.3	0.24 - 0.29
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	ND - 2.9	ND - 3.1	ND - 3.3	ND - 3.2
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	Not Required	ND
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2022 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	SAR-10 Qtr 1	SAR-10 Qtr 2	SAR-10 Qtr 3	SAR-10 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND	ND	ND	ND
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	Not Required	ND
533	PFAS Compounds	OCWD	Not Sampled	Not Sampled	Not Sampled	ND
537.1	PFAS Compounds	OCWD	Not Sampled	ND	Not Sampled	Not Sampled
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	Not Required	ND
8015D	Nonhalogenated Organics	Eurof Buf	Not Required	ND	Not Required	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	Not Required	ND
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND < NL	ND < NL	ND < NL	ND < NL

SAR-10/1

Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/14/2022 11:45	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
3/14/2022 11:45	Chloroform (CHCl3)	1.1	ug/L	0.5
3/14/2022 11:45	Total Trihalomethanes (TTHMs)	1.1	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/14/2022 11:45	n-Nitrosodimethylamine (NDMA)	4	ng/L	2

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
6/15/2022 11:25	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
6/15/2022 11:25	Chloroform (CHCl3)	1.3	ug/L	0.5
6/15/2022 11:25	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
6/15/2022 11:25	n-Nitrosodimethylamine (NDMA)	4.2	ng/L	2

Year 2022, Quarter 3

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
8/29/2022 11:45	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
8/29/2022 11:45	Chloroform (CHCl3)	1.3	ug/L	0.5
8/29/2022 11:45	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
8/29/2022 11:45	n-Nitrosodimethylamine (NDMA)	2.4	ng/L	2

SAR-10/1
Organic Detections by Method

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time		*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
11/28/2022	12:15	Chloroform (CHCl3)	1	ug/L	0.5
11/28/2022	12:15	Total Trihalomethanes (TTHMs)	1	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
11/28/2022	12:15	n-Nitrosodimethylamine (NDMA)	2.3	ng/L	2

SAR-10/2
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/14/2022 10:30	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
3/14/2022 10:30	Chloroform (CHCl3)	1.2	ug/L	0.5
3/14/2022 10:30	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/14/2022 10:30	n-Nitrosodimethylamine (NDMA)	6.7	ng/L	2

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
6/15/2022 12:30	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
6/15/2022 12:30	Chloroform (CHCl3)	1.6	ug/L	0.5
6/15/2022 12:30	Total Trihalomethanes (TTHMs)	1.6	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
6/15/2022 12:30	n-Nitrosodimethylamine (NDMA)	4.9	ng/L	2

Year 2022, Quarter 3

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
8/29/2022 12:45	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
8/29/2022 12:45	Chloroform (CHCl3)	1.3	ug/L	0.5
8/29/2022 12:45	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
8/29/2022 12:45	n-Nitrosodimethylamine (NDMA)	2.9	ng/L	2

SAR-10/2
Organic Detections by Method

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
11/28/2022 12:00	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
11/28/2022 12:00	Chloroform (CHCl3)	1.2	ug/L	0.5
11/28/2022 12:00	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
11/28/2022 12:00	n-Nitrosodimethylamine (NDMA)	2.5	ng/L	2

SAR-10/4
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/14/2022 10:40	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
3/14/2022 10:40	Chloroform (CHCl3)	1.2	ug/L	0.5
3/14/2022 10:40	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/14/2022 10:40	n-Nitrosodimethylamine (NDMA)	9.2	ng/L	2

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
6/15/2022 10:15	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
6/15/2022 10:15	Chloroform (CHCl3)	1.7	ug/L	0.5
6/15/2022 10:15	Total Trihalomethanes (TTHMs)	2.4	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
6/15/2022 10:15	n-Nitrosodimethylamine (NDMA)	3.3	ng/L	2

Year 2022, Quarter 3

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
8/29/2022 10:45	Chloroform (CHCl3)	1.2	ug/L	0.5
8/29/2022 10:45	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
8/29/2022 10:45	n-Nitrosodimethylamine (NDMA)	3.1	ng/L	2

SAR-10/4

Organic Detections by Method

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/28/2022	11:10	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
11/28/2022	11:10	Chloroform (CHCl3)	1.3	ug/L	0.5
11/28/2022	11:10	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5

Summary of All 2022 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	SAR-11 Qtr 1	SAR-11 Qtr 2	SAR-11 Qtr 3	SAR-11 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	3.3 - 7.5	5.1 - 8	3.4 - 7.3	4.5 - 7.6
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	2.4 - 4.1	2.4 - 3.6	2.2 - 3.7	2.4 - 3.9
Arsenic (dissolved) (As-DIS), ug/L	OCWD	N/A	2.3 - 4.1	2.3 - 3.4	2.4 - 3.8	2.4 - 3.9
Barium (Ba), ug/L	OCWD	1000	15.5 - 25.9	15.6 - 24.6	14.8 - 22.8	14.8 - 24.2
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND - 1.7	ND - 2	ND	ND
Fluoride (F), mg/L	OCWD	2	ND - 0.43	ND - 0.45	ND - 0.43	ND - 0.42
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND - 0.33	ND - 0.29	ND - 0.3	ND - 0.27
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 1.4	ND - 1.5	ND - 1.2	ND
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 1.17	ND - 1.22	ND - 1.29	ND - 1.33
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	Not Required	ND
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 4.2	ND - 4.1	ND - 3.6	ND - 3.8
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND - 1.9	ND - 1.9	ND - 1.6	ND - 1.1
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	135 - 209	128 - 188	132 - 196	136 - 193
Iron (Fe), ug/L	OCWD	300	16.5 - 18.8	13.2 - 24.1	7 - 11.3	8.4 - 12.4
Manganese (Mn), ug/L	OCWD	50	ND - 9.1	ND - 9.6	ND - 9.2	ND - 9.6
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 9.1	ND - 9.5	ND - 9.3	ND - 9.1
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	82.4 - 134	76 - 120	62 - 76	82 - 116
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	0.1 - 0.15	0.15 - 0.25	0.1	0.1 - 0.15
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND	ND	ND	ND
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.17 - 0.23	0.18 - 0.25	0.18 - 0.26	0.2 - 0.26
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	ND - 9.4	ND - 10.4	ND - 9.8	ND - 9.3
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	Not Required	ND
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	Not Required	ND

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2022 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	SAR-11 Qtr 1	SAR-11 Qtr 2	SAR-11 Qtr 3	SAR-11 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND	ND	ND	ND
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	Not Required	ND
533	PFAS Compounds	OCWD	Not Sampled	Not Sampled	Not Sampled	ND
537.1	PFAS Compounds	OCWD	Not Sampled	ND	Not Sampled	Not Sampled
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	Not Required	ND
8015B / 8015D	Nonhalogenated Organics	Eurof Buf/ WeckLab	Not Required	ND	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	Not Required	ND
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND < NL	ND < NL	ND < NL	ND < NL

SAR-11/1
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
3/14/2022	9:50	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
3/14/2022	9:50	Chloroform (CHCl3)	0.9	ug/L	0.5
3/14/2022	9:50	Total Trihalomethanes (TTHMs)	0.9	ug/L	0.5

Year 2022, Quarter 2

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
6/15/2022	10:30	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
6/15/2022	10:30	Chloroform (CHCl3)	1	ug/L	0.5
6/15/2022	10:30	Total Trihalomethanes (TTHMs)	1	ug/L	0.5

Year 2022, Quarter 3

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
8/29/2022	10:05	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
8/29/2022	10:05	Chloroform (CHCl3)	1.1	ug/L	0.5
8/29/2022	10:05	Total Trihalomethanes (TTHMs)	1.1	ug/L	0.5

Year 2022, Quarter 4

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
11/28/2022	9:50	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
11/28/2022	9:50	Chloroform (CHCl3)	1	ug/L	0.5
11/28/2022	9:50	Total Trihalomethanes (TTHMs)	1	ug/L	0.5

METHOD: NDMA-LOW

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
11/28/2022	9:50	n-Nitrosodimethylamine (NDMA)	2	ng/L	2

SAR-11/2
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
3/14/2022	10:50	Bromodichloromethane (CHBrCl)	0.5	ug/L	0.5
3/14/2022	10:50	Chloroform (CHCl3)	1.4	ug/L	0.5
3/14/2022	10:50	Total Trihalomethanes (TTHMs)	1.9	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
3/14/2022	10:50	n-Nitrosodimethylamine (NDMA)	2.6	ng/L	2

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
6/15/2022	9:15	Bromodichloromethane (CHBrCl)	0.5	ug/L	0.5
6/15/2022	9:15	Chloroform (CHCl3)	1.4	ug/L	0.5
6/15/2022	9:15	Total Trihalomethanes (TTHMs)	1.9	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
6/15/2022	9:15	n-Nitrosodimethylamine (NDMA)	2.7	ng/L	2

Year 2022, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/29/2022	11:05	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
8/29/2022	11:05	Chloroform (CHCl3)	1.6	ug/L	0.5
8/29/2022	11:05	Total Trihalomethanes (TTHMs)	1.6	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/29/2022	11:05	n-Nitrosodimethylamine (NDMA)	3.3	ng/L	2

SAR-11/2
Organic Detections by Method

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/28/2022 11:10	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
11/28/2022 11:10	Chloroform (CHCl3)	1.1	ug/L	0.5
11/28/2022 11:10	Total Trihalomethanes (TTHMs)	1.1	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/28/2022 11:10	n-Nitrosodimethylamine (NDMA)	3.7	ng/L	2

Summary of All 2022 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	SAR-12 Qtr	SAR-12 Qtr 2	SAR-12 Qtr 3	SAR-12 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	2 - 7.5	1.5 - 8.4	1.5 - 8.3	4.4 - 8
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 2.6	ND - 2.7	ND - 2.8	ND - 2.9
Arsenic (dissolved) (As-DIS), ug/L	OCWD	N/A	ND - 2.5	ND - 2.6	ND - 2.7	1 - 3
Asbestos (ASBESTOS), MFL	EurofCEI/Eurofins	7	ND	ND	ND	ND
Barium (Ba), ug/L	OCWD	1000	16.6 - 55.3	14 - 55.1	15.1 - 56	14.5 - 56.6
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND - 4.8	ND - 5.4	ND - 4.8	ND - 6.4
Cyanide (CN), ug/L	OCWD	150	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.26 - 0.49	0.25 - 0.51	0.25 - 0.56	0.26 - 0.59
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND - 5.93	ND - 5.81	ND - 5.46	ND - 5.67
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 1.1	ND - 1.5	ND - 1.4	ND - 1.7
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 1.01	ND - 0.95	ND - 1.08	ND - 1.28
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	ND	ND	ND	ND
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 1.2	ND - 1.2	ND - 1.1	ND - 1.2
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD), pg/L	EuroTSac	30	ND	ND	ND	ND
Primary Drinking Water Standards - Radioactivity						
Gross Alpha Excluding Uranium (TOTa-U), pCi/L	FGL	15	2.53 - 3.13	1.06 - 2.98	0.745 - 1.48	ND - 2.38
Other Radionuclides	FGL/Eber	Varies	ND < PMCL	ND < PMCL	ND < PMCL	ND < PMCL
Primary Drinking Water Standards - Disinfection By-Products						
Sum of five Haloacetic Acids (HAA5), ug/L	OCWD	60***	ND	ND	ND	ND
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND - 1.8	ND - 1	ND - 1	ND - 1.9
Primary Drinking Water Standards - Biological						
E. Coli (Colilert - MPN/100mL) (ECOLIQ), MPN	OCWD	N/A	ND	ND	ND	ND
Total Coliform (Colilert - MPN/100mL) (TCOLIQ), MPN	OCWD	N/A	ND - 13.5	ND	ND	ND
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	178 - 407	152 - 370	147 - 375	152 - 417
Iron (Fe), ug/L	OCWD	300	ND - 13.7	5.2 - 12.3	6.2 - 16.5	8.4 - 51.9
Manganese (Mn), ug/L	OCWD	50	ND - 17.3	ND - 18	ND - 16.5	ND - 18.3
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 17.3	ND - 17.6	ND - 17.2	ND - 17.1
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND - 8	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	102 - 234	98 - 232	100 - 238	90 - 242
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	ND - 0.2	ND - 0.3	ND - 0.25	ND - 0.3
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND - 1.2	ND - 1.7	ND - 1.3	ND
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	ND - 0.11	ND - 0.13	ND - 0.14	ND - 0.16
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	ND - 6.6	ND - 7.2	ND - 7.5	ND - 7.3
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	EurfCalT CLLC/OCWD	N/A	ND	ND	ND	ND
2,6-Dinitrotoluene (26DNT), ug/L	EurfCalT CLLC/OCWD	N/A	ND	ND	ND	ND
4,4'-DDE (DDE), ug/L	OCWD / Weck	N/A	ND	ND	ND	ND
Acetochlor (ACETOC), ug/L	OCWD	N/A	ND	ND	ND	ND
DCPA-Dacthal (DCPA), ug/L	OCWD / Weck	N/A	ND	ND	ND	ND
EPTC (EPTC), ug/L	OCWD	N/A	ND	ND	ND	ND
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	ND	ND	ND	ND
Nitrobenzene (NBENZ), ug/L	EurfCalT CLLC	N/A	ND	ND	ND	ND
Terbacil (TRBACL), ug/L	OCWD	N/A	ND	ND	ND	ND

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2022 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	SAR-12 Qtr 1	SAR-12 Qtr 2	SAR-12 Qtr 3	SAR-12 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND	ND	ND	ND
1613B	2,3,7,8-Tetrachlorodibenzo-p-dioxin	EuroTSac	ND	ND	ND	ND
504.1	EDB, DBCP & 123TCP	OCWD	ND	ND	ND	ND
508.1	Chlorinated Pesticides	WeckLab	ND	ND	ND	ND
515.4	Chlorinated Acids	WeckLab	ND	ND	ND	ND
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
524M-TCP	123TCP & EDB	OCWD	ND	ND	ND	ND
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	ND	ND	ND	ND
531.2	Carbamates	OCWD	ND	ND	ND	ND
533	PFAS Compounds	OCWD	Not Sampled	Not Sampled	Not Sampled	ND
537.1	PFAS Compounds	OCWD	ND	ND	ND	Not Sampled
547	Glyphosate	OCWD	ND	ND	ND	ND
548.1	Endothall	WeckLab	ND	ND	ND	ND
549.2	Diquat and Paraquat	OCWD	ND	ND	ND	ND
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	OCWD / WeckLab	ND	ND	ND	ND
552.2	Disinfection Byproducts (DBPs) - Haloacetic Acids	OCWD	ND	ND	ND	ND
625.1	Semi-Volatile Organic Compounds, including Priority Pollutants	EurfCalT-EurfCLLC	ND	ND	ND	ND
8015B	Nonhalogenated Organics	WeckLab	Not Required	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	Not Required	ND
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND < NL	ND < NL	ND < NL	ND < NL

SAR-12/3
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/1/2022	11:40	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
2/1/2022	11:40	Chloroform (CHCl3)	1.2	ug/L	0.5
2/1/2022	11:40	Total Trihalomethanes (TTHMs)	1.8	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/1/2022	11:40	n-Nitrosodimethylamine (NDMA)	2.5	ng/L	2

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/10/2022	12:15	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
5/10/2022	12:15	Chloroform (CHCl3)	1	ug/L	0.5
5/10/2022	12:15	Total Trihalomethanes (TTHMs)	1	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/10/2022	12:15	n-Nitrosodimethylamine (NDMA)	2.3	ng/L	2

Year 2022, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/2/2022	11:50	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
8/2/2022	11:50	Chloroform (CHCl3)	1	ug/L	0.5
8/2/2022	11:50	Total Trihalomethanes (TTHMs)	1	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/2/2022	11:50	n-Nitrosodimethylamine (NDMA)	2.9	ng/L	2

SAR-12/3
Organic Detections by Method

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/1/2022 11:50	Bromodichloromethane (CHBrCl)	0.5	ug/L	0.5
11/1/2022 11:50	Chloroform (CHCl3)	1.3	ug/L	0.5
11/1/2022 11:50	Total Trihalomethanes (TTHMs)	1.9	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/1/2022 11:50	n-Nitrosodimethylamine (NDMA)	3.7	ng/L	2

SAR-12/4
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/1/2022	10:30	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/12/2022	12:10	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5
5/10/2022	10:30	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/10/2022	10:30	n-Nitrosodimethylamine (NDMA)	2.4	ng/L	2

Year 2022, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/2/2022	10:20	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/1/2022	10:25	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5

Summary of All 2022 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	SAR-13 Qtr 1	SAR-13 Qtr 2	SAR-13 Qtr 3	SAR-13 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	3.4 - 6.7	4.2 - 7.2	3.8 - 8.3	4 - 9.5
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	1.9 - 3.4	1.7 - 3.2	1.8 - 3.6	2 - 3.9
Arsenic (dissolved) (As-DIS), ug/L	OCWD	N/A	1.7 - 3.3	1.6 - 3.1	1.7 - 3.6	2.1 - 4.2
Asbestos (ASBESTOS), MFL	EurofCEI/Eurofins	7	ND	ND	ND	ND
Barium (Ba), ug/L	OCWD	1000	10.4 - 36.5	10.2 - 33.3	9 - 34.5	8.1 - 34.6
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND - 1.3	ND - 1.1	ND	ND
Cyanide (CN), ug/L	OCWD	150	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.34 - 0.65	0.36 - 0.6	0.38 - 0.63	0.34 - 0.63
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND - 1.34	ND - 1.18	ND - 1.05	ND - 0.86
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 1.2	ND	ND	ND
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 1.32	ND - 1.28	ND - 1.37	ND - 1.69
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	ND - 0.009	ND - 0.003	ND	ND
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND	ND	ND	ND
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD), pg/L	EurotSac	30	ND	ND	ND	ND
Primary Drinking Water Standards - Radioactivity						
Gross Alpha Excluding Uranium (TOTa-U), pCi/L	FGL	15	2.24 - 3.43	1.64 - 3.13	0.452 - 1.48	ND - 1.17
Other Radionuclides	FGL/ Davi/ Eber	Varies	ND < PMCL	ND < PMCL	ND < PMCL	ND < PMCL
Primary Drinking Water Standards - Disinfection By-Products						
Sum of five Haloacetic Acids (HAA5), ug/L	OCWD	60***	ND	ND	ND	ND
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND - 2.5	ND - 1.8	ND - 1.3	ND - 1.4
Primary Drinking Water Standards - Biological						
E. Coli (Colilert - MPN/100mL) (ECOLIQ), MPN	OCWD	N/A	ND	ND	ND	ND
Total Coliform (Colilert - MPN/100mL) (TCOLIQ), MPN	OCWD	N/A	ND	ND	ND	ND
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	129 - 266	116 - 235	112 - 225	125 - 227
Iron (Fe), ug/L	OCWD	300	ND - 8.8	ND - 7.6	ND	ND
Manganese (Mn), ug/L	OCWD	50	ND - 10.5	ND - 9.8	ND - 8.4	ND - 7.5
Manganese (dissolved)**** (Mn-DIS), ug/L	OCWD	N/A	ND - 10.1	ND - 9.6	ND - 8.7	ND - 7.3
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	82 - 150	71 - 170	96 - 148	76 - 134
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	ND	ND	ND - 0.2	ND - 0.1
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND	ND	ND	ND
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	ND - 0.19	0.1 - 0.2	0.13 - 0.2	0.16 - 0.23
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	ND - 13.1	ND - 13.4	ND - 17.9	ND - 18.1
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	EurfCalT CLLC/OCWD	N/A	ND	ND	ND	ND
2,6-Dinitrotoluene (26DNT), ug/L	EurfCalT CLLC/OCWD	N/A	ND	ND	ND	ND
4,4'-DDE (DDE), ug/L	OCWD / Weck	N/A	ND	ND	ND	ND
Acetochlor (ACETOC), ug/L	OCWD	N/A	ND	ND	ND	ND
DCPA-Dacthal (DCPA), ug/L	OCWD / Weck	N/A	ND	ND	ND	ND
EPTC (EPTC), ug/L	OCWD	N/A	ND	ND	ND	ND
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	ND	ND	ND	ND
Nitrobenzene (NBENZ), ug/L	EurfCalT CLLC	N/A	ND	ND	ND	ND
Terbacil (TRBACL), ug/L	OCWD	N/A	ND	ND	ND	ND

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2022 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	SAR-13 Qtr 1	SAR-13 Qtr 2	SAR-13 Qtr 3	SAR-13 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND	ND	ND	ND
1613B	2,3,7,8-Tetrachlorodibenzo-p-dioxin	EuroTSac	ND	ND	ND	ND
504.1	EDB, DBCP & 123TCP	OCWD	ND	ND	ND	ND
508.1	Chlorinated Pesticides	WeckLab	ND	ND	ND	ND
515.4	Chlorinated Acids	WeckLab	ND	ND	ND	ND
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
524M-TCP	123TCP & EDB	OCWD	ND	ND	ND	ND
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	ND	ND	ND	ND
531.2	Carbamates	OCWD	ND	ND	ND	ND
533	PFAS Compounds	OCWD	Not Sampled	Not Sampled	Not Sampled	ND
537.1	PFAS Compounds	OCWD	ND	ND	ND	Not Sampled
547	Glyphosate	OCWD	ND	ND	ND	ND
548.1	Endothall	WeckLab	ND	ND	ND	ND
549.2	Diquat and Paraquat	OCWD	ND	ND	ND	ND
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	OCWD / WeckLab	ND	ND	ND	ND
552.2	Disinfection Byproducts (DBPs) - Haloacetic Acids	OCWD	ND	ND	ND	ND
625.1	Semi-Volatile Organic Compounds, including Priority Pollutants	EurfCalT-EurfCLLC	ND	ND	ND	ND
8015B / 8015D	Nonhalogenated Organics	Eurof Buf/ WeckLab	Not Required	ND	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	Not Required	ND
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND < NL	ND < NL	ND < NL	ND < NL

SAR-13/1
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
2/2/2022	9:55	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
2/2/2022	9:55	Chloroform (CHCl3)	1.2	ug/L	0.5
2/2/2022	9:55	Total Trihalomethanes (TTHMs)	1.8	ug/L	0.5

Year 2022, Quarter 2

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
5/11/2022	9:35	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
5/11/2022	9:35	Chloroform (CHCl3)	1	ug/L	0.5
5/11/2022	9:35	Total Trihalomethanes (TTHMs)	1	ug/L	0.5

Year 2022, Quarter 3

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
8/3/2022	10:00	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
8/3/2022	10:00	Chloroform (CHCl3)	1	ug/L	0.5
8/3/2022	10:00	Total Trihalomethanes (TTHMs)	1	ug/L	0.5

Year 2022, Quarter 4

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
11/1/2022	10:45	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
11/1/2022	10:45	Chloroform (CHCl3)	1.2	ug/L	0.5
11/1/2022	10:45	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5

METHOD: NDMA-LOW

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
11/1/2022	10:45	n-Nitrosodimethylamine (NDMA)	2.2	ng/L	2

SAR-13/2
Organic Detections by Method

Year 2022, Quarter 3

METHOD: ***524.2***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/3/2022	12:05	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5

Year 2022, Quarter 4

METHOD: ***524.2***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/1/2022	12:55	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5

SAR-13/3
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
2/2/2022 11:50	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
2/2/2022 11:50	Chloroform (CHCl3)	1.6	ug/L	0.5
2/2/2022 11:50	Total Trihalomethanes (TTHMs)	2.3	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
2/2/2022 11:50	n-Nitrosodimethylamine (NDMA)	4.2	ng/L	2

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
5/11/2022 11:30	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
5/11/2022 11:30	Chloroform (CHCl3)	1.2	ug/L	0.5
5/11/2022 11:30	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
5/11/2022 11:30	n-Nitrosodimethylamine (NDMA)	4.1	ng/L	2

Year 2022, Quarter 3

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
8/3/2022 11:50	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
8/3/2022 11:50	Chloroform (CHCl3)	1.3	ug/L	0.5
8/3/2022 11:50	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
8/3/2022 11:50	n-Nitrosodimethylamine (NDMA)	5.1	ng/L	2

SAR-13/3
Organic Detections by Method

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/1/2022 12:35	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
11/1/2022 12:35	Chloroform (CHCl3)	1.4	ug/L	0.5
11/1/2022 12:35	Total Trihalomethanes (TTHMs)	1.4	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/1/2022 12:35	n-Nitrosodimethylamine (NDMA)	4	ng/L	2

SAR-13/4
Organic Detections by Method

Year 2022, Quarter 1

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
2/2/2022 10:25	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
2/2/2022 10:25	Chloroform (CHCl3)	1.7	ug/L	0.5
2/2/2022 10:25	Total Trihalomethanes (TTHMs)	2.5	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
2/2/2022 10:25	n-Nitrosodimethylamine (NDMA)	3.6	ng/L	2

Year 2022, Quarter 2

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
5/11/2022 10:00	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
5/11/2022 10:00	Chloroform (CHCl3)	1.3	ug/L	0.5
5/11/2022 10:00	Total Trihalomethanes (TTHMs)	1.8	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
5/11/2022 10:00	n-Nitrosodimethylamine (NDMA)	4.3	ng/L	2

Year 2022, Quarter 3

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
8/3/2022 10:35	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
8/3/2022 10:35	Chloroform (CHCl3)	1.2	ug/L	0.5
8/3/2022 10:35	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
8/3/2022 10:35	n-Nitrosodimethylamine (NDMA)	4.9	ng/L	2

SAR-13/4
Organic Detections by Method

Year 2022, Quarter 4

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/1/2022 11:15	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
11/1/2022 11:15	Chloroform (CHCl3)	1.4	ug/L	0.5
11/1/2022 11:15	Total Trihalomethanes (TTHMs)	1.4	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/1/2022 11:15	n-Nitrosodimethylamine (NDMA)	5.1	ng/L	2

Appendix L

Mid-Basin Injection Area Monitoring Well Groundwater Quality

1,4-Dioxane, NDMA and Selected Constituents

Orange County Water District
Groundwater Replenishment System
2022 Annual Report

TABLE L-1
OCWD MONITORING WELL SAR-10
1,4-dioxane and NDMA Concentrations
2018- 2022

SAR-10/1 *Upper Rho Aquifer* *Perforations: 590-600 ft bgs*			**SAR-10/2** *Lower Rho Aquifer* *Perforations: 690-710 ft bgs*			**SAR-10/3** *Main 2 Aquifer* *Perforations: 800-820 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
3/20/2018	<1	2.6	3/20/2018	<1	2.5	3/20/2018	<1	<2
6/18/2018	<1	4.1	6/18/2018	<1	6	6/18/2018	<1	<2
9/5/2018	<1	<2	9/5/2018	<1	5.5	9/5/2018	<1	<2
12/3/2018	<1	4.5	12/3/2018	<1	5.6	12/3/2018	<1	2.3
3/20/2019	<1	4.2	3/20/2019	<1	5.5	3/20/2019	<1	<2
6/18/2019	<1	3.7	6/18/2019	<1	4.9	6/18/2019	<1	2.3
9/4/2019	<1	4.2	9/4/2019	<1	4.9	9/4/2019	<1	2.8
12/4/2019	<1	4.6	12/4/2019	<1	4.2	12/4/2019	<1	2
3/16/2020	<1	3.6	3/16/2020	<1	4.6	3/16/2020	<1	<2
6/15/2020	<1	4.3	6/15/2020	<1	5.2	6/15/2020	<1	<2
9/21/2020	<0.5	3.8	9/21/2020	<0.5	4.2	9/21/2020	<0.5	<2
11/30/2020	<0.5	3.7	11/30/2020	<0.5	4.4	11/30/2020	<0.5	<2
3/15/2021	<0.5	2.7	3/15/2021	<0.5	3.3	3/15/2021	<0.5	<2
6/21/2021	<0.5	5.5	6/21/2021	<0.5	5.7	6/21/2021	<0.5	<2
9/20/2021	<0.5	4	9/20/2021	<0.5	4.2	9/20/2021	<0.5	<2
11/29/2021	<0.5	5.6	11/29/2021	<0.5	6.2	11/29/2021	<0.5	<2
3/14/2022	<0.5	4	3/14/2022	<0.5	6.7	3/14/2022	<0.5	<2
6/15/2022	<0.5	4.2	6/15/2022	<0.5	4.9	6/15/2022	<0.5	<2
8/29/2022	<0.5	2.4	8/29/2022	<0.5	2.9	8/29/2022	<0.5	<2
11/28/2022	<0.5	2.3	11/28/2022	<0.5	2.5	11/28/2022	<0.5	<2

SAR-10/4 *Main 7 Aquifer* *Perforations: 1,100-1,115 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)
3/20/2018	<1	2.9
6/18/2018	<1	4.4
9/5/2018	<1	4.1
12/3/2018	<1	5.9
3/20/2019	<1	2.8
6/18/2019	<1	4.2
9/4/2019	<1	6.3
12/4/2019	<1	<2
3/16/2020	<1	5
6/15/2020	<1	7.6
9/21/2020	<0.5	4.2
11/30/2020	<0.5	4.2
3/15/2021	<0.5	3.6
6/21/2021	<0.5	9.5
9/20/2021	<0.5	5.3
11/29/2021	<0.5	2.1
3/14/2022	<0.5	9.2
6/15/2022	<0.5	3.3
8/29/2022	<0.5	3.1
11/28/2022	<0.5	0.2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE L-2
OCWD MONITORING WELL SAR-11
1,4-dioxane and NDMA Concentrations
2018 - 2022

SAR-11/1 *Upper Rho Aquifer* *Perforations: 592-602 ft bgs*			**SAR-11/2** *Lower Rho Aquifer* *Perforations: 675-690 ft bgs*			**SAR-11/3** *Main 7 Aquifer* *Perforations: 1,100-1,110 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
3/19/2018	<1	<2	3/19/2018	<1	3.5	3/19/2018	<1	<2
6/18/2018	<1	<2	6/18/2018	<1	2.2	6/18/2018	<1	<2
9/5/2018	<1	<2	9/5/2018	<1	<2	9/5/2018	<1	<2
12/3/2018	<1	<2	12/3/2018	<1	3.4	12/3/2018	<1	<2
3/20/2019	<1	<2	3/20/2019	<1	4.2	3/20/2019	<1	<2
6/17/2019	<1	2.1	6/17/2019	<1	3.7	6/17/2019	<1	<2
9/4/2019	<1	<2	9/4/2019	<1	3.5	9/4/2019	<1	<2
12/4/2019	<1	2.1	12/4/2019	<1	3.7	12/4/2019	<1	<2
3/16/2020	<1	2.1	3/16/2020	<1	4.5	3/16/2020	<1	<2
6/15/2020	<1	<2	6/15/2020	<1	2.9	6/15/2020	<1	<2
9/21/2020	<0.5	<2	9/21/2020	<0.5	2.3	9/21/2020	<0.5	<2
11/30/2020	<0.5	<2	11/30/2020	<0.5	2.2	11/30/2020	<0.5	<2
3/15/2021	<0.5	<2	3/15/2021	<0.5	<2	3/15/2021	<0.5	<2
6/21/2021	<0.5	<2	6/21/2021	<0.5	<2	6/21/2021	<0.5	<2
9/20/2021	<0.5	<2	9/20/2021	<0.5	2.2	9/20/2021	<0.5	<2
11/29/2021	<0.5	<2	11/29/2021	<0.5	2.4	11/29/2021	<0.5	<2
3/14/2022	<0.5	<2	3/14/2022	<0.5	2.6	3/14/2022	<0.5	<2
6/15/2022	<0.5	<2	6/15/2022	<0.5	2.7	6/15/2022	<0.5	<2
8/29/2022	<0.5	<2	8/29/2022	<0.5	3.3	8/29/2022	<0.5	<2
11/28/2022	<0.5	2	11/28/2022	<0.5	3.7	11/28/2022	<0.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE L-3
OCWD MONITORING WELL SAR-12
1,4-dioxane and NDMA Concentrations
2020 - 2022

SAR-12/1 *Lower Rho Aquifer* *Perforations: 605-625 ft bgs*			**SAR-12/2** *Main 2 Aquifer* *Perforations: 755-775 ft bgs*			**SAR-12/3** *Main 4 Aquifer* *Perforations: 915-930 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
1/8/2020	na	<2	1/8/2020	na	<2	1/8/2020	na	<2
2/4/2020	<1	<2	2/4/2020	<1	<2	2/4/2020	<1	<2
5/5/2020	<1	<2	5/5/2020	<1	<2	5/5/2020	<1	<2
6/4/2020	na	<2	6/4/2020	na	<2	6/4/2020	na	<2
6/30/2020	na	<2	6/30/2020	na	<2	6/30/2020	na	<2
7/13/2020	na	<2	7/13/2020	na	<2	7/13/2020	na	<2
7/27/2020	na	<2	7/27/2020	na	<2	7/27/2020	na	<2
8/4/2020	<0.5	<2	8/4/2020	<0.5	<2	8/4/2020	<0.5	<2
8/20/2020	na	<2	8/20/2020	na	<2	8/20/2020	na	<2
9/2/2020	na	<2	9/2/2020	na	<2	9/2/2020	na	<2
9/17/2020	na	<2	9/17/2020	na	<2	9/17/2020	na	<2
10/1/2020	na	<2	10/1/2020	na	<2	10/1/2020	na	<2
10/14/2020	na	<2	10/14/2020	na	<2	10/14/2020	na	<2
10/26/2020	na	<2	10/26/2020	na	<2	10/26/2020	na	<2
11/5/2020	<0.5	<2	11/5/2020	<0.5	<2	11/5/2020	<0.5	<2
11/18/2020	na	<2	11/18/2020	na	<2	11/18/2020	na	<2
12/2/2020	na	<2	12/2/2020	na	<2	12/2/2020	na	<2
12/14/2020	na	<2	12/14/2020	na	<2	12/14/2020	na	<2
12/31/2020	na	<2	12/31/2020	na	<2	12/31/2020	na	<2
1/7/2021	na	<2	1/7/2021	na	<2	1/7/2021	na	<2
1/21/2021	na	<2	1/21/2021	na	<2	1/21/2021	na	<2
2/2/2021	<0.5	<2	2/2/2021	<0.5	<2	2/2/2021	<0.5	<2
2/18/2021	na	<2	2/18/2021	na	<2	2/18/2021	na	<2
3/4/2021	na	<2	3/4/2021	na	<2	3/4/2021	na	<2
3/18/2021	na	<2	3/18/2021	na	<2	3/18/2021	na	<2
4/1/2021	na	<2	4/1/2021	na	<2	4/1/2021	na	<2
4/15/2021	na	<2	4/15/2021	na	<2	4/15/2021	na	<2
5/4/2021	<0.5	<2	5/4/2021	<0.5	<2	5/4/2021	<0.5	<2
5/19/2021	na	<2	5/19/2021	na	<2	5/19/2021	na	<2
6/3/2021	na	<2	6/3/2021	na	<2	6/3/2021	na	<2
6/17/2021	na	<2	6/17/2021	na	<2	6/17/2021	na	<2
7/1/2021	na	<2	7/1/2021	na	<2	7/1/2021	na	<2
7/15/2021	na	<2	7/15/2021	na	<2	7/15/2021	na	<2
7/26/2021	na	<2	7/26/2021	na	<2	7/26/2021	na	2.5
8/10/2021	<0.5	<2	8/10/2021	<0.5	<2	8/10/2021	<0.5	2.4
8/25/2021	na	<2	8/25/2021	na	<2	8/25/2021	na	3.0
9/9/2021	na	<2	9/9/2021	na	<2	9/9/2021	na	3.0
9/23/2021	na	<2	9/23/2021	na	<2	9/23/2021	na	2.7
10/7/2021	na	<2	10/7/2021	na	<2	10/7/2021	na	3.5
10/21/2021	na	<2	10/21/2021	na	<2	10/21/2021	na	2.9
11/2/2021	<0.5	<2	11/2/2021	<0.5	<2	11/2/2021	<0.5	2.3
2/1/2022	<0.5	<2	2/1/2022	<0.5	<2	2/1/2022	<0.5	2.5
5/10/2022	<0.5	<2	5/10/2022	<0.5	<2	5/10/2022	<0.5	2.3
8/2/2022	<0.5	<2	8/2/2022	<0.5	<2	8/2/2022	<0.5	2.9
11/1/2022	<0.5	<2	11/1/2022	<0.5	<2	11/1/2022	<0.5	3.7

TABLE L-3
OCWD MONITORING WELL SAR-12
1,4-dioxane and NDMA Concentrations
2020 - 2022

SAR-12/4 *Main 7 Aquifer* *Perforations: 1,045-1,055 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)
1/8/2020	na	<2
2/4/2020	<1	<2
5/5/2020	<1	<2
6/4/2020	na	<2
6/30/2020	na	<2
7/13/2020	na	<2
7/27/2020	na	<2
8/4/2020	<0.5	<2
8/20/2020	na	<2
9/2/2020	na	<2
9/17/2020	na	<2
10/1/2020	na	<2
10/14/2020	na	<2
10/26/2020	na	<2
11/5/2020	<0.5	<2
11/18/2020	na	<2
12/2/2020	na	<2
12/14/2020	na	<2
12/31/2020	na	<2
1/7/2021	na	<2
1/21/2021	na	<2
2/2/2021	<0.5	<2
2/18/2021	na	<2
3/4/2021	na	<2
3/18/2021	na	<2
4/1/2021	na	<2
4/15/2021	na	<2
5/4/2021	<0.5	<2
5/19/2021	na	<2
6/3/2021	na	<2
6/17/2021	na	<2
7/1/2021	na	<2
7/15/2021	na	<2
7/26/2021	na	<2
8/10/2021	<0.5	<2
8/25/2021	na	<2
9/9/2021	na	<2
9/23/2021	na	<2
10/7/2021	na	5.9
10/21/2021	na	<2
11/2/2021	<0.5	<2
2/1/2022	<0.5	<2
5/10/2022	<0.5	2.4
8/2/2022	<0.5	<2
11/1/2022	<0.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE L-4
OCWD MONITORING WELL SAR-13
1,4-dioxane and NDMA Concentrations
2020- 2022

SAR-13/1 *Lower Rho Aquifer* *Perforations: 600-620 ft bgs*			**SAR-13/2** *Main 2 Aquifer* *Perforations: 750-770 ft bgs*			**SAR-13/3** *Main 4 Aquifer* *Perforations: 910-930 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
1/8/2020	na	<2	1/8/2020	na	<2	1/8/2020	na	<2
2/4/2020	<1	<2	2/4/2020	<1	<2	2/4/2020	<1	<2
4/1/2020	na	<2	4/1/2020	na	<2	4/1/2020	na	<2
4/15/2020	na	<2	4/15/2020	na	<2	4/15/2020	na	<2
4/30/2020	na	<2	4/30/2020	na	<2	4/30/2020	na	<2
5/6/2020	<1	<2	5/6/2020	<1	<2	5/6/2020	<1	<2
5/21/2020	na	<2	5/21/2020	na	<2	5/21/2020	na	<2
6/4/2020	na	<2	6/4/2020	na	<2	6/1/2020	na	<2
6/17/2020	na	<2	6/17/2020	na	<2	6/17/2020	na	<2
6/30/2020	na	<2	6/30/2020	na	<2	6/30/2020	na	<2
7/13/2020	na	<2	7/13/2020	na	<2	7/13/2020	na	<2
7/27/2020	na	<2	7/27/2020	na	<2	7/27/2020	na	<2
8/5/2020	<0.5	<2	8/5/2020	<0.5	<2	8/5/2020	<0.5	<2
8/20/2020	na	<2	8/20/2020	na	<2	8/20/2020	na	<2
9/2/2020	na	<2	9/2/2020	na	<2	9/2/2020	na	<2
9/17/2020	na	<2	9/17/2020	na	<2	9/17/2020	na	<2
10/1/2020	na	<2	10/1/2020	na	<2	10/1/2020	na	<2
10/14/2020	na	<2	10/14/2020	na	<2	10/14/2020	na	2.2
10/26/2020	na	<2	10/26/2020	na	<2	10/26/2020	na	2.4
11/4/2020	<0.5	<2	11/4/2020	<0.5	<2	11/4/2020	<0.5	2.8
11/18/2020	na	<2	11/18/2020	na	<2	11/18/2020	na	3.1
12/2/2020	na	<2	12/2/2020	na	<2	12/2/2020	na	3.2
12/14/2020	na	<2	12/14/2020	na	<2	12/14/2020	na	3.7
12/31/2020	na	<2	12/31/2020	na	<2	12/31/2020	na	3.2
1/7/2021	na	<2	1/7/2021	na	<2	1/7/2021	na	3.1
1/21/2021	na	<2	1/21/2021	na	<2	1/21/2021	na	3.7
2/3/2021	<0.5	<2	2/3/2021	<0.5	<2	2/3/2021	<0.5	4.5
2/18/2021	na	<2	2/18/2021	na	<2	2/18/2021	na	4.4
3/4/2021	na	<2	3/4/2021	na	<2	3/4/2021	na	4.5
3/18/2021	na	<2	3/18/2021	na	<2	3/18/2021	na	4.3
4/1/2021	na	<2	4/1/2021	na	<2	4/1/2021	na	4.4
4/15/2021	na	<2	4/15/2021	na	<2	4/15/2021	na	4.0
5/5/2021	<0.5	<2	5/5/2021	<0.5	<2	5/5/2021	<0.5	3.7
5/19/2021	na	<2	5/19/2021	na	<2	5/19/2021	na	3.3
6/3/2021	na	<2	6/3/2021	na	<2	6/3/2021	na	2.9
6/17/2021	na	<2	6/17/2021	na	<2	6/17/2021	na	3.0
7/1/2021	na	<2	7/1/2021	na	<2	7/1/2021	na	3.0
7/15/2021	na	<2	7/15/2021	na	<2	7/15/2021	na	2.9
7/27/2021	na	<2	7/27/2021	na	<2	7/27/2021	na	3.0
8/11/2021	<0.5	<2	8/11/2021	<0.5	<2	8/11/2021	<0.5	3.6
8/25/2021	na	<2	8/25/2021	na	<2	8/25/2021	na	4.4
9/9/2021	na	<2	9/9/2021	na	<2	9/9/2021	na	3.7
9/23/2021	na	<2	9/23/2021	na	<2	9/23/2021	na	3.6
10/7/2021	na	<2	10/7/2021	na	<2	10/7/2021	na	4.7
10/21/2021	na	<2	10/21/2021	na	<2	10/21/2021	na	3.6
11/3/2021	<0.5	<2	11/3/2021	<0.5	<2	11/3/2021	<0.5	4.0
2/2/2022	<0.5	<2	2/2/2022	<0.5	<2	2/2/2022	<0.5	4.2
5/11/2022	<0.5	<2	5/11/2022	<0.5	<2	5/11/2022	<0.5	4.1
8/3/2022	<0.5	<2	8/3/2022	<0.5	<2	8/3/2022	<0.5	5.1
11/1/2022	<0.5	2.2	11/1/2022	<0.5	<2	11/1/2022	<0.5	4.0

TABLE L-4
OCWD MONITORING WELL SAR-13
1,4-dioxane and NDMA Concentrations
2020- 2022

SAR-13/4 *Main 7 Aquifer* *Perforations: 1,045-1,055 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)
1/8/2020	na	<2
2/4/2020	<1	<2
4/1/2020	na	<2
4/15/2020	na	<2
4/30/2020	na	<2
5/6/2020	<1	<2
5/21/2020	na	<2
6/1/2020	na	<2
6/17/2020	na	<2
6/30/2020	na	2.6
7/13/2020	na	2.8
7/27/2020	na	3.0
8/5/2020	<0.5	2.8
8/20/2020	na	3.6
9/2/2020	na	3.4
9/17/2020	na	3.5
10/1/2020	na	3.4
10/14/2020	na	3.2
10/26/2020	na	3.3
11/4/2020	<0.5	3.3
11/18/2020	na	3.4
12/2/2020	na	3.0
12/14/2020	na	3.0
12/31/2020	na	2.9
1/7/2021	na	3.0
1/21/2021	na	3.4
2/3/2021	<0.5	4.1
2/18/2021	na	3.4
3/4/2021	na	3.9
3/18/2021	na	3.7
4/1/2021	na	3.8
4/15/2021	na	3.3
5/5/2021	<0.5	3.3
5/19/2021	na	3.3
6/3/2021	na	3.1
6/17/2021	na	3.5
7/1/2021	na	3.6
7/15/2021	na	3.6
7/27/2021	na	3.5
8/11/2021	<0.5	4.2
8/25/2021	na	3.2
9/9/2021	na	2.6
9/23/2021	na	4.0
10/7/2021	na	3.8
10/21/2021	na	3.7
11/3/2021	<0.5	3.4
2/2/2022	<0.5	3.6
5/11/2022	<0.5	4.3
8/3/2022	<0.5	4.9
11/1/2022	<0.5	5.1

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE L-5
OCWD MONITORING WELL SAR-10
2018 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
SAR-10/1 Upper Rho Perforations 590-600 ft bgs	3/20/2018	0.001	5	6.7	82	51.7	<0.2	0.008	0.58	0.1
	6/18/2018	0.012	6.7	6.7	96	51.5	na	na	0.99	0.07
	9/5/2018	0.015	6.6	8.7	114	63.8	na	na	0.62	0.11
	12/3/2018	0.012	5.1	5.3	75	45.6	<0.2	0.006	0.86	0.07
	3/20/2019	0.014	5.1	5.2	68	47.8	<0.2	0.004	0.74	0.07
	6/18/2019	0.014	5.6	6.1	74	51.6	na	na	0.78	0.1
	9/4/2019	0.016	6.4	6.3	66	49.8	na	na	0.83	0.11
	12/4/2019	0.016	5.4	5.3	92	46.7	na	na	0.76	0.15
	3/16/2020	0.014	5.9	5.5	82	47.1	na	na	0.77	0.12
	6/15/2020	0.016	6.2	5.4	86	50.4	<0.2	0.008	0.94	0.06
	9/21/2020	0.02	6.4	5.8	82	49.8	na	na	0.94	0.06
	11/30/2020	0.013	5.2	5.4	84	46.5	na	na	0.84	<0.05
	3/15/2021	0.014	4.7	4.9	83	48	na	na	0.72	0.07
	6/21/2021	0.012	5.5	4.7	94	47.1	na	na	0.81	0.06
	9/20/2021	0.014	5.9	5.4	84	50.6	<0.2	0.004	0.77	0.07
	11/29/2021	0.014	6.1	4.4	72	47.3	na	na	1.01	0.09
	3/14/2022	0.011	6.2	4.9	79.2	46.2	na	na	1.03	<0.05
	6/15/2022	0.011	6.4	4.2	68	45.1	na	na	1.16	0.11
	8/29/2022	0.014	8.3	4.4	70	49.7	na	na	1.37	0.07
	11/28/2022	0.01	6.3	3.6	72	46.3	<0.2	0.005	1.24	0.07
SAR-10/2 Lower Rho Perforations 690-710 ft bgs	3/20/2018	<0.01	4.6	0.6	60	39	<0.2	0.002	1	0.06
	6/18/2018	0.011	7	0.05	55	42.4	na	na	1.55	<0.05
	9/5/2018	0.011	6.5	0.7	72	41.8	na	na	1.47	<0.05
	12/3/2018	0.011	5	0.6	61	38.1	<0.2	0.003	1.17	<0.05
	3/20/2019	0.014	4.7	0.7	56	40.6	<0.2	0.003	0.95	0.11
	6/18/2019	<0.01	5.6	0.6	64	44.2	na	na	1.16	0.06
	9/4/2019	0.019	6.3	0.6	64	39.6	na	na	1.25	0.08
	12/4/2019	0.017	4.6	0.6	40	34.2	na	na	0.99	0.01
	3/16/2020	0.011	5.4	<0.5	66	39.2	na	na	1.05	<0.05
	6/15/2020	0.014	5.4	<0.5	68	41.3	<0.2	0.002	1.22	<0.05
	9/21/2020	0.019	5.4	0.6	68	40.8	na	na	1.27	0.05
	11/30/2020	0.011	5.4	0.7	66	38.7	na	na	1.08	<0.05
	3/15/2021	0.010	4.2	0.6	55.6	40.4	na	na	0.93	<0.05
	6/21/2021	0.012	5	<0.5	108	40.1	na	na	1.05	<0.05
	9/20/2021	0.010	5.9	<0.5	71	42.9	<0.2	0.003	1.33	0.05
	11/29/2021	0.012	5.9	<0.5	54	39.8	na	na	1.32	<0.05
	3/14/2022	<0.01	5.8	<0.5	63.2	39.3	na	na	1.31	<0.05
	6/15/2022	<0.01	6.2	<0.5	68	39.7	na	na	1.42	<0.05
	8/29/2022	0.012	8.3	<0.5	54	43.4	na	na	1.87	<0.05
	11/28/2022	<0.01	5.6	<0.5	64	44.6	<0.2	<0.002	1.51	<0.05

TABLE L-5
OCWD MONITORING WELL SAR-10
2018 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
SAR-10/3 Main 2 Perforations 800-820 ft bgs	3/20/2018	<0.01	4.9	11.3	76	49.2	<0.2	<0.002	<0.1	0.13
	6/18/2018	<0.01	5.1	10.7	92	49.4	na	na	<0.1	0.09
	9/5/2018	0.012	6.6	11.8	86	55.5	na	na	<0.1	0.08
	12/3/2018	0.015	6.8	11.6	98	54.9	<0.2	<0.002	<0.1	0.11
	3/20/2019	0.011	4.9	10.9	78	49.6	<0.2	0.002	<0.1	0.12
	6/18/2019	0.012	4.8	11	80	52.4	na	na	<0.1	0.11
	9/4/2019	0.013	5.5	11.3	76	52.5	na	na	<0.1	0.15
	12/4/2019	0.018	5.8	11.4	74	42.8	na	na	<0.1	0.16
	3/16/2020	0.016	5.4	10.7	86	50.7	na	na	<0.1	0.1
	6/15/2020	0.018	5	10.6	86	51.9	<0.2	<0.002	<0.1	0.1
	9/21/2020	0.019	5.4	9.9	82	53	na	na	<0.1	0.08
	11/30/2020	0.019	5.7	11	90	56.2	na	na	<0.1	0.08
	3/15/2021	0.021	6.6	13.3	113	64.1	na	na	<0.1	0.1
	6/21/2021	0.02	6.7	13.9	132	65.8	na	na	<0.1	0.08
	9/20/2021	0.014	5.2	8.8	74	52.4	<0.2	0.003	<0.1	0.08
	11/29/2021	0.017	6.3	12	88	63.8	na	<0.002	<0.1	0.08
	3/14/2022	0.021	7.6	15.9	119	75.3	na	na	<0.1	0.08
	6/15/2022	0.023	8.6	19.4	132	84	na	na	<0.1	0.07
	8/29/2022	0.023	9.1	21	124	92	na	na	<0.1	0.08
	11/28/2022	0.026	9.5	22.5	140	97.3	<0.2	<0.002	<0.1	0.07
SAR-10/4 Main 7 Perforations 1,100-1,115 ft bgs	3/20/2018	<0.01	4.8	4.6	62	41.3	<0.2	0.004	1.10	0.05
	6/18/2018	<0.01	7.6	4.6	88	44	na	na	1.55	0.05
	9/5/2018	0.014	6.2	2.8	74	42.2	na	na	1.51	0.06
	12/3/2018	0.011	4.8	3.0	60	37.5	<0.2	<0.002	1.24	0.05
	3/20/2019	0.012	4.1	3.2	53	38.6	<0.2	<0.002	0.90	0.07
	6/18/2019	0.014	5.4	3.9	64	41.8	na	na	1.07	0.08
	9/4/2019	0.023	6.9	4.8	52	41.5	na	na	1.21	0.13
	12/4/2019	0.015	4.6	3.6	53	33.5	na	na	1.08	0.06
	3/16/2020	0.011	5.1	2.9	60	36.1	na	na	0.99	0.06
	6/15/2020	0.02	6.3	3.6	68	41.6	<0.2	<0.002	1.21	<0.05
	9/21/2020	0.02	6.4	4.7	74	41	na	na	1.28	<0.05
	11/30/2020	<0.01	4.8	3.6	64	40	na	na	1.05	0.08
	3/15/2021	0.011	4.1	2.6	61	38	na	na	0.86	0.05
	6/21/2021	0.012	5.3	1.9	92	38.3	na	na	1.04	<0.05
	9/20/2021	0.010	6.3	2.5	52	40.8	na	0.002	1.04	<0.05
	11/29/2021	0.011	5.5	2.0	56	38.2	<0.2	<0.002	1.20	<0.05
	3/14/2022	<0.01	6.1	2.0	60	37.8	na	na	1.26	<0.05
	6/15/2022	0.010	6.2	1.4	62	36.3	na	na	1.66	<0.05
	8/29/2022	0.012	8.2	0.6	60	38.7	na	na	1.87	<0.05
	11/28/2022	<0.01	5.9	1.0	42	40.7	<0.2	<0.002	1.36	<0.05

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE L-6
OCWD MONITORING WELL SAR-11
2018 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
SAR-11/1 Upper Rho Perforations 592-602 ft bgs	3/19/2018	0.022	9.5	17.3	172	89.5	<0.2	<0.002	0.83	0.07
	6/18/2018	<0.01	8.9	15.9	154	85.8	na	na	0.8	0.05
	9/5/2018	0.028	9.9	20.6	176	92.5	na	na	0.56	0.05
	12/3/2018	0.024	8.8	14.2	156	78.5	<0.2	0.003	0.92	0.06
	3/20/2019	0.021	8.3	12.9	138	73.3	<0.2	<0.002	0.87	0.07
	6/17/2019	0.019	8.1	12.7	138	73.6	na	na	0.8	0.08
	9/4/2019	0.019	8.6	14.7	146	75.4	na	na	0.67	0.11
	12/4/2019	0.020	7.1	9.7	130	59.4	na	na	0.82	0.07
	3/16/2020	0.020	7.5	10.7	138	64.4	na	na	0.77	0.05
	6/15/2020	0.021	7.4	10.7	130	66.7	<0.2	<0.002	0.7	<0.05
	9/21/2020	0.021	7.4	10	136	64.6	na	na	0.82	0.05
	11/30/2020	0.022	7.1	9.6	134	60.2	na	na	0.8	<0.05
	3/15/2021	0.022	7.3	8.5	161	59.8	na	na	0.88	0.05
	6/21/2021	0.021	7.3	9.7	116	63.2	na	na	0.75	<0.05
	9/20/2021	0.020	7.1	9.4	130	62.4	<0.2	<0.002	0.81	0.11
	11/29/2021	0.019	6.8	9.2	114	62.5	na	na	0.77	0.08
	3/14/2022	0.020	7.3	10.7	134	64.1	na	na	0.78	0.08
	6/15/2022	0.017	7.1	9	120	60.2	na	na	0.9	<0.05
	8/29/2022	0.017	7.1	8.8	62	61.9	na	na	0.92	<0.05
	11/28/2022	0.016	7.2	8.1	116	62.3	<0.2	<0.002	1.01	<0.05
SAR-11/2 Lower Rho Perforations 675-690 ft bgs	3/19/2018	0.011	5.8	1.5	104	55	<0.2	0.002	1.33	0.10
	6/18/2018	0.011	5.2	1.2	91	53.8	na	na	1.18	0.06
	9/5/2018	0.011	5.4	1.4	100	50.9	na	na	1.21	<0.05
	12/3/2018	0.014	6.5	1.3	100	54.2	<0.2	0.004	1.49	<0.05
	3/20/2019	0.012	5.7	1	90	53.2	<0.2	0.003	1.28	0.07
	6/17/2019	0.013	5	0.9	76	52.6	na	na	1.06	0.07
	9/4/2019	0.013	5.1	1	66	50.6	na	na	1.04	0.10
	12/4/2019	0.016	5.3	1.1	92	37.2	na	na	1.11	0.06
	3/16/2020	0.015	5.6	0.9	84	50.2	na	na	1.14	<0.05
	6/15/2020	0.017	5.2	1	84	50.3	<0.2	0.002	1.03	<0.05
	9/21/2020	0.016	5.5	1.1	90	53.8	na	na	1.14	0.10
	11/30/2020	0.016	5.4	1.2	92	52.8	na	na	1.08	0.10
	3/15/2021	0.017	5.5	1.2	138	53.4	na	na	1.09	0.06
	6/21/2021	0.015	5.4	0.9	108	53.6	na	na	1.08	<0.05
	9/20/2021	0.015	5.4	0.9	94	52.8	<0.2	<0.002	1.14	<0.05
	11/29/2021	0.014	5.2	0.7	114	55	na	na	1.14	<0.05
	3/14/2022	0.015	5.4	0.8	95.2	53.4	na	na	1.17	<0.05
	6/15/2022	0.013	5.4	0.8	84	53.1	na	na	1.22	<0.05
	8/29/2022	0.012	5.5	<0.5	76	53.9	na	na	1.29	0.06
	11/28/2022	0.011	5.7	<0.5	84	55.9	<0.2	<0.002	1.33	<0.05

TABLE L-6
OCWD MONITORING WELL SAR-11
2018 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
SAR-11/3 Main 7 Perforations 1,100-1,110 ft bgs	3/19/2018	0.011	5.6	11	89.5	32.1	<0.2	<0.002	<0.1	0.07
	6/18/2018	0.013	5.13	8.62	72	28.2	na	na	<0.1	0.08
	9/5/2018	0.013	6.7	9.3	84	27.8	na	na	<0.1	0.07
	12/3/2018	0.015	6.7	7.9	85	38.1	<0.2	0.003	<0.1	0.09
	3/20/2019	0.011	4.9	8	74	34.9	<0.2	0.002	<0.1	0.08
	6/17/2019	0.014	5.1	8.6	58	33	na	na	<0.1	0.09
	9/4/2019	0.012	5.6	9.2	54	32.4	na	na	<0.1	0.18
	12/4/2019	0.018	6	10	80	33.2	na	na	<0.1	0.08
	3/16/2020	0.02	5.3	9.8	78	36.4	na	na	<0.1	0.07
	6/15/2020	0.016	5.4	11.1	80	43.1	<0.2	<0.002	<0.1	0.05
	9/21/2020	0.01	5.7	13.2	90	48.6	na	na	<0.1	0.06
	11/30/2020	0.017	6.7	16.5	106	55.3	na	na	<0.1	0.05
	3/15/2021	0.034	9.9	25.5	146	85.3	na	na	<0.1	0.06
	6/21/2021	0.017	5.5	12.5	84	48.1	na	na	<0.1	0.10
	9/20/2021	0.012	4.8	10.7	66	42.4	<0.2	<0.002	<0.1	0.05
	11/29/2021	0.012	5.2	10	88	44	na	na	<0.1	0.06
	3/14/2022	0.014	5.9	10	82.4	44.8	na	na	<0.1	<0.05
	6/15/2022	0.001	5.7	11.1	76	44.5	na	na	<0.1	<0.05
	8/29/2022	0.011	5.9	11.2	74	44.9	na	na	<0.1	0.05
	11/28/2022	0.012	7.2	10.5	82	46.2	<0.2	<0.002	<0.1	<0.05

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE L-7
OCWD MONITORING WELL SAR-12
2020 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
SAR-12/1 Lower Rho Perforations 605-625 ft bgs	1/8/2020	na	12	34	274	135	na	<0.002	<0.1	na
	2/4/2020	0.035	12	33.7	250	144	<0.2	<0.002	<0.1	0.08
	5/5/2020	0.034	11.6	33.3	256	132	<0.2	<0.002	<0.1	0.09
	6/4/2020	na	11.6	33.1	234	135	na	<0.002	<0.1	na
	6/30/2020	na	11.8	34.2	236	136	na	<0.002	<0.1	na
	7/13/2020	na	11.9	34.3	246	135	na	<0.002	<0.1	na
	7/27/2020	na	11.5	33.1	232	131	na	<0.002	<0.1	na
	8/4/2020	0.037	11.7	33.9	236	132	<0.2	<0.002	<0.1	<0.05
	8/20/2020	na	11.7	33.3	256	130	na	<0.002	<0.1	na
	9/2/2020	na	11.9	34.2	230	133	na	<0.002	<0.1	na
	9/17/2020	na	11.5	32.8	232	131	na	<0.002	0.13	na
	10/1/2020	na	11.8	33.8	254	130	na	<0.002	0.1	na
	10/14/2020	na	11.6	33.2	248	131	na	<0.002	0.11	na
	10/26/2020	na	11.8	33.6	234	127	na	<0.002	<0.1	na
	11/5/2020	0.037	11.7	33.6	226	127	<0.2	<0.002	0.11	<0.05
	11/18/2020	na	11.6	32.9	260	123	na	<0.002	0.12	<0.05
	12/2/2020	na	11.4	32.5	236	128	na	0.002	0.12	0.06
	12/14/2020	na	11.4	32.7	242	131	na	0.003	0.13	0.12
	12/31/2020	na	11.3	32.7	235	125	na	0.003	0.12	<0.05
	1/7/2021	na	11.4	32.7	228	na	na	0.048	0.13	0.07
	1/21/2021	na	11.4	32.7	235	na	na	<0.002	0.16	<0.05
	2/2/2021	0.04	11.5	32.8	215	125	<0.2	0.002	0.15	0.06
	2/18/2021	na	11.8	34	241	na	na	<0.002	0.16	<0.05
	3/4/2021	na	11.6	32.8	230	na	na	<0.002	0.21	<0.05
	3/18/2021	na	11.3	31.8	213	na	na	<0.002	0.2	<0.05
	4/1/2021	na	11.4	32	234	na	na	<0.002	0.16	<0.05
	4/15/2021	na	11.3	32.1	212	na	na	<0.002	0.17	<0.05
	5/4/2021	0.037	11	31.5	238	129	0.2	<0.002	0.15	<0.05
	5/19/2021	na	11.2	31.6	204	na	na	<0.002	0.17	<0.05
	6/3/2021	na	11.5	32.1	258	na	na	<0.002	0.16	0.06
	6/17/2021	na	11.6	31.9	264	na	na	0.003	0.21	0.07
	7/1/2021	na	11.5	32	240	na	na	0.002	0.17	0.09
	7/15/2021	na	11.2	32	234	na	na	<0.002	0.2	0.07
	7/26/2021	na	11.2	31.6	254	na	na	<0.002	0.19	0.05
	8/10/2021	0.037	11.3	31.9	238	129	<0.2	<0.002	0.17	0.11
	8/25/2021	na	11.6	32.3	242	na	na	<0.002	0.16	<0.05
	9/9/2021	na	11.8	32.2	230	na	na	<0.002	0.26	0.07
	9/23/2021	na	11.8	32.2	228	na	na	<0.002	0.26	<0.05
	10/7/2021	na	11.3	31.3	224	na	na	0.002	0.21	0.06
	10/21/2021	na	11.3	31.6	212	na	na	<0.002	0.2	0.05
	11/2/2021	0.037	11.4	32	214	127	<0.2	<0.002	0.19	<0.05
	12/6/2021	na	11.2	31.6	226	na	na	<0.002	0.18	0.12
	2/1/2022	0.040	11.6	32.7	232	124	<0.2	<0.002	0.19	<0.05
	5/10/2022	0.036	11.4	32.6	218	126	<0.2	<0.002	0.19	<0.05
	8/2/2022	0.035	11.6	31.7	220	128	<0.2	<0.002	0.32	<0.05
	11/1/2022	0.033	11.7	32	222	138	<0.2	<0.002	0.32	<0.05

TABLE L-7
OCWD MONITORING WELL SAR-12
2020 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
	1/8/2020	na	12.4	36.3	250	122	na	<0.002	<0.1	na
	2/4/2020	0.035	12.3	35.9	246	132	<0.2	<0.002	<0.1	0.12
	5/5/2020	0.035	12.3	36	266	124	<0.2	<0.002	<0.1	0.13
	6/4/2020	na	12.3	36	254	125	na	<0.002	<0.1	na
	6/30/2020	na	13	37.5	248	137	na	<0.002	<0.1	na
	7/13/2020	na	13.2	37.7	246	130	na	<0.002	<0.1	na
	7/27/2020	na	13.4	37.4	250	130	na	<0.002	<0.1	na
	8/4/2020	0.040	13.9	38.8	250	128	<0.2	<0.002	<0.1	0.12
	8/20/2020	na	14.1	38.3	244	130	na	<0.002	<0.1	na
	9/2/2020	na	14.6	39.6	260	131	na	0.002	<0.1	na
	9/17/2020	na	14.3	38.4	244	133	na	<0.002	<0.1	na
	10/1/2020	na	15.1	40.2	252	132	na	<0.002	<0.1	na
	10/14/2020	na	15.5	40.8	258	132	na	<0.002	<0.1	na
	10/26/2020	na	16.3	42	262	137	na	<0.002	<0.1	na
	11/5/2020	0.050	16.8	43	270	136	<0.2	<0.002	<0.1	0.1
	11/18/2020	na	17.2	43.2	278	na	na	<0.002	<0.1	0.1
	12/2/2020	na	17.1	42.9	266	na	na	<0.002	<0.1	0.1
	12/14/2020	na	17.1	42.5	274	na	na	0.003	<0.1	0.11
	12/31/2020	na	16.8	42	258	na	na	<0.002	<0.1	0.11
	1/7/2021	na	17.2	42.2	259	na	na	0.002	<0.1	0.1
SAR-12/2	1/21/2021	na	17.4	42.5	266	na	na	0.003	<0.1	0.1
Main 2	2/2/2021	0.053	17.6	43	222	135	<0.2	0.003	<0.1	0.11
Perforations	2/18/2021	na	18.1	44.3	263	na	na	<0.002	<0.1	0.1
755-775 ft bgs	3/4/2021	na	17.4	42.7	260	na	na	<0.002	<0.1	0.11
	3/18/2021	na	16.9	41.6	258	na	na	<0.002	<0.1	0.13
	4/1/2021	na	16.8	41.7	262	na	na	<0.002	<0.1	0.11
	4/15/2021	na	16.6	41.9	232	na	na	<0.002	<0.1	0.15
	5/4/2021	0.051	16.5	41.5	280	134	0.2	<0.002	<0.1	0.11
	5/19/2021	na	16.1	40.9	224	na	na	<0.002	<0.1	0.16
	6/3/2021	na	15.8	40.6	276	na	na	<0.002	<0.1	0.11
	6/17/2021	na	15.6	39.9	304	na	na	<0.002	<0.1	0.16
	7/1/2021	na	15.1	39.9	244	na	na	<0.002	<0.1	0.11
	7/15/2021	na	14.3	39	252	na	na	<0.002	<0.1	0.1
	7/26/2021	na	13.6	37.4	244	na	na	<0.002	<0.1	0.1
	8/10/2021	0.043	13.2	37.1	246	127	<0.2	0.002	<0.1	0.1
	8/25/2021	na	13.4	37.6	246	na	na	<0.002	<0.1	0.08
	9/9/2021	na	13.6	37.5	240	na	na	<0.002	<0.1	0.1
	9/23/2021	na	13.6	37.6	250	na	na	<0.002	<0.1	0.09
	10/7/2021	na	13.4	36.8	242	na	na	0.003	<0.1	0.12
	10/21/2021	na	13.5	37.7	226	na	na	<0.002	<0.1	0.1
	11/2/2021	0.043	13.7	37.6	232	128	<0.2	<0.002	<0.1	0.15
	12/6/2021	na	13.6	37.3	238	na	na	<0.002	<0.1	0.14
	2/1/2022	0.043	13.1	37	234	121	<0.2	<0.002	<0.1	0.07
	5/10/2022	0.039	12.4	36.3	232	119	<0.2	<0.002	<0.1	0.09
	8/2/2022	0.038	12.8	36.5	238	121	<0.2	<0.002	<0.1	0.1
	11/1/2022	0.041	16	41.7	242	140	<0.2	<0.002	<0.1	0.12

TABLE L-7
OCWD MONITORING WELL SAR-12
2020 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
	1/8/2020	na	11.5	33.6	238	110	na	<0.002	0.14	na
	2/4/2020	0.033	11.4	33.1	204	113	<0.2	<0.002	0.11	<0.05
	5/5/2020	0.032	11.2	32.9	222	104	<0.2	<0.002	0.14	<0.05
	6/4/2020	na	11.3	33.2	234	104	na	<0.002	0.14	na
	6/30/2020	na	11.5	33.6	224	105	na	<0.002	0.13	na
	7/13/2020	na	11.5	33.8	230	104	na	<0.002	0.13	na
	7/27/2020	na	11.3	32.9	238	102	na	<0.002	0.13	na
	8/4/2020	0.035	11.5	33.8	224	103	<0.2	<0.002	0.12	<0.05
	8/20/2020	na	11.4	33	238	101	na	<0.002	0.13	na
	9/2/2020	na	11.8	34.4	240	103	na	<0.002	0.14	na
	9/17/2020	na	11.2	32.5	210	102	na	<0.002	0.17	na
	10/1/2020	na	11.4	33.5	226	99.9	na	<0.002	0.15	na
	10/14/2020	na	11.4	33.3	234	99.9	na	<0.002	0.14	na
	10/26/2020	na	11.5	33.6	238	101	na	<0.002	0.14	na
	11/5/2020	0.036	11.4	33.3	226	99.8	<0.2	<0.002	0.15	<0.05
	11/18/2020	na	11.3	32.8	246	na	na	<0.002	0.16	<0.05
	12/2/2020	na	11.2	32.7	228	na	na	0.003	0.14	<0.05
	12/14/2020	na	11.2	32.6	232	na	na	0.004	0.15	0.09
	12/31/2020	na	11	32.6	218	na	na	0.003	0.14	<0.05
	1/7/2021	na	11.1	32.5	215	na	na	0.002	0.16	<0.05
SAR-12/3	1/21/2021	na	11.2	32.8	225	na	na	0.002	0.17	<0.05
Main 4	2/2/2021	0.037	11.4	33.5	197	98.1	<0.2	0.002	0.15	0.1
Perforations	2/18/2021	na	11.5	33.9	224	na	na	<0.002	0.17	<0.05
915-930 ft bgs	3/4/2021	na	11.3	32.8	215	na	na	<0.002	0.25	<0.05
	3/18/2021	na	10.8	30.8	212	na	na	<0.002	0.27	<0.05
	4/1/2021	na	10.2	28.8	224	na	na	<0.002	0.3	<0.05
	4/15/2021	na	9.6	26.5	212	na	na	<0.002	0.43	<0.05
	5/4/2021	0.028	8.8	21.8	208	88.1	<0.2	0.003	0.55	<0.05
	5/19/2021	na	8.4	18.9	198	na	na	<0.002	0.7	0.07
	6/3/2021	na	8.2	15.5	206	na	na	<0.002	0.84	0.07
	6/17/2021	na	8.1	13.4	234	na	na	<0.002	0.95	0.07
	7/1/2021	na	7.8	12.3	170	na	na	<0.002	0.97	<0.05
	7/15/2021	na	7.4	10.4	162	na	na	0.002	1.05	<0.05
	7/26/2021	na	7.5	10	134	na	na	<0.002	1.06	<0.05
	8/10/2021	0.021	7.3	9	136	53.5	<0.2	0.003	1.07	<0.05
	8/25/2021	na	7.4	8	142	na	na	<0.002	1.07	<0.05
	9/9/2021	na	7.6	8.3	126	na	na	<0.002	1.15	<0.05
	9/23/2021	na	7.3	7.6	130	na	na	<0.002	1.16	<0.05
	10/7/2021	na	6.8	6.5	124	na	na	0.004	1.11	0.05
	10/21/2021	na	6.6	6.4	112	na	na	<0.002	1.09	<0.05
	11/2/2021	0.019	6.4	6	112	42.5	<0.2	<0.002	1.08	0.08
	12/6/2021	na	5.9	5.6	108	na	na	<0.002	1.01	<0.05
	2/1/2022	0.016	5.7	4.9	126	35.3	<0.2	<0.002	1.01	<0.05
	5/10/2022	0.014	5	3.8	104	33.4	<0.2	<0.002	0.95	<0.05
	8/2/2022	0.014	5.6	3.1	100	31.1	<0.2	<0.002	1.08	<0.05
	11/1/2022	0.012	6.2	2.7	90	31.6	<0.2	<0.002	1.28	<0.05

TABLE L-7
OCWD MONITORING WELL SAR-12
2020 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
SAR-12/4 Main 7 Perforations 1,045-1,055 ft bgs	1/8/2020	na	12.7	35.2	228	70.6	na	<0.002	<0.1	na
	2/4/2020	0.036	12.6	35.4	216	70.7	<0.2	<0.002	<0.1	0.07
	5/5/2020	0.035	12.2	34.7	236	65.5	<0.2	<0.002	<0.1	0.11
	6/4/2020	na	12.5	34.6	214	65.8	na	<0.002	<0.1	na
	6/30/2020	na	12.6	35.9	212	66.4	na	<0.002	<0.1	na
	7/13/2020	na	12.5	35.5	212	66.5	na	<0.002	<0.1	na
	7/27/2020	na	12.3	34.2	206	65	na	<0.002	<0.1	na
	8/4/2020	0.038	12.5	34.8	208	64.8	<0.2	<0.002	<0.1	0.06
	8/20/2020	na	12.1	32.3	196	62.8	na	<0.002	<0.1	na
	9/2/2020	na	12.1	32.0	202	61.8	na	<0.002	<0.1	na
	9/17/2020	na	11.2	28.6	188	57.8	na	<0.002	<0.1	na
	10/1/2020	na	11.1	27.9	186	54.8	na	<0.002	<0.1	na
	10/14/2020	na	10.9	26.7	198	52.8	na	<0.002	<0.1	na
	10/26/2020	na	10.4	23.5	178	47.7	na	<0.002	<0.1	na
	11/5/2020	0.029	9.9	22.0	170	44.8	<0.2	<0.002	<0.1	0.12
	11/18/2020	na	9.3	18.9	172	40.5	na	<0.002	<0.1	0.09
	12/2/2020	na	9.2	19.3	152	40.7	na	0.003	<0.1	0.08
	12/14/2020	na	8.8	17.0	156	37.5	na	0.003	<0.1	0.08
	12/31/2020	na	8.9	17.7	145	37.1	na	0.003	<0.1	0.07
	1/7/2021	na	8.8	17.2	142	na	na	<0.002	<0.1	0.11
	1/21/2021	na	8.6	16.2	149	na	na	0.002	<0.1	0.08
	2/2/2021	0.026	8.7	16.4	136	36.2	<0.2	0.003	<0.1	0.10
	2/18/2021	na	8.9	17.1	152	na	na	<0.002	<0.1	0.07
	3/4/2021	na	8.6	15.8	139	na	na	<0.002	<0.1	0.08
	3/18/2021	na	8.3	14.8	139	na	na	<0.002	<0.1	0.10
	4/1/2021	na	8.0	14.2	142	na	na	<0.002	<0.1	0.09
	4/15/2021	na	7.8	14.4	156	na	na	<0.002	<0.1	0.08
	5/4/2021	0.025	7.9	14.7	152	35.4	0.2	0.004	<0.1	0.12
	5/19/2021	na	7.6	13.3	124	na	na	<0.002	<0.1	0.08
	6/3/2021	na	7.6	13.2	148	na	na	<0.002	<0.1	0.12
	6/17/2021	na	7.7	12.7	116	na	na	<0.002	<0.1	0.15
	7/1/2021	na	7.4	12.7	116	na	na	<0.002	<0.1	0.09
	7/15/2021	na	7.0	11.9	136	na	na	<0.002	<0.1	0.09
	7/26/2021	na	7.0	11.2	112	na	na	<0.002	<0.1	0.11
	8/10/2021	0.021	6.9	10.5	112	31.1	<0.2	0.002	<0.1	0.12
	8/25/2021	na	7.0	9.9	126	na	na	<0.002	<0.1	0.09
	9/9/2021	na	7.1	9.7	128	na	na	<0.002	<0.1	0.10
	9/23/2021	na	6.9	9.2	120	na	na	<0.002	<0.1	0.11
	10/7/2021	na	6.3	7.8	74	na	na	<0.002	<0.1	0.19
	10/21/2021	na	6.1	7.5	70	na	na	<0.002	<0.1	0.11
	11/2/2021	0.017	6.3	7.9	136	26.6	<0.2	<0.002	<0.1	0.13
	12/6/2021	na	6.3	7.8	94	na	na	0.003	<0.1	0.11
	2/1/2022	0.020	6.7	7.3	102	24.4	<0.2	<0.002	<0.1	0.09
	5/10/2022	0.015	6.2	4.9	98	22.8	<0.2	<0.002	<0.1	0.12
	8/2/2022	0.015	6.5	5.8	102	22.4	<0.2	<0.002	<0.1	0.10
	11/1/2022	0.015	7.1	7.8	90	25.9	<0.2	<0.002	<0.1	0.11

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE L-8
OCWD MONITORING WELL SAR-13
2020 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
SAR-13/1 Lower Rho Perforations 600-620 ft bgs	1/8/2020	na	15.7	39.7	256	151	na	<0.002	0.27	na
	2/4/2020	0.043	16	39.6	250	154	<0.2	<0.002	0.25	0.08
	4/1/2020	na	16	40.1	246	145	na	<0.002	0.26	na
	4/15/2020	na	15.5	39	264	145	na	<0.002	0.26	na
	4/30/2020	na	15.9	40.3	272	148	<0.2	<0.002	0.25	na
	5/6/2020	0.044	15.8	39.9	252	148	<0.2	<0.002	0.26	0.07
	5/21/2020	na	15.8	40.3	260	147	na	<0.002	0.28	na
	6/4/2020	na	15.2	39.4	278	150	na	<0.002	0.25	na
	6/17/2020	na	15	39.2	270	148	na	<0.002	0.23	na
	6/30/2020	na	15.2	40.3	256	146	na	<0.002	0.22	na
	7/13/2020	na	14.7	39.4	254	150	na	<0.002	0.22	na
	7/27/2020	na	14.1	38	268	146	na	<0.002	0.17	na
	8/5/2020	0.041	14	38.1	242	142	<0.2	<0.002	0.19	0.08
	8/20/2020	na	13.1	34.2	242	140	na	<0.002	0.25	na
	9/2/2020	na	12.5	32.4	250	136	na	<0.002	0.3	na
	9/17/2020	na	11.6	28.4	238	133	na	<0.002	0.35	na
	10/1/2020	na	11.7	29.5	228	127	na	<0.002	0.41	na
	10/14/2020	na	12	26.9	240	123	na	<0.002	0.5	na
	10/26/2020	na	12	25.9	226	119	na	<0.002	0.54	na
	11/4/2020	0.035	12.4	26	228	118	<0.2	<0.002	0.64	0.08
	11/18/2020	na	12	25.3	220	114	na	<0.002	0.63	<0.05
	12/2/2020	na	11.7	24.3	210	114	na	0.002	0.63	<0.05
	12/14/2020	na	11.4	23.5	218	112	na	0.003	0.63	<0.05
	12/31/2020	na	11.1	23.4	207	106	na	0.003	0.63	<0.05
	1/7/2021	na	10.9	22.6	197	na	na	<0.002	0.62	<0.05
	1/21/2021	na	10.7	22.2	208	na	na	0.005	0.66	<0.05
	2/3/2021	0.032	10.7	22.2	150	103	<0.2	<0.002	0.66	<0.05
	2/18/2021	na	9.9	21	217	na	na	<0.002	0.63	0.06
	3/4/2021	na	9.9	20.9	198	na	na	<0.002	0.68	<0.05
	3/18/2021	na	9.6	19.8	184	na	na	<0.002	0.65	<0.05
	4/1/2021	na	9.2	19	174	na	na	<0.002	0.62	<0.05
	4/15/2021	na	8.9	19	198	na	na	0.002	0.64	<0.05
	5/5/2021	0.028	8.6	17.8	192	93.6	<0.2	<0.002	0.64	0.06
	5/19/2021	na	8.4	17	154	na	na	<0.002	0.7	0.09
	6/3/2021	na	8.4	16.7	190	na	na	<0.002	0.76	0.05
	6/17/2021	na	8.2	15.1	212	na	na	<0.002	0.79	0.06
	7/1/2021	na	8.1	15.1	164	na	na	<0.002	0.76	<0.05
	7/15/2021	na	7.9	14.6	172	na	na	0.002	0.8	<0.05
	7/27/2021	na	8.1	14.9	202	na	na	<0.002	0.8	0.05
	8/11/2021	0.025	8	14.5	202	91	<0.2	0.003	0.76	<0.05
	8/25/2021	na	8.4	14.9	164	na	na	<0.002	0.79	<0.05
	9/9/2021	na	8.8	15.2	168	na	na	<0.002	0.88	0.05
	9/23/2021	na	8.7	15.4	154	na	na	<0.002	0.86	<0.05
	10/7/2021	na	8.6	15.2	152	na	na	0.003	0.81	0.07
	10/21/2021	na	8.6	15.9	140	na	na	<0.002	0.81	<0.05
	11/3/2021	0.024	8.5	15.8	152	89.8	<0.2	<0.002	0.84	0.06
	12/6/2021	na	8.1	14.2	140	na	na	<0.002	0.89	<0.05
	2/2/2022	0.020	7.9	13.7	150	84.2	<0.2	<0.002	1.01	<0.05
	5/11/2022	0.018	6.9	11.3	170	83.5	<0.2	<0.002	1.01	<0.05
	8/3/2022	0.017	7.1	10	148	80.2	<0.2	<0.002	1.12	<0.05
	11/1/2022	0.015	7.3	8.7	134	82.8	<0.2	<0.002	1.27	<0.05

TABLE L-8
OCWD MONITORING WELL SAR-13
2020 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
	1/8/2020	na	12.2	36.7	240	112	na	<0.002	<0.1	na
	2/4/2020	0.034	12.2	36.5	242	133	<0.2	<0.002	<0.1	0.1
	4/1/2020	na	12.5	36.8	230	119	na	<0.002	<0.1	na
	4/15/2020	na	11.9	35.7	244	120	na	<0.002	<0.1	na
	4/30/2020	na	12.1	36.3	242	121	<0.2	<0.002	<0.1	na
	5/6/2020	0.034	12	36.2	234	122	<0.2	<0.002	<0.1	0.08
	5/21/2020	na	14.4	36.7	238	121	na	<0.002	<0.1	na
	6/4/2020	na	12	36.3	240	123	na	<0.002	<0.1	na
	6/17/2020	na	12.1	36.3	226	124	na	<0.002	<0.1	na
	6/30/2020	na	12.2	37.1	228	125	na	<0.002	<0.1	na
	7/13/2020	na	12.3	37.1	248	125	na	<0.002	<0.1	na
	7/27/2020	na	12	36.2	232	125	na	<0.002	<0.1	na
	8/5/2020	0.038	12.3	37.3	248	123	<0.2	<0.002	<0.1	0.11
	8/20/2020	na	12.1	36.1	240	122	na	<0.002	<0.1	na
	9/2/2020	na	12.3	37.1	266	123	na	<0.002	<0.1	na
	9/17/2020	na	11.9	35.7	242	125	na	<0.002	<0.1	na
	10/1/2020	na	13	37.1	232	123	na	<0.002	<0.1	na
	10/14/2020	na	12.5	37.7	260	119	na	<0.002	<0.1	na
	10/26/2020	na	12.2	36.7	232	120	na	<0.002	<0.1	na
	11/4/2020	0.038	12.2	36.7	240	120	na	<0.002	<0.1	0.09
	11/18/2020	na	12.1	36.3	270	118	na	<0.002	<0.1	0.07
	12/2/2020	na	12	36.4	232	106	na	0.002	<0.1	0.09
	12/14/2020	na	12	36.3	252	120	na	0.003	<0.1	0.07
SAR-13/2	12/31/2020	na	11.9	36.3	244	118	na	0.003	<0.1	0.07
Main 2	1/7/2021	na	11.9	35.9	232	na	na	<0.002	<0.1	0.07
Perforations	1/21/2021	na	12	36.2	147	na	na	0.003	<0.1	0.07
750-770 ft bgs	2/3/2021	0.100	12.2	37	203	116	<0.2	0.003	<0.1	0.08
	2/18/2021	na	12.3	37.4	234	na	na	<0.002	<0.1	0.08
	3/4/2021	na	12.2	36.6	230	na	na	<0.002	<0.1	0.07
	3/18/2021	na	12	35.7	239	na	na	<0.002	<0.1	0.09
	4/1/2021	na	11.9	35.9	248	na	na	<0.002	<0.1	0.11
	4/15/2021	na	11.8	36.1	232	na	na	<0.002	<0.1	0.09
	5/5/2021	0.200	12.1	36	248	119	<0.2	<0.002	<0.1	0.07
	5/19/2021	na	11.9	35.8	226	na	na	<0.002	<0.1	0.09
	6/3/2021	na	12.2	36.8	258	na	na	<0.002	<0.1	0.2
	6/17/2021	na	11.9	35.1	262	na	na	<0.002	<0.1	0.09
	7/1/2021	na	11	32.3	232	na	na	<0.002	<0.1	0.08
	7/15/2021	na	10.2	28.9	224	na	na	<0.002	<0.1	0.08
	7/27/2021	na	10.4	28.2	196	na	na	<0.002	<0.1	0.1
	8/11/2021	0.010	10	26.6	236	104	<0.2	0.002	<0.1	0.13
	8/25/2021	na	10.3	26.9	212	na	na	<0.002	<0.1	0.07
	9/9/2021	na	10.3	26.3	212	na	na	<0.002	<0.1	0.11
	9/23/2021	na	9.6	24.1	200	na	na	<0.002	<0.1	0.08
	10/7/2021	na	8.5	19.6	206	na	na	<0.002	<0.1	0.13
	10/21/2021	na	7.7	16.9	188	na	na	<0.002	<0.1	0.09
	11/3/2021	0.100	8	15.5	172	83.4	<0.2	<0.002	<0.1	0.18
	12/6/2021	na	7.1	12.9	152	na	na	<0.002	<0.1	0.1
	2/2/2022	0.023	6.5	11.5	150	69.5	<0.2	<0.002	<0.1	0.13
	5/11/2022	0.013	4.9	7.6	158	62	<0.2	<0.002	<0.1	0.11
	8/3/2022	0.012	4.7	7.1	128	55.7	<0.2	<0.002	<0.1	0.1
	11/1/2022	0.012	5.5	7.4	114	54.2	<0.2	<0.002	<0.1	0.17

TABLE L-8
OCWD MONITORING WELL SAR-13
2020 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
	1/8/2020	na	11.6	33.7	226	124	na	<0.002	0.17	na
	2/4/2020	0.033	11.7	33.6	198	125	<0.2	<0.002	0.15	0.09
	4/1/2020	na	11.7	33.3	228	114	na	<0.002	0.16	na
	4/15/2020	na	11.5	33	230	114	na	<0.002	0.16	na
	4/30/2020	na	11.6	33.3	242	117	<0.2	<0.002	0.15	na
	5/6/2020	0.036	11.4	33.1	254	114	<0.2	<0.002	0.17	0.06
	5/21/2020	na	11.6	33.7	234	116	na	<0.002	0.18	na
	6/1/2020	na	11.3	32.6	232	117	na	<0.002	0.18	na
	6/17/2020	na	11.1	32.5	238	114	na	<0.002	0.16	na
	6/30/2020	na	11.4	33.2	230	115	na	<0.002	0.18	na
	7/13/2020	na	11.3	32.8	240	114	na	<0.002	0.18	na
	7/27/2020	na	11.1	31.7	238	114	na	<0.002	0.18	na
	8/5/2020	0.032	11.3	32.5	232	111	<0.2	<0.002	0.21	<0.05
	8/20/2020	na	10.2	27.8	216	106	na	<0.002	0.32	na
	9/2/2020	na	9.6	24.6	210	95.8	na	<0.002	0.44	na
	9/17/2020	na	8.2	17.7	190	80.2	na	<0.002	0.64	na
	10/1/2020	na	8	14.7	180	67.3	na	<0.002	0.78	na
	10/14/2020	na	7.7	11.7	172	59.8	na	<0.002	0.92	na
	10/26/2020	na	7.4	9.1	164	51	na	<0.002	1.04	na
	11/4/2020	0.019	7.1	7.4	130	45.8	<0.2	<0.002	1.17	<0.05
	11/18/2020	na	6.9	5.5	134	41.2	na	<0.002	1.2	0.09
	12/2/2020	na	6.8	4.6	104	35.7	na	0.003	1.22	<0.05
	12/14/2020	na	6.6	3.7	104	33.1	na	0.003	1.22	0.07
	12/31/2020	na	6.4	3.5	148	31.9	na	0.003	1.21	<0.05
	1/7/2021	na	6.4	3.3	107	na	na	<0.002	1.19	<0.05
SAR-13/3	1/21/2021	na	6.5	3	91	na	na	0.005	1.22	<0.05
Main 4	2/3/2021	0.019	6.4	2.9	79	29.6	<0.2	0.006	1.22	<0.05
Perforations	2/18/2021	na	6.2	2.7	100	na	na	<0.002	1.23	<0.05
910-930 ft bgs	3/4/2021	na	6.2	3	92	na	na	<0.002	1.22	<0.05
	3/18/2021	na	6	2.9	100	na	na	<0.002	1.15	<0.05
	4/1/2021	na	5.8	2.8	74	na	na	<0.002	1.12	<0.05
	4/15/2021	na	5.5	3.2	96.5	na	na	0.002	1.09	<0.05
	5/5/2021	0.016	5	2.5	92	28	<0.2	0.002	0.99	<0.05
	5/19/2021	na	5.1	3.1	87.5	na	na	<0.002	0.99	0.05
	6/3/2021	na	5.5	3.2	90.5	na	na	<0.002	0.99	<0.05
	6/17/2021	na	5.2	2.9	92	na	na	<0.002	0.98	0.07
	7/1/2021	na	4.8	2.9	87	na	na	<0.002	0.92	<0.05
	7/15/2021	na	4.6	2.5	94	na	na	<0.002	0.95	<0.05
	7/27/2021	na	4.8	2.7	116	na	na	<0.002	0.96	<0.05
	8/11/2021	0.013	4.8	2.6	102	24.7	<0.2	0.002	0.95	<0.05
	8/25/2021	na	5	1.4	74	na	na	<0.002	1	<0.05
	9/9/2021	na	5.6	2.1	78	na	na	<0.002	1.09	0.1
	9/23/2021	na	5.5	2.3	90	na	na	0.004	1.1	<0.05
	10/7/2021	na	5.5	2.4	68	na	na	<0.002	1.09	<0.05
	10/21/2021	na	5.4	2.3	66	na	na	<0.002	1.1	<0.05
	11/3/2021	0.013	5.5	1.8	62	24.7	<0.2	<0.002	1.14	0.09
	12/6/2021	na	5.7	2.3	80	na	na	<0.002	1.07	<0.05
	2/2/2022	0.013	6.1	1.9	82	24	<0.2	<0.002	1.32	<0.05
	5/11/2022	0.011	5.8	1.6	71	24.5	<0.2	<0.002	1.28	<0.05
	8/3/2022	0.011	6.2	1.2	96	26	<0.2	<0.002	1.37	<0.05
	11/1/2022	0.011	7.5	0.9	76	29.9	<0.2	<0.002	1.69	<0.05

TABLE L-8
OCWD MONITORING WELL SAR-13
2020 - 2022 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
SAR-13/4 Main 7 Perforations 1,045-1,055 ft bgs	1/8/2020	na	11.9	35.0	224	24.2	na	0.004	<0.1	0.15
	2/4/2020	0.034	11.9	34.8	212	28.6	<0.2	0.006	<0.1	na
	4/1/2020	na	11.9	34.2	198	47.4	na	0.004	0.12	na
	4/15/2020	na	11.5	33.3	212	53.6	na	0.003	0.11	na
	4/30/2020	na	11.3	32.5	208	49.4	<0.2	0.003	<0.1	na
	5/6/2020	0.033	11.3	32.5	194	46.1	<0.2	0.003	0.12	0.11
	5/21/2020	na	10.7	26.1	190	43.7	na	0.013	0.3	na
	6/1/2020	na	8.7	20.4	168	40.6	na	<0.002	0.42	na
	6/17/2020	na	7.4	14.1	154	35.5	na	0.002	0.55	na
	6/30/2020	na	6.6	8.9	128	31.2	na	0.002	0.71	na
	7/13/2020	na	6.6	7.7	130	28.4	na	<0.002	0.78	na
	7/27/2020	na	6.4	5.8	134	26.8	na	0.003	0.84	na
	8/5/2020	0.018	6.7	5.7	130	26	<0.2	0.003	0.93	0.09
	8/20/2020	na	6.6	4.3	122	24.6	na	0.005	0.96	na
	9/2/2020	na	6.7	3.7	114	23.1	na	0.024	0.99	na
	9/17/2020	na	6.4	2.7	106	22.5	na	0.005	1.19	na
	10/1/2020	na	6.6	2.8	102	21.4	na	0.004	1.22	na
	10/14/2020	na	6.7	2.9	104	20.8	na	0.004	1.25	na
	10/26/2020	na	6.7	3.2	112	21.1	na	0.005	1.24	na
	11/4/2020	0.018	6.6	3.4	106	21.6	<0.2	0.004	1.28	0.08
	11/18/2020	na	6.6	3.7	120	23	na	0.005	1.22	0.08
	12/2/2020	na	6.6	3.8	110	22.9	na	0.006	1.2	0.07
	12/14/2020	na	6.5	4.2	118	24	na	0.009	1.16	0.09
	12/31/2020	na	6.5	4.6	126	23.2	na	0.005	1.16	0.08
	1/7/2021	na	6.5	4.5	96	na	na	0.004	1.13	0.09
	1/21/2021	na	6.5	4.3	113	na	na	0.002	1.16	0.10
	2/3/2021	0.02	6.3	3.6	89	22	<0.2	0.005	1.19	0.07
	2/18/2021	na	6.3	3.6	103	na	na	<0.002	1.2	0.12
	3/4/2021	na	6.0	3.4	108	na	na	0.002	1.16	0.08
	3/18/2021	na	5.8	3.1	113	na	na	0.002	1.11	0.08
	4/1/2021	na	5.2	2.4	126	na	na	0.003	1.02	0.09
	4/15/2021	na	4.8	2.4	110	na	na	0.003	1	0.07
	5/5/2021	0.015	4.8	2.1	128	20.3	<0.2	0.004	0.95	0.08
	5/19/2021	na	5.0	2.6	100	na	na	0.010	0.89	0.09
	6/3/2021	na	5.4	2.6	132	na	na	0.002	1.01	0.07
	6/17/2021	na	5.7	2.3	118	na	na	0.003	1.06	0.07
	7/1/2021	na	5.7	2.5	106	na	na	0.007	1.09	0.06
	7/15/2021	na	5.8	3.2	124	na	na	0.003	1.08	0.05
	7/27/2021	na	6.1	2.8	138	na	na	0.008	1.15	0.06
	8/11/2021	0.018	5.9	2.6	122	23	<0.2	0.006	1.13	0.07
	8/25/2021	na	7.6	11.5	136	na	na	<0.002	0.71	0.17
	9/9/2021	na	8.3	13.8	132	na	na	<0.002	0.73	0.12
	9/23/2021	na	5.9	2.8	110	na	na	0.007	1.15	<0.05
	10/7/2021	na	5.5	2.1	84	na	na	0.004	1.09	0.05
	10/21/2021	na	5.1	2.1	74	na	na	<0.002	1.03	<0.05
	11/3/2021	0.014	5.2	2.1	82	19.8	<0.2	<0.002	1.04	0.06
	12/6/2021	na	6.0	1.8	98	na	na	0.002	1.07	0.05
	2/2/2022	0.016	5.9	2.1	110	21.2	<0.2	0.009	1.17	<0.05
	5/11/2022	0.014	5.7	2.6	118	22.5	<0.2	0.003	1.1	<0.05
	8/3/2022	0.015	7.1	6.2	116	17.6	<0.2	<0.002	1.13	<0.05
	11/1/2022	0.011	6.4	2.0	84	16.9	<0.2	<0.002	1.36	<0.05

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed