Engineering Report for Consideration of Permit

Amendment No. 1910146PA-006

City of Santa Monica

Los Angeles County

December 11, 2024

State Water Resources Control Board
Division of Drinking Water
Southern California Field Operations Branch

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Acronyms and Abbreviations

µg/L	Microgram per liter
µS/cm	Microsiemens per centimeter
1,1,2-TCA	1,1,2-Trichloroethane
1,1-DCA	1,1-Dicloroethane
1,1-DCE	1,1-Dichloroethylene
1,2,3-TCP	1,2,3-Trichloropropane
1,2-DCA	1,2-Dichloroethane
AL	Action level
ANSI	American National Standard Institute
AOP	Advanced oxidation process
AWTP	Arcadia Water Treatment Plant
CA	Contaminant assessment
CaCO3	Calcium carbonate
CAO	Cleanup and abatement order
CEQA	California Environmental Quality Act
CFM	Cubic feet per minute
Charnock WTP	Charnock Water Treatment Plant
CIP	Clean-in-place
cis-1,2-DCE	cis-1,2-Dichloroethene
City	City of Santa Monica Water Department
COC	Contaminants of concern
COPC	Contaminants of potential concern
Cr(VI)	Chromium-6
CWTP	Charnock Water Treatment Plant
Division	State Water Resources Control Board, Division of Drinking Water
DLR	Detection limit reportable
E. coli	Escherichia coli bacteria
EC	Electrical conductivity
FRRO	Flow reversal reverse osmosis
ft2	Square feet
GAC	Granular activated carbon
H2O2	Hydrogen peroxide
HPC	Hetertrophic plate count
LA-RWQCB	Los Angeles Regional Water Quality Control Board
LCP	Local control panel
LRP	Local resources program
MCL	Maximum contaminant level
MG	Million gallons
mg/L	Miligram per liter
MGD	Million gallons per day
MND	Mitigated negative declaration

MRL	Method reporting limit
MSA	Mechanical surface aeration
MTBE	Methyl-tert-butyl-ether
MWD	Metropolitan Water District of Southern California
ND	Non-detect
ng/L	Nanograms per liter
NL	Notification level
NSF	National Science Foundation
Olympic AWTF	Olympic Arcadia Water Treatment Facility
OMMP	Operation monitoring and maintenance plan
ORP	Oxidation reduction potential
PCE	Tetrachloroethylene
PFAS	Per- and polyfluoroalkyl substances
PFHxS	Perfluorohexanesulfonic acid
PFOA	Perfluorooctanoic acid
PLC	Programmable logic controller
PRP	Potential responsible party
PS code	Primary station code
RO	Reverse osmosis
RP	Responsible party
SA	Source assessment
SCADA	Supervisory control and data acquisition
SCC	System control center
SM-1	Santa Monica Well 1
SM-3	Santa Monica Well 3
SM-4	Santa Monica Well 4
SM-8	Santa Monica Well 8
SM-9	Santa Monica Well 9
SMCL	Secondary maximum contaminant level
SO4	Sulfate
SRA	Settlement and release agreement
SVOC	Semi-volatile organic compound
T.O.N	Threshold odor number
TBA	Tertiary butyl alcohol
TCE	Trichloroethylene
TDS	Total dissolved solids
TIC	Tentatively identified compound
TOC	Total organic carbon
trans-1,2-DCE	trans-1,2-Dichloroethene
UCMR	Unregulated chemicals requiring monitoring
USEPA	United States Environmental Protection Agency
UV	Ultraviolet
UVT	Ultraviolet transmittance
VFD	Variable flow drive

1. INTRODUCTION

1.1 Purpose of Report

On February 8, 2023, City of Santa Monica Water Department (City) submitted a permit amendment application to the State Water Resources Control Board, Division of Drinking Water (Division) (Appendix A). The City is requesting the following changes be implemented with this permit amendment:

1. Operate two new groundwater wells, Santa Monica Well 8 (SM-8) and Santa Monica Well 9 (SM-9).
2. Change the status of Santa Monica Well 3 (SM-3) and Santa Monica Well 4 (SM-4) from active to inactive.
3. Operate the new Olympic Advanced Water Treatment Facility (Olympic AWTF).
4. Cease operation of and remove mechanical surface aeration (MSA) equipment located in Arcadia Reservoir at Arcadia Water Treatment Plant (AWTP).

This permit amendment was prepared in accordance with the Division's Process Memo 97-005, which was last revised on September 21, 2020.

1.2 Background Information

The City began producing drinking water from the Olympic Well Field in the mid-1970's. Volatile organic compounds (VOCs) were first detected in the drinking water wells in the late 1970s. The Gillette Company and Boeing would both be identified as potentially responsible parties (PRPs) for this contamination, which included tetrachloroethylene (PCE); trichloroethylene (TCE); and 1,4-dioxane. Between the mid-1980s and early-2000s, significant work was conducted at the Gillette and Boeing sites. Once it became clear that Gillette and Boeing were, indeed, the responsible parties (RPs) for the VOC contamination, oversight of the cleanup was transferred to the Los Angeles Regional Water Quality Control Board (LA-RWQCB).

In 1996, methyl-tert-butyl-ether (MTBE) was detected in the City's groundwater wells at the Charnock and Arcadia well fields at levels above the then-provisional action level (AL) of 35 µg/L set by the Division. Consequently, these wells were shut down the same year. The highest MTBE concentration found was 610 µg/L and was detected in a sample collected on March 15, 1996 from Well CH-19 in the Charnock Well Field. The presence of MTBE in the groundwater was caused by the release of gasoline to the soil from nearby gasoline service stations. MTBE was extensively used as a fuel additive in motor gasoline. Over time, MTBE contamination can break down in groundwater to form tertiary butyl alcohol (TBA). TBA has not been detected in the production wells. However, TBA has been detected in samples collected from surrounding regional monitoring wells. Current contaminants of concern (COC) include PCE; TCE; 1,4-dioxane; and 1,2,3-trichloropropane (1,2,3-TCP).

In 1997, the LA-RWQCB and the United States Environmental Protection Agency (USEPA) entered into a joint State and Federal response action to address MTBE contamination in the Charnock Sub-Basin Investigation area. Thirty-two facilities were identified as PRPs in this effort. Chevron, ExxonMobil, Shell, Thrifty Oil, Texaco, and Best California Gas took full responsibility for the MTBE contamination in the Charnock Aquifer. The City entered into various settlement agreements with the oil companies and reached an agreement effective October 2006 in the restoration of the Charnock wells into operation including the monitoring of the Charnock regional monitoring wells being conducted by the City. Shell, Chevron, and ExxonMobil formed the

Charnock Technical Advisory Group, and were involved in the settlement with the City. The LA-RWQCB has agreed to allow the City to discontinue monitoring of monitoring wells.

Permission to discontinue use of the MSA system, located in the reservoir at AWTP, was also requested in the application for this permit amendment. It was determined that VOC levels have dropped to a degree that the MSA system was no longer effective. Furthermore, the City expressed that it was necessary to disconnect and remove the MSA system during the construction process of the current project. For these reasons, the Division issued a letter on June 22, 2023, which nullified the requirement for MSA. This letter can be found in Appendix B.

1.2.1 Permit History

The City currently operates under a domestic water supply permit issued by the Division on March 22, 1966. The city has also received nine permit amendments, which are detailed in Table 1.

Table 1: City of Santa Monica Permit History

Issue Date	Permit Number	Description
03/22/1966	N/A	Original Permit
08/21/1989	03-89-000	Addition of three new wells; Santa Monica Well 2A, Arcadia Well 5, Charnock Well 19.
05/15/2002	04-16-02PA-000	To install and operate the Arcadia granular activated carbon (GAC) production aquifer remediation system (PARS) Facility for Arcadia Wells 4 and 5.
04/09/2004 01/20/2005	1910146PA-001 1910146PA-001 (Updated)	To discontinue the operation of PARS and place the system on standby. To change the status of Santa Monica Well 03 from standby to active.
12/03/2007	1910146PA-002	To install and operate a fluoridation treatment facility for Santa Monica Well 1.
12/12/2012 02/27/2014	1910146PA-003 1910146PA-003 (Revised)	Addition of the Charnock Water Treatment Facility (GAC) for Charnock wells for VOC treatment, upgrade of the Arcadia Water Treatment Facility, and addition of new Charnock Well 20 to replace Charnock Well 15.
08/22/2018	1910146PA-004	To blend water from Santa Monica Well 4 with other local production wells in the Arcadia Water Treatment Facility to reduce the concentration of 1,2,3-trichloropropane below the MCL.
02/10/2023	1910146PA-005	To change the status of Arcadia Wells 4 and 5 from active to standby.
TBD	1910146PA-006	Addition of two new wells: Santa Monica Wells 8 and 9. To operate the new Olympic Advanced Water Treatment Facility (Olympic AWTF). Change the status of the SM-3 and SM-4 wells from active to inactive.

1.3 Brief Description of System

The City's water system is classified as a community water system and directly serves an estimated population of 93,076 permanent residents through 16,970 metered service connections, including 14,020 residential, 2,305 commercial, and 645 landscape irrigation connections. The City serves an eight square mile area in west Los Angeles County, bounded by San Vicente Boulevard to the north, Dewey Street to the south, Centinela Avenue to the east, and the Pacific Ocean to the west. The City's distribution system has three pressure zones, which were established to accommodate the vertical elevation changes within the City's service area.

To help maintain water pressure throughout the distribution system, the City has nine booster pumps housed in two booster stations. The City has four storage reservoirs, with a combined capacity of about 40.1 million gallons (MG).

The City currently maintains ten active wells, which take water from three sub-basins within the Santa Monica Groundwater Basin part of the Coastal Plain of Los Angeles County. The city also maintains two treated surface water connections with Metropolitan Water District of Southern California (MWD). All of the City's water sources are detailed in Table 2.

Table 2: City of Santa Monica Water Sources

Groundwater Wells		
Sub-Basin	**Well Name**	**PS Code**
Arcadia Sub-Basin	Santa Monica Well 01	CA190146_012_012
	Arcadia Well 5	CA190146_001_001
	Arcadia Well 4	CA190146_003_003
Charnock Sub-Basin	Charnock Well 13	CA190146_005_005
	Charnock Well 16	CA190146_008_008
	Charnock Well 18	CA190146_010_010
	Charnock Well 19	CA190146_011_011
	Charnock Well 20	CA190146_073_073
Olympic Sub-Basin	Santa Monica Well 3	CA190146_015_015
	Santa Monica Well 4	CA190146_003_003
Interconnections		
Connection Name	**Location**	**PS Code**
MWD Connection SMN-1	Montana Ave & South Gretna Green Way	CA190146_024_024
MWD Connection SMN-2	3440 Butler Ave	CA190146_025_025

Treatment of the contaminated aquifer has been ongoing since 2002. Charnock Water Treatment Plant (CWTP) treats water from Charnock Wells 13, 19, and 20 before combining with water from Charnock Wells 16 and 18, as shown in Figure 1.

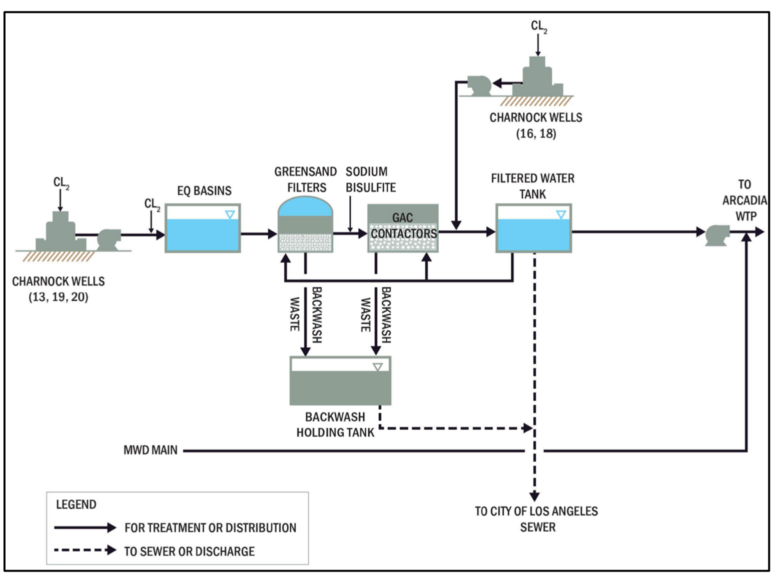

Figure 1: Process Flow Diagram of Charnock Water Treatment Plant

The CWTP effluent is then sent to AWTP where it is combined with the water from Santa Monica Well 1 (SM-1). Arcadia Wells 4 and 5 are also available as standby sources. This is shown below in Figure 2.

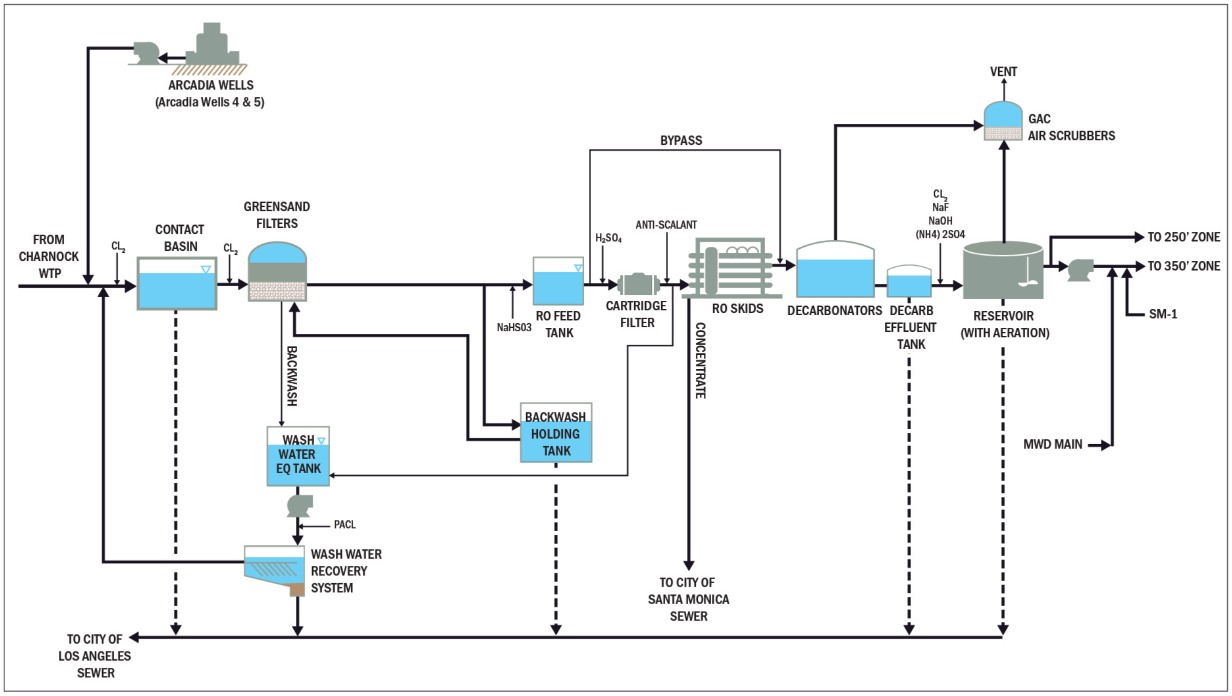

Figure 2: Arcadia Water Treatment Plant Prior to Implementation of Olympic-AWTF

1.4 Sources of Information

Sources of information for this report include the City's 2023 Annual Report as well as previously issued permit amendments. Water quality results and information regarding the proposed improvements came from 97-005 documents and plans provided by the City, as well as monthly meetings held to discuss the matter, which were attended by District staff, City staff, and consultants from Brown and Caldwell. All of these were reviewed and considered during the permitting process.

2. INVESTIGATION AND FINDINGS

2.1 Water Sources

The water sources utilized by the City primarily consist of groundwater and is supplemented by water purchased from MWD. The water sources primarily discussed here are SM-8 and SM-9. Their specifications, as well as those for SM-3, are shown below in Table 3.

Table 3: SM-8 and SM-9 Specifications

Well Name	SM-8	SM-9	SM-3
PS Code	CA1910146_072_072	CA1910146_076_076	CA1910146_015_015
Well depth (ft. bgs)	490	911	570
Annular seal depth (ft.)	150	190	200
Screening intervals (ft. below ground surface)	209-264 294-324 334-345 361-460	240-265 300-380 390-430 490-535 655-750 760-790	210-270 300-380 410-430 490-530
Capacity (gpm)	600	800	850*
Casing material	SS Type 304L		Steel
Pump type	Vertical Turbine, Variable Speed, 125 hp		Vertical Turbine, 75hp

*This figure is from a pump test conducted in 2001 and was not representative of the well capacity at the time of its destruction.

2.1.1 Santa Monica Well 8

Santa Monica Well 8 (SM-8) is a newly constructed well. The water quality for SM-8 has been tested for all constituents for which monitoring is required per California Code of Regulations (CCR), Title 22. The regulatory exceedances are shown below in Table 4. The data sheet for SM-8 can be found in Appendix C.

Table 4: Notable Water Quality Results for SM-8

Date	Contaminant	Result	Regulatory Threshold	Units	Exceedance Type
06/09/2020	TCE	7	5	µg/L	MCL
06/09/2020	1,4-Dioxane	5.3	1	µg/L	NL
06/09/2020	Specific conductance (EC)	1000	900	µS/cm	SMCL
06/09/2020	Threshold odor number	100	3	T.O.N.	SMCL
06/09/2020	Total dissolved solids	650	500	mg/L	SMCL

2.1.2 Santa Monica Well 9

Santa Monica Well 9 (SM-9) is a newly constructed well, located approximate 60-70 feet from, and intended to replace, SM-3. The water quality for SM-9 has been tested for all Title 22 constituents. The regulatory exceedances are shown below in Table 4. The data sheet for SM-9 can be found in Appendix C.

Table 5: Notable Water Quality Results for SM-9

Date	Contaminant	Result	Regulatory Threshold	Units	Exceedance Type
05/27/2020	PCE	41	5	µg/L	MCL
05/27/2020	1,4-Dioxane	3.3	1	µg/L	NL
05/27/2020	Perfluorohexanesulfonic acid (PFHxS)	4.7*	3	ng/L	NL
05/27/2020	Iron, total	34	0.3	mg/L	SMCL
05/27/2020	Specific conductance	1800	900	µS/cm	SMCL
05/27/2020	Sulfate as SO_4	320	250	mg/L	SMCL
05/27/2020	Total dissolved solids	1200	500	mg/L	SMCL

*This result exceeded the NL, but is less than the Federal USEPA MCL of 10 ng/L.

2.1.3 Santa Monica Well 3

The City ceased operation of SM-3 in August 2022. The City demolished SM-3 on June 5, 2024 and now seeks to change the status from active to inactive. Table 3 shows SM-3 water quality data for contaminants that have MCL exceedances. The upper range of results for PCE, TCE, and 1,1-DCE were samples analyzed by Eurofins and appear to be outliers. Samples taken the same day and analyzed by the City's own onsite lab were more in line with values typical of SM-3. If these upper limits were to be discarded, the new upper limits for PCE, TCE, and 1,1-DCE would become 35.6, 32.8, and 1.9 µg/L, respectively. However, the City has not found any apparent source of error in the water quality report. Therefore, they have been included here to maintain full transparency.

Table 6: SM-3 Range of Values for Contaminants with Regulatory Exceedances Since 2020

Contaminant	Range	Regulatory Threshold	Units	Exceedance Type
PCE	5.8-180	5	µg/L	MCL
TCE	ND-160	5	µg/L	MCL
1,1-Dichloroethylene (1,1-DCE)	ND-9.1	6	µg/L	MCL
1,4-Dioxane	1.8-17	1	µg/L	NL

2.1.4 Santa Monica Well 4

Santa Monica Well 4 (SM-4) was drilled in 1982 using the reverse rotary method. The well was drilled to a depth of 560 ft bgs, with an annular seal depth of 200 ft, and a surface seal is also present. In the time between the start of the design and conceptualization of this project and the release of this report, the well casing of SM-4 collapsed. For that reason, the City requested that the status of SM-4 be changed from active to inactive as a part of this permit amendment. A new well with similar depth and perforations is expected to be constructed and permitted in the future. Further testing and analysis for any new proposed well will be conducted at a later date. For now, the water quality of SM-4 is acting as a stand-in, as a future well is expected to be constructed on or near the site of SM-4 and the water quality is not expected to be significantly different. The data sheet for SM-4 can be found in Appendix C.

Table 7: Regulatory Exceedances of SM-4

Date	Contaminant	Result	Regulatory Threshold	Units	Exceedance Type
06/30/2020	Aluminum, total	2,400	1,000	µg/L	MCL
06/30/2020	Tetrachloroethene	41	5	µg/L	MCL
06/30/2020	Trichloroethene	43	5	µg/L	MCL
06/30/2020	1,4-Dioxane	20	1	µg/L	NL
06/30/2020	Manganese, total	67	50	µg/L	NL
06/30/2020	Iron, total	3.2	0.3	mg/L	SMCL
06/30/2020	Specific conductance	1,500	900	µS/cm	SMCL
06/30/2020	Sulfate as SO_4	280	250	mg/L	SMCL
06/30/2020	Threshold odor number	4	3	T.O.N.	SMCL
06/30/2020	Total dissolved solids	990	500	mg/L	SMCL
06/30/2020	Turbidity	48	5	NTU	SMCL

2.1.5 Flow Weighted Average Water Quality into Olympic Water Treatment Plant

Contaminants of potential concern (COPCs) were identified in the Raw Water Quality Characterization Report by analyzing water quality samples from production and monitoring wells in the vicinity of the Olympic Well Field from the years 2012-2020. An initial screening of water quality data indicated 42 COPCs based on constituents detected in production wells (or constituents with three or more detections in monitoring wells), at or above 5% of the MCL or NL. The list of COPCs was then further refined to those that were detected at or above 50% of the MCL or NL. This process yielded a list of 15 COPCs as follows:

- 1,1-Dichloroethane (1,1-DCA)
- 1,2-Dichloroethane (1,2-DCA)
- cis-1,2-Dichloroethene (cis-1,2-DCE)
- trans-1,2-Dichloroethene (trans-1,2-DCE)
- 1,1,2-Trichloroethane (1,1,2-TCA)
- TCE
- PCE
- 1,1-DCE
- 1,4-Dioxane
- 1,2,3-TCP
- Vinyl chloride
- Benzene
- Carbon tetrachloride
- Methyl tert-butyl ether (MTBE)
- Perfluorooctanoic acid (PFOA)

Data from production wells were collected and analyzed in 2020. As described in the Step 2 97-005 Evaluation Report found in Appendix D, the highest value for each constituent was considered as if they were to all occur simultaneously. This provides, what is believed to be, an overly conservative estimate for the treatment plant influent. For this reason, the City did not use these values when designing the treatment plant. Monitoring well data was also used to determine the 95% upper confidence limits (UCL95) for each COPC in each production well. These figures were then used to calculate an estimated flow weighted average at the treatment plant influent for each COPC, as shown below in Table 8.

Table 8: Estimated Treatment Plant Influent Contamination Values

			Using UCL95		Using Production Well Concentration from 2020*	
Contaminant	**Units**	**Regulatory Threshold**	**Plant Influent Concentration Estimates**	**With Safety Factor Applied****	**Plant Influent Concentration Estimates**	**With Safety Factor Applied****
PFOA	ng/L	4.0	0.44	0.66	1.2	1.8
1,2,3-TCP	µg/L	0.005	0.022	0.026	0.00091	0.0011
1,1-DCA	µg/L	5	0.11	0.17	0.098	0.15
1,1,2-TCA	µg/L	5	0.094	0.14	ND	ND
1,1-DCE	µg/L	6	0.47	0.71	0.67	1.0
1,2-DCA	µg/L	0.5	0.043	0.065	ND	ND
1,4-Dioxane	µg/L	1	13.8	20.7	9.9	14.9
Benzene	µg/L	1	0.037	0.056	ND	ND
Carbon tetrachloride	µg/L	0.5	0.15	0.23	0.098	0.15
cis-1,2-DCE	µg/L	6	0.84	1.26	0.23	0.35
MTBE	µg/L	13	0.11	0.17	ND	ND
PCE	µg/L	5	10.4	15.6	31	46.5
trans-1,2-DCE	µg/L	10	0.026	0.039	ND	ND
TCE	µg/L	5	8.2	12.3	23	34.5
Vinyl chloride	µg/L	0.5	0.028	0.042	ND	ND

Note: *From production well concentration estimates described above.
**Safety factor of 1.5 was used for all contaminants except for 1,2,3-TCP, which used a safety factor of 1.2

As detailed in Appendix E, the figures in Table 8 were considered to be overly conservative and were not used in the design of Olympic-AWTF. The Step 4 97-005 Evaluation Report, which can be found in Appendix D, discusses the design process and how influent water quality design parameters were arrived at. The figures for the initial and contingency designs are shown in Table 9 and Table 10, respectively.

Table 9: Olympic AWTF Initial Design Influent Contaminant Concentrations

Contaminant	Units	Regulatory Threshold	SM-4*	SM-8*	SM-9*	Olympic AWTF Design Influent
PFOA	ng/L	4.0	1.70	0.10	0.20	0.85
1,2,3-TCP	µg/L	0.005	0.045	0.018	0.017	0.030
1,1-DCA	µg/L	5	0.41	0.06	0.02	0.21
1,1,2-TCA	µg/L	5	0.5	ND	ND	0.23
1,1-DCE	µg/L	6	1.65	0.30	0.12	0.86
1,2-DCA	µg/L	0.5	0.20	0.10	0.10	0.15
1,4-Dioxane	µg/L	1	54	4	4	27
Benzene	µg/L	1	0.10	0.20	ND	0.10
Carbon tetrachloride	µg/L	0.5	0.54	0.07	0.04	0.27
cis-1,2-DCE	µg/L	6	0.33	3.15	0.08	1.04
MTBE	µg/L	13	0.30	0.30	ND	0.22
PCE	µg/L	5	42	2	3	20
trans-1,2-DCE	µg/L	10	ND	0.10	0.10	0.06
TCE	µg/L	5	34	2	1	16
Vinyl chloride	µg/L	0.5	ND	0.20	ND	0.06

Note: *Safety factor of 1.5 was used for all contaminants except for 1,2,3-TCP, which used a safety factor of 1.2

Table 10: Olympic AWTF Contingency Design Influent Contaminant Concentrations

Contaminant	Units	Regulatory Threshold	SM-4*	SM-8*	SM-9*	Olympic AWTF Design Influent
PFOA	ng/L	4.0	2.20	0.10	0.30	1.10
1,2,3-TCP	µg/L	0.005	0.074	0.030	0.028	0.049
1,1-DCA	µg/L	5	0.60	0.10	0.10	0.33
1,1,2-TCA	µg/L	5	0.60	ND	ND	0.27
1,1-DCE	µg/L	6	2.20	0.40	0.16	1.14
1,2-DCA	µg/L	0.5	0.20	0.10	0.10	0.15
1,4-Dioxane	µg/L	1	71	5	5	35
Benzene	µg/L	1	0.10	0.20	ND	0.10
Carbon tetrachloride	µg/L	0.5	0.80	0.10	0.10	0.42
cis-1,2-DCE	µg/L	6	0.50	4.20	0.10	1.41
MTBE	µg/L	13	0.30	0.30	ND	0.22
PCE	µg/L	5	56	2	3	27
trans-1,2-DCE	µg/L	10	ND	0.10	0.10	0.06
TCE	µg/L	5	45	2	1	21
Vinyl chloride	µg/L	0.5	ND	0.20	ND	0.06

Note: *Safety factor of 2.0 was used for all contaminants.

Four of the 15 COPCs identified exceed the MCL or NL at the production wells. These contaminants are 1,2,3-TCP, 1,4-Dioxane, PCE, and TCE and they are the contaminants that are targeted for treatment by Olympic-AWTF.

2.1.6 Purchased Water Supply

In addition to the groundwater produced by the City's wells, water is also purchased from MWD. Shown below in Table 11 are the figures for water produced, purchased, and delivered for the last ten years. The amount of groundwater produced and treated dropped drastically in 2023 because AWTP was shut down for construction for the majority of February-October 2023.

Table 11: Water Produced, Purchase, and Delivered for Years 2013-2023.

Year	Total Potable Water Delivered (MG)	Water Produced From Groundwater Wells (MG)	Finished Water Purchased From MWD (MG)	Percent of Total Water Purchased
2023	3,475.66	288.05	3,187.61	91.7%
2022	3,428.18	1,330.24	2,097.94	61.2%
2021	3,424.86	1,704.44	1,720.42	50.2%
2020	3,806.84	2,039.23	1,767.61	46.4%
2019	3,350.79	2,367.10	983.69	29.3%
2018	3,629.66	2,322.94	1,306.72	36.0%
2017	3,698.60	2,371.40	1,327.20	35.9%
2016	3,737.04	2,791.54	945.50*	25.3%
2015	3,857.00	2,782.30	1,074.70	27.9%
2014	4,557.4	2,893.03	1,664.37	36.5%
2013	4,578.40	2,677.60	1,900.80	41.5%

*Water purchased in 2016 was not finished water. It was raw water that was then treated by the City. The figure shown represents the amount of water treated.

2.2 Arcadia Water Treatment Plant and Olympic Advanced Water Treatment Facility

As part of the Olympic Well Field Restoration Project (Project), the City has constructed a new treatment facility labeled Olympic Advanced Water Treatment Facility (Olympic AWTF) within the existing Arcadia Water Treatment Plant (Arcadia WTP). The new Olympic AWTF consists of two greensand filters to remove iron and manganese, two ultraviolet light (UV) trains for an advanced oxidation process (AOP) with hydrogen peroxide (H_2O_2) to remove 1,4-dioxane as well as other VOCs such as TCE and PCE, and four granular activated carbon (GAC) trains in lead-lag configuration to quench remaining H_2O_2 from water downstream of AOP and to provide a treatment barrier for 1,2,3-TCP. The treatment capacity for the Olympic AWTF is 2,000 gpm. The City has also made modifications and expansions to the existing Arcadia WTP including addition of the Olympic AWTF effluent to the reverse osmosis (RO) feed tank, addition of one low-pressure RO feed pump and one cartridge filter for handling the additional Olympic AWTF flow, retrofitting the existing four RO trains to flow reversal for increasing recovery, construction of a brine tank and pump station for RO concentrate disposal to the sewer system, addition of one decarbonator for the additional flow, and improvements to post treatment chemical mixing for disinfection and stabilization. The expansion increases the Arcadia WTP capacity from 10 mgd to 13 mgd by incorporating the additional flow from Olympic Well Field.

2.2.1 Process Description

Water pumped from the production wells at the Charnock, Olympic, and Arcadia Well Fields are all treated at the Arcadia WTP for a total capacity of 9,097 gpm. The Charnock Well Field is comprised of five groundwater production wells: CH-13, CH-16, CH-18, CH-19, and CH-20. The Arcadia Well Field production wells treated at the Arcadia WTP are ARC-4 and ARC-5. The Olympic Well Field production wells treated at the Olympic AWTF and then at the Arcadia WTP are the new wells, SM-8 and SM-9 Olympic well water flows to the greensand filtration for removal of iron and manganese which will reduce UV lamp fouling from the Olympic well flow as well as RO membrane fouling by the Charnock, Arcadia, and Olympic well flows. Next, the UV/AOP system with hydrogen peroxide will be utilized to reduce 1,4-dioxane; TCE; and PCE concentrations from the Olympic Well Field to below their respective DLR or detection limit as the primary mode of treatment for these contaminants. Following UV/AOP, water will pass through the GAC system which is utilized to quench excess hydrogen peroxide from the UV/H_2O_2 effluent and act as a potential barrier for removal of any 1,2,3-TCP present.

An RO bypass stream is used to re-mineralize the final treated water. The treated water from Olympic wells will be combined with the Charnock and Arcadia well flows in the RO feed tank and be treated via RO to reduce total dissolved solids and hardness, and remove low-concentration contaminants to below the DLR. The combined RO permeate and RO bypass flows through the decarbonators which will remove carbon dioxide to increase pH for stabilization as well as additional removal of VOCs from the combined flow.

A schematic figure of the Arcadia WTP encompassing the new Olympic AWTF is shown below in Figure 3.

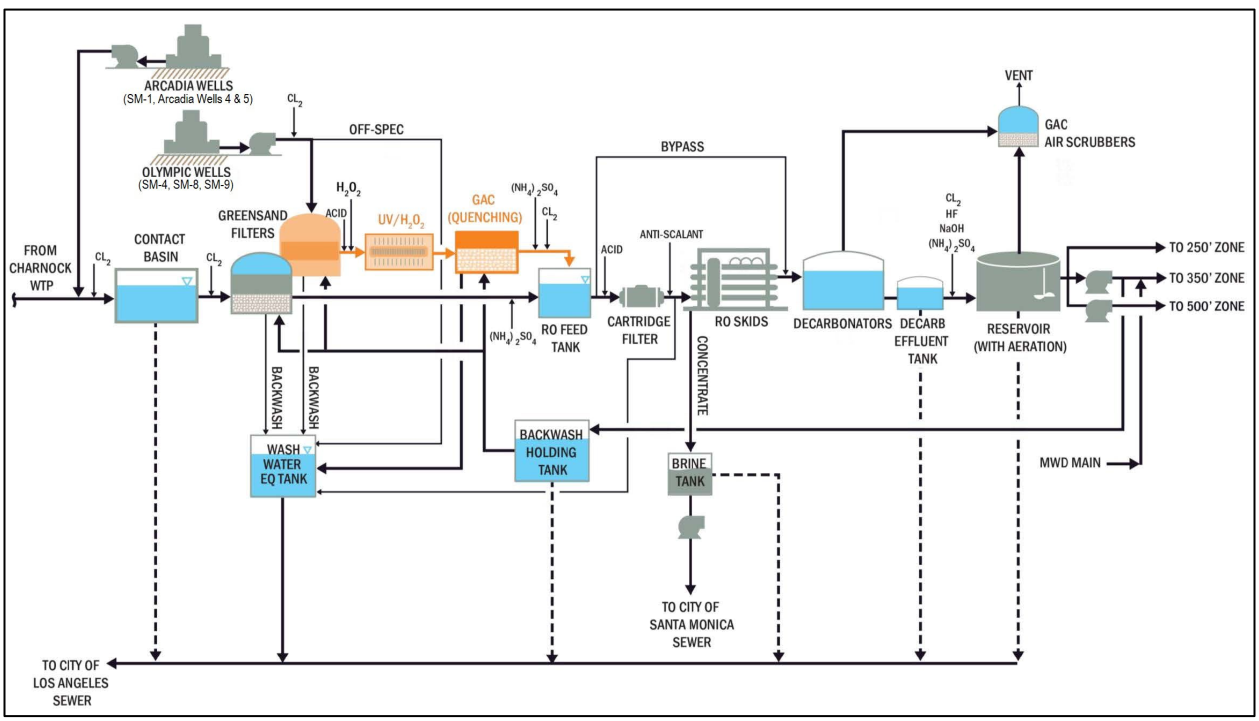

Figure 3: Arcadia WTP and Olympic AWTF treatment system schematic diagram

2.2.2 Greensand Filters

Four (4+0) greensand filters remove iron and manganese from the Arcadia WTP flow. Two (2+0) greensand filters are dedicated to removing iron and manganese from the Olympic Well Field flow. Each filter contains two independently operating cells in series. The system is designed to maintain the normal production flow when one filter cell is offline, and when one filter vessel or two cells are offline. Greensand filters provide pretreatment by removal of iron and manganese through both filtration and adsorption. Chlorine is added upstream to continuously regenerate the media. Manganese greensand is a purple-black medium, derived by coating the naturally occurring glauconite sand with a thin layer of manganese dioxide by treating it with manganous sulfate and potassium permanganate. Design criteria for the greensand filters are provided in Table 12.

Table 12: Greensand Filters Design Information

Parameter	Units	Olympic AWTF	Arcadia WTP
Type of Filters	-	Pressure	
Filters	Quantity	2 (2+0)	4 (4+0)
Cells Per Filter	Quantity	2	2
Design Feed Flow	gpm	2,000	7,097
Filter Area Per Cell	ft^2	227	227
Recovery	%	99.4%	99.3%
Loading Rate, all cells in service	gpm/ft^2	2.2	3.9
Loading Rate, 1 cell out of service	gpm/ft^2	2.9	4.5
Loading Rate, 2 cells out of service	gpm/ft^2	4.4	5.2

The greensand filters cells are backwashed with a combination of air and water. The 350-foot pressure zone booster pump discharge header fills the backwash holding tank with treated water. Piping will separate Olympic greensand filtrate from non-Olympic greensand filtrate, allowing only non-Olympic greensand filtrate to fill the backwash holding tank. Backwash waste from the greensand filters and Olympic Wells blowdown during start-up will be sent to the washwater equalization tank before final discharge to the City of Los Angeles sewer system. Olympic wells blowdown will continue until an acceptable turbidity setpoint is met and water may be conveyed to the greensand filters. Solids will be kept in suspension within the tank through submersible mixers and discharged through submersible pumps. The backwash system design criteria are summarized in Table 13.

Table 13: Greensand Filter Backwash System Information

Parameter	Units	Olympic AWTF	Arcadia WTP
Backwash frequency per cell	hours	293	165
Backwash rate	gpm/ft^2	11	11
Backwash duration	min	15	15
Backwash Holding Tank			
Backwash holding tank type	-	cast-in-place reinforced concrete	
Tanks	Quantity	1 (1+0)	
Useable volume	Gal	73,700	
Backwash Pumps			
Number of pumps	Quantity	2 (1+1)	
Rated capacity, each	gpm	3,450	
Rated head	ft	45	
Motor size	hp	75	
Drive type	-	VFD	
Backwash Blowers			
Number of blowers	Quantity	2 (1+1)	
Motor size	hp	25	
Rated capacity, each	SCFM	675	
Washwater Equalization Tank			
Washwater equalization tank type	-	cast-in-place reinforced concrete	
Tanks	Quantity	1 (1+0)	
Volume	Gal	58,000	
Washwater Pumps			
Pumps	Quantity	2 (1+1)	
Rated capacity, each	gpm	650	
Rated head	ft	42	
Motor size	hp	10	
Drive type	-	VFD	
Mixers	Quantity	2 (2+0)	
Motor size	hp	8	

2.2.2.1 Greensand Filters Performance Test

The greensand performance test was conducted concurrently with the UV/AOP performance test to confirm that anticipated pretreatment requirements for iron (≤ 0.3 mg/L) and manganese (≤ 0.05 mg/L) were achieved. Grab samples for iron and manganese were collected for each test condition at the greensand feed and effluent sampling locations. Reported greensand feed concentrations ranged from below the detection limit to 0.36 mg/L and from 0.11 to 3.9 mg/L for total manganese and iron, respectively. All greensand effluent samples achieved the ≤ 0.3 mg/L iron and ≤ 0.05 mg/L manganese performance criteria for all test conditions. The Olympic well sodium hypochlorite chemical addition system was not in operation during the performance test. Greater iron and manganese removal through the greensand system is expected with a 1-2 mg/L free chlorine residual from the Olympic wells through the greensand filters.

2.2.3 Advanced Oxidation Process

UV/H_2O_2 AOP uses H_2O_2 with UV light to produce hydroxyl radicals that react with and destroy contaminants. Two UV trains (1+1) use H_2O_2 as the oxidant. Each UV reactor includes 12 reactor sections, with 11 sections filled with UV lamps to meet initial design requirements. The system will achieve 2.4-log removal of 1,4-dioxane, 2.3-log removal of PCE, and 2.2-log removal of TCE with a H_2O_2 dose of 40 milligrams per liter (mg/L). The capacity of both UV trains can be expanded by adding more UV lamps on the empty 12th reactor section during the Contingency Design if constituent levels rise and additional treatment is required. The expanded system will achieve 2.6-log removal of 1,4-dioxane, 2.5-log removal of PCE, and 2.4-log removal of TCE with a H_2O_2 dose of 40 mg/L. Design criteria for the UV trains are provided in Table 14.

Table 14: AOP System Design Information

Parameter	Units	Olympic AWTF	Contingency Design
Lamp type	-	Low pressure high output	
Oxidant type	-	H_2O_2	
Design feed flow (minimum - maximum)	gpm	1,000 - 2,000	
Trains	Quantity	2 (1+1)	
Reactors per train	Quantity	1	
Hydroxyl radical scavenging demand	S^{-1}	130,000	
Nitrate concentration as nitrogen	mg/L	8.0	
Design log removal 1,4-dioxane	-	2.4	2.6
Design log removal of PCE	-	2.3	2.5
Design log removal of TCE	-	2.2	2.4
UV transmittance at 254 nm	%	96	96
H_2O_2 dose	mg/L	40	40
Lamps per train	Quantity	264	288
Uv intensity sensors per train	Quantity	11	12
Total connected load	kilowatt	596	647
Reactor power turndown	%	30 - 100	
Lamp power	watt	1,000	
Guaranteed lamp life	hours	15,000	
Maximum operating pressure	psi	87	
Maximum head loss across reactor train at design flow	inches	3.0	

2.2.3.1 Hydrogen Peroxide Feed

Two metering pumps (1+1) will add H_2O_2 (50 percent weight per weight) to the UV/H_2O_2 AOP influent. Design criteria for the H_2O_2 system are provided in Table 15.

Table 15: Hydrogen Peroxide Feed System Information at Design Flow

Parameter	Units	Value
Tanks	Quantity	1
Total storage capacity	Gal	4,800
Days of storage at average dose	Days	25
Days of storage at max dose	Days	25
Average dose – ultimate flow	mg/L	40.0
Maximum dose – ultimate flow	mg/L	40.0
Metering pumps	Quantity	2 (1+1)
Minimum pumping capacity required	gph	1.2
Maximum pumping capacity required	gph	9.6
Maximum injection pressure	psi	50

2.2.3.2 Ultraviolet Light Reactors

There are two UV/H_2O_2 trains (OXW-RUV-1110, OXW-RUV-2110), each containing one UV reactor. The one duty train will provide up to 2.4 log reduction of 1,4-dioxane, 2.2 log reduction of

TCE and 2.3 log reduction of PCE from 2,000 gpm of 96% ultraviolet light transmittance (UVT) water with up to 40 mg/L H_2O_2.

Each UV train has one local control panel (LCP) for control and monitoring. The LCP controls one or more UV chambers within a train, as well as supervisory control and monitoring of associated HSC. The LCP operator interface allows users to operate the UV train. During operation, the system control center (SCC) will monitor and control the operating capacity of each reactor by bringing lamp sections on and offline, changing lamp power and/or changing H_2O_2 dose to maintain the required operating capacity. The SCC monitors the operating capacity of each UV train so that the actual flow of the operating train does not exceed the operating capacity without the appropriate response.

2.2.3.3 Ultraviolet Light Control and Alarms

The following are major alarms provided through the UV/H_2O_2 PLC:

- UV/H_2O_2 inlet flow is less than the minimum flow
- UV/H_2O_2 inlet flow is greater than the operating capacity
- Log removal is below the required value(s)
- UVT is less than the permitted value
- UV reactor temperature reached high
- UV reactor water level reached low level
- H_2O_2 tank reaches low level
- H_2O_2 pump failure

The following conditions related to the AOP system will initiate shutdown of the Olympic AWTF:

- UV/H_2O_2 system log removal is below the Division-approved compliance value based on a 15-minute running average and if it ever drops below the minimum permitted value and the second train is unhealthy
- UV/H_2O_2 system flow meter failure
- H_2O_2 pumps fail
- H_2O_2 tank below the low-low level
- UVT drops below the minimum permitted value
- Plantwide power failure or UV/H_2O_2-specific power failure

2.2.3.4 Ultraviolet Light Advanced Oxidation Process Performance Testing

The objective of performance testing was to demonstrate that the UV AOP system (TrojanUVFlex 200) meets the specified performance requirements, can meet the treatment criteria at the design operating conditions, achieves treatment up to 2.4, 2.2 and 2.3 log removal of 1,4-dioxane, TCE, and PCE, respectively, and that the automatic control program can perform to reliably meet the contaminant treatment targets.

Aqua Hume solution was injected upstream of the UV reactors to produce the desired UVT value in the UV influent water quality. The UVT ranged from the ambient level of approximately 98% to design UVT of 96% and a minimum value of 93%. A 50% solution of H_2O_2 from the storage tank was injected upstream of the reactors. 1,4-Dioxane injection stock solution was injected into the UV influent piping to quantitatively demonstrate the required log reduction targets, aiming at high enough influent concentrations so that effluent samples could be measured at levels exceeding the analytical method reporting limit (MRL). The analytical method used for 1,4-dioxane was EPA Method 522 with an MRL of 0.07 µg/L.

The testing included 2 control runs without power or H_2O_2 and 20 scenarios with varying operational modes (auto or manual control), lamp sections and power, flow rates, H_2O_2 levels, influent 1,4-dioxane concentrations, contaminant log reduction targets, scavenging demand terms, and pH levels. Testing was performed on one train with flow from Wells SM-8 and SM-9. In the automatic control mode, the algorithm dynamically adjusted the power and peroxide levels to meet the contaminant log reduction target setpoints entered as input at the lowest operating cost. The algorithm predicts the log reduction as a function of system flow, UV transmittance, hydroxyl radical scavenging demand, H_2O_2 concentration and UV reactor intensity sensor values. During the test, a safety factor of 10% was applied to the log reduction setpoints which are 2.64, 2.53, and 2.42 for 1,4-dioxane, PCE, and TCE, respectively. PCE and TCE were not injected during the test and only the ambient levels in the influent were used to calculate the achieved log target. The observed reduction levels of 1,4-dioxane were used to predict the log reduction values for PCE and TCE.

The performance test plan was approved by the Division on August 9, 2023, and testing was conducted at the Olympic AWTF in from September 22, 2023 through October 5, 2023, and the City submitted the test report to the Division on December 26, 2023 (Appendix F).

The results indicated that the measured and PLC-calculated levels of UVT in the influent and effluent are in good agreement, providing confidence in the accuracy of UV system control algorithm for predicting the UV influent and effluent UVT values. Online UVT measurements also provided good agreement with the UVT grab samples indicating that the online UVT meter provides accurate UVT measurement for the PLC to calculate log reductions. The same calculation accuracy was demonstrated for the peroxide levels in the influent and effluent of the UV system by providing good agreement between predicted and measured peroxide concentrations.

In all but four of the test scenarios, the measured 1,4-dioxane log reduction values exceeded the operating setpoints. The four scenarios which did not exceed the target setpoints had a reduced log reduction target setpoint of 1.32 for 1,4-dioxane. The results were potentially due to lack of upstream chlorination, influence of nitrite in the influent water and contribution to scavenging demand, or the lower target setpoints. The City will operate the AOP system with chlorinated water upstream of greensand filtration units, and at higher log reduction targets than these four tests.

2.2.4 Granular Activated Carbon

AOP results in excess residual H_2O_2 downstream of the UV reactors. Parallel GAC treatment will be utilized downstream of the AOP process to quench this excess H_2O_2 by catalytically degrading hydrogen peroxide into oxygen and water. GAC is also an adsorption process that removes some organic and inorganic compounds.

The GAC system has four trains. Each train consists of two 12-ft-diameter GAC contactor vessels capable of holding up to 40,000 pounds of media each, operating in lead-lag configuration to quench residual H_2O_2 and provide treatment via adsorption of contaminants such as1,2,3-TCP. Design criteria for the GAC system is based on one train offline due to backwashing or maintenance. During normal operation when flows are high enough to permit, the GAC system will operate in a four-duty, no standby configuration to prevent stagnant water within the vessels. GAC pressure vessel backwash cycles and bumps (short term backwash) are accommodated using the greensand filter system backwash pumps. Since the flowrate required for GAC backwashes are lower than that for greensand filters, part of the backwash flow is diverted back into the backwash water supply tank to provide controlled GAC backwash loading rate.

GAC system is designed to be used for both quenching and adsorption. Changeout frequency when operating as lead/lag for contaminant removal will depend on contaminant concentrations and background water quality (e.g., total organic carbon). Design criteria for the GAC contactors and backwash system are provided in Table 16.

Table 16: GAC System Operating Conditions

Parameter	Units	Value
Type of contactors	-	Cylindrical, Pressure
Contactor media	-	GAC
Contactor orientation	-0.86	Vertical
Media effective size	mm	0.55 – 1.1
Vessel diameter	ft	12
Design feed flow	mgd	2.9
Recovery	%	99.8%
Trains	Quantity	4
Contactors per train	Quantity	2
Contactor operation	-	Contactors within each train in lead/lag
EBCT, all trains in service	min	17.8
EBCT, duty trains in service	min	13.3
Gac media weight per contactor	lb	40,000
Gac media depth	ft	10.5
Contactor Loading Rate, duty trains in service	gpm/ft^2	5.9
Contactor Loading Rate, all trains in service	gpm/ft^2	4.4
Maximum backwash rate, 75°F	gpm/ft^2	8.9
Maximum backwash duration, 75°F	min	42
Maximum backwash frequency	Times/month	1
Bump rate	gpm/ft^2	5.0
Bump duration	min	15
Maximum bump frequency	Times/month	12
Backwash/bump pumps	-	Shared with greensand filter system

2.2.4.1 Granular Activated Carbon Media Changeout

GAC media changeout is required when the GAC is no longer effective at quenching the H_2O_2 residual or the lowest interim sample port indicates breakthrough of target contaminant(s). Changeout will be required when H_2O_2 breakthrough is detected in the GAC effluent. The lead-lag order of the GAC vessels will be switched after the media changeout of the lead vessel is completed. A 4-inch connection is provided at the top and bottom of each GAC contactor to remove exhausted media and fill with new media. The media exchange is performed by the media manufacturer. Treated water is used to slurry in the new media, and compressed air is used to move the slurry into the contactor. The contactor shall be isolated prior to media changeout by actuating the valves on the feed and discharge lines.

2.2.4.2 Granular Activated Carbon Controls, Monitoring, and Alarms

A ready-to-receive-feed-water signal is maintained from the GAC PLC to the SCADA system if the GAC contactors are ready to receive feed water from the UV system. The GAC PLC allows for either manual or auto modes of operation. In manual mode, the GAC PLC isolates the GAC train by closing all valves; the operator can manually open and close any of the valves. The GAC contactors normally operate in auto mode, where the corresponding modes are auto online, auto offline, and auto backwash. The GAC PLC automatically opens, closes, and modulates the filter cell valves during remote auto mode. A combined free chlorine and total chlorine analyzer is provided for the GAC effluent downstream of ammonium sulfate addition, to ensure that there is no chlorine residual in the GAC effluent.

If all GAC trains are not already in service, the GAC PLC automatically starts a standby GAC train to replace a duty train that must be taken offline. If power failure is local to a GAC train, a replacement GAC train is brought online.

The following alarms (with operator adjustable setpoints) are provided through the GAC PLC:

- Differential pressure is greater than alarm setpoint of 10 psi
- Differential pressure reaches high setpoint of 15 psi
- Flow exceeds design limit of 1,500 gpm
- GAC effluent free chlorine residual is greater than 0.0 mg/L

2.2.4.3 Granular Activated Carbon Performance Testing

Performance testing of GAC was conducted to demonstrate that the media meets the design criteria for H_2O_2 quenching. Testing was carried out concurrently with the UV-AOP performance test to confirm residual H_2O_2 was quenched to non-detect levels (< 0.2 mg/L). Flow was split between GAC Trains 1 and 2 for test conditions at 1,500 to 2,000 gpm, which resulted in hydraulic loading rates of 6.6 to 8.8 gpm/ft^2. For low flow conditions at 1,000 gpm, Train 1 treated the full flow with an approximate hydraulic loading rate of 8.8 gpm/ft^2. Head loss through the GAC lead vessel was 3 psi or less for all test conditions. Grab samples were collected along the lead vessel media bed for each test condition and monitored for H_2O_2 residual.

GAC influent H_2O_2 residual varied from 0 to 40.5 mg/L for the GAC performance test conditions. H_2O_2 residuals were quenched to 3 mg/L or less by the first GAC vessel sample port (top of the media bed) and were non-detect by the third GAC vessel sample port, which refers to the 60% bed depth, for all test conditions. COPCs were non-detect in the GAC influent except for the following: 1,4-dioxane, 1,2,3-TCP, carbon tetrachloride, cis-1,2-dichloroethene, tetrachloroethene, trichloroethene, and PFOA. 1,4-dioxane was detected below the lab MDL (1 µg/L) for two test conditions (11 and 20) in the lead GAC effluent sample location. All other GAC lead and lag effluent samples were non-detect for all COPCs across the test conditions.

2.2.5 Reverse Osmosis

The Olympic AWTF effluent from the GAC vessels is next blended with the groundwater flow from the Charnock Water Treatment Plant (Charnock WTP) and Arcadia Well Field (both pre-treated with greensand filtration) in the RO feed tank. A new inlet pipe penetration is added to the RO feed tank for Olympic AWTF effluent.

Low-pressure RO feed pumps convey flow from the RO feed tank through cartridge filters to the RO system. The cartridge filters serve to protect the RO membranes by capturing any large particles that may be in the feed water.

Table 17: RO Feed Pump and Tank Information

Parameter	Units	Design (Ultimate Flow)
Total pumps	Quantity	4 (3+1)
Motor size	hp	3 at 125 (existing) 1 at 150 (new)
Rated capacity, each	gpm	3,500
Rated head	ft	103
Drive	Type	VFD
Tank type	-	cast-in-place reinforced concrete
Tanks	Quantity	1 (1+0)
Useable volume	Gal	154,100
Hydraulic retention time	-	17 min at 9,097 gpm

Table 18: Cartridge Filter Information

Parameter	Units	Design (Ultimate Flow)
Vessels	Quantity	5 (5+0)
Flow per vessel	gpm	1,401
Cartridge filter material	-	Polypropylene
Vessel orientation	-	Horizontal
Maximum pressure drop - dirty filter	psi	15
Cartridge filters per vessel (40-inch filters)	Quantity	176
Cartridge filter rating	micron	5
Cartridge filter length	inches	40
Cartridge filter element diameter	inches	2.5
Cartridge filter nominal flow rate per 10-inch equivalent	gpm	2.0

The RO trains are retrofitted to flow reversal reverse osmosis (FRRO) to achieve 90 percent or greater recovery. Approximately 24 percent of the RO feed flow is bypassed around the RO based on a water hardness target of approximately 160 mg/L as calcium carbonate ($CaCO_3$). The RO trains include a high-pressure RO feed pump, an RO interstage pump between Stages 1 and 2 and Stages 2 and 3, piping and valving manifolds, and control system. In the initial design, the retrofitted RO trains can operate in a three duty, one standby, mode based on available influent water. In case additional groundwater wells become available, all RO trains will operate in duty mode with no standby. When an RO train goes offline due to cleaning or maintenance, plant operating capacity will be reduced temporarily and supplemented by the City's imported water source.

An RO clean-in-place (CIP) system is required to remove fouling and scaling that accumulates on RO membranes over time. The CIP sequence is comprised of four steps: The immersion heater is called to run until a temperature setpoint is met; the CIP Pump is called to run and modulates speed to circulate CIP solution through the RO train at an operator adjustable flow rate and duration; SCADA automatically closes valves on the RO train to soak the membranes over an operator adjustable duration; RO CIP solution is neutralized and discharged to the brine tank.

An RO flush system flushes the membranes with permeate to prevent fouling whenever a RO train is called to stop. The membranes are also flushed after a CIP sequence is performed. SCADA automatically actuates valves to switch the feed water to flush water, opens the concentrate valves, opens the off-spec permeate valves, and closes the permeate valves. The CIP and flush water systems are located inside the RO Building. Design criteria for the RO system are provided in Table 19.

Table 19: RO System Information

Parameter	Units	Design (Ultimate Flow)
RO feed tank inflow	gpm	9,097
RO bypass flow	gpm	2,092
Feed flow per train	gpm	1,650 – 1,900
Permeate flow per train	gpm	1,353 – 1,710
RO concentrate flow per train	gpm	165 – 342
Design system recovery	%	82 – 90
Membrane material	-	Composite polyamide
Membrane type	-	High rejection, low fouling
Membrane area per element	ft^2	440
Trains (duty & standby)	Quantity	4 (4+0)
Stages per train	Quantity	3
Pressure vessel configuration	Quantity	43:21:9
Pressure vessel diameter	inches	8
Height of RO Trains	Quantity of vessels	7
Elements per pressure vessel	Quantity	6
Maximum average flux	GFD	12.8
Flush tanks	Quantity	1 (1+0)
Flush tank volume	Gal	18,500
Flush pumps	Quantity	2 (1+1)
Rated capacity, each	gpm	600
CIP tanks	Quantity	1 (1+0)
CIP tank volume	Gal	6,600
CIP pumps	Quantity	2 (1+1)
Rated capacity, each	gpm	1,085

2.2.5.1 Reverse Osmosis Performance Testing

The FRRO performance test was conducted with blended water from the Charnock WTP and Olympic AWTF on February 6 and 7, 2024 to confirm the RO system satisfies operational and treatment performance criteria. Each RO skid was operated in flow reversal mode with a feed flow of 1,900 gpm and monitored for operational and water quality performance.

The FRRO system met performance goals. RO Trains 2, 3, and 4 were operated at the maximum design flow of 1,900 gpm at the specified antiscalant dose during the FRRO performance test. RO Train 2 was operated for 24 hours with an average feed flow rate of 1,899 gpm and operated at 90 percent recovery. Train 3 was operated for 124 minutes at 90 percent recovery, and Train 4 was operated for 68 minutes at 88 percent recovery.

The RO feed water quality was continuously monitored via online water quality monitors for conductivity, oxidation reduction potential (ORP), chloramine residual, turbidity, pH, and temperature. All COPCs in the RO permeate were below the method detection limit except for 1,4-dioxane and TCE. 1,4-Dioxane concentrations were reduced by approximately 90% to below the method reporting limit of 0.07 µg/L. TCE is not well removed by RO with RO permeate concentrations ranging from 1.6 - 2.4 µg/L, which is expected to be removed by the downstream decarbonator process. TCE concentrations in the RO feed water were contributed by Charnock WTP source water with GAC effluent samples resulting in non-detect during the Olympic AWTF performance test.

2.2.6 Decarbonators

Decarbonators are intended to remove carbon dioxide to increase pH and reduce the required sodium hydroxide dosage for post treatment. The decarbonators can also remove VOCs from the combined RO permeate and RO bypass. Water is spread over a packed media bed and subjected to an updraft of air, enhancing volatilization of carbon dioxide and VOCs from the feed water.

Three decarbonators (3+0) treat the blended RO permeate and bypass flows. By maintaining the loading rate of the decarbonators, the Arcadia WTP expansion can achieve reduction of TCE and PCE. With the addition of the Olympic AWTF, the City's existing reservoir aeration system may no longer be required to meet treatment goals. Design criteria for the decarbonators are summarized in Table 20.

Table 20: Decarbonator System Information

Parameter	Units	Design (Ultimate Flow)
Towers	Quantity	3 (3+0)
Flow per tower	gpm	2,799
Diameter per tower	ft	11
Blowers	Quantity	3 (3+0)
Blower capacity, each	SCFM	9,000
Motor size	hp	40
Fill media	-	2" Tripack
Media depth	ft	5
Liquid loading rate	gpm/ft^2	29.5
Gas loading rate	CFM/gpm	3.2
Air:water ratio	-	24.1

2.2.7 Post Treatment

Flash mix pumps downstream of the decarbonator effluent tank enhance chemical mixing for post-treatment disinfection and stabilization. The chemical feed order is hydrofluorosilicic acid, sodium hypochlorite, and sodium hydroxide. Design criteria for the flash mix pumps are provided in Table 21.

Table 21: Flash Mix Pump Information

Parameter	Units	Design (Ultimate Flow)
Pumps	Quantity	2 (1+1)
Rated Capacity, each	gpm	196
Rated head	ft of water	23
Motor size	hp	3
Drive	Type	Constant speed

2.2.8 Reservoir

The 5-MG treated-water reservoir has two outlets. The first outlet sends water to the Arcadia booster pumps to supply the 350-foot pressure zone. The second outlet flows by gravity directly to the 250-foot pressure zone. A booster pump station supplies the 500-foot pressure zone using the 250-foot pressure zone reservoir outlet. A bladder-type surge tank will dissipate transient surges in the system in the event of a power failure at the 500-foot pressure zone booster pump station. Design criteria for the reservoir are provided in Table 22.

Table 22: Reservoir Information

Parameter	Units	Design (Ultimate Flow)
Type	-	cast-in-place reinforced concrete
Tanks	Quantity	1 (1+0)
Usable Volume	Gal	2,340,000
Hydraulic Residence Time	hours	4.6 hours at 8,397 gpm

2.2.9 Chemical Feed Systems

2.2.9.1 Sodium Hypochlorite

Two pairs of metering pumps (1+1 shared standby for each location) add sodium hypochlorite to the raw water contact tank influent and non-Olympic greensand filter influent. Three pairs of metering pumps (1+1 for each location) add sodium hypochlorite to the Olympic greensand filter influent to enhance iron and manganese removal, downstream of GAC to form chloramine prior to RO treatment if only the Olympic Well Field is running (Charnock/Arcadia flow uses residual chlorine from the greensand process), and downstream of the decarbonator effluent tank for disinfection residual.

2.2.9.2 Ammonium Sulfate

Three pairs of metering pumps (1+1 for each location) add ammonium sulfate (40 percent) to the non-Olympic greensand effluent, GAC effluent, and decarbonator effluent. Ammonium sulfate is added along with sodium hypochlorite to form chloramines to control RO biofouling and for disinfection.

2.2.9.3 Sulfuric Acid

Two metering pumps (1+1) will add sulfuric acid (93 percent) to the UV/H_2O_2 influent. Two pairs of metering pumps (1+1 shared standby for each location) will add sulfuric acid (93 percent) to the RO influent and RO CIP. Sulfuric acid is added to maintain pH in the RO feed at 6.7 to minimize scaling on the RO membranes, to create low pH RO cleaning solutions, and to neutralize spent RO CIP waste prior to sewer disposal. It may also be used to enhance UV/H_2O_2 treatment efficiency.

2.2.9.4 Hydrogen Peroxide

Two metering pumps (1+1) add H_2O_2 (50 percent) to the UV/H_2O_2 AOP influent. H_2O_2 is the oxidant for the UV/AOP treatment process.

2.2.9.5 Antiscalant

Two metering pumps (1+1) add antiscalant (Avista Vitec 4,000 or AWC A-119) to the cartridge filter effluent to reduce inorganic scaling on the membrane surface.

2.2.9.6 Hydrofluorosilicic Acid

Two metering pumps (1+1) add hydrofluorosilicic acid (23 percent) downstream of the decarbonator effluent tank for fluoridation. The hydrofluorosilicic acid system replaces the previous sodium fluoride metering pumps and powder/saturator system.

2.2.9.7 Sodium Hydroxide

Sodium hydroxide (caustic soda) will be delivered to the site as a 50 percent solution and stored in heat traced and insulated bulk storage tanks. The 50 percent sodium hydroxide will be diluted on-site to 25 percent sodium hydroxide. Three metering pumps (2+1) will add sodium hydroxide (25 percent) downstream of the decarbonator effluent tank to achieve a pH between 8.0 to 8.5 to match the MWD water quality and minimize corrosion. It is also used to create RO cleaning solutions and neutralize spent RO CIP waste prior to sewer disposal.

2.2.10 Operation and Online Monitoring

2.2.10.1 Olympic Wells

A flow meter is provided for each well pump to monitor the flow for the respective well. The SM-8 and SM-9 well pumps are equipped with VFDs that communicate with wellhead PLCs. The VFD will adjust one of the in-service Olympic well pump's speed to maintain the setpoint for the Olympic Well Field flow rate. The other in-service Olympic well pump(s) will operate at a constant speed. The wellhead PLCs communicate with SCADA over an existing telephone line. The VFDs are equipped with soft starter bypasses. The pumps can operate in either local manual, remote manual, or remote auto modes. In local manual mode, the pump speed can be adjusted using controls on the VFD. In remote manual mode, the HMI can be used to turn the pump on or off and control speed. In remote auto mode, the pumps are controlled by the SCADA system to meet the City's diurnal water demands. The well pumps normally operate in remote auto mode. Alarms (with operator-adjustable setpoints) for well water level, pump discharge pressure and flowrate, and pump waste flowrate are provided through the wellhead PLC.

2.2.10.2 Greensand Filters

The pressure filter PLC allows for either remote manual or remote auto modes. In manual mode, the pressure filter PLC isolates the filter cell by closing all filter cell valves. The operator can manually open and close any of the filter cell valves through the pressure filter PLC. In remote auto mode, the pressure filter PLC automatically opens, closes, and modulates the filter cell valves depending on the operation mode. The modes are auto online, auto offline, or auto backwash. A turbidity analyzer is provided for the Olympic greensand filter influent, and a free chlorine residual analyzer is provided for the Olympic greensand filter effluent. The Olympic greensand filter system is normally operated in remote auto mode. The SCADA system brings the required number of filter cells online through the pressure filter PLC, depending on the flow from Olympic Well Field. Flow is equally distributed to all online filter cells. Alarms (with operator-adjustable setpoints) are provided through the pressure filter PLC for influent turbidity and effluent free chlorine.

2.2.10.3 Ultraviolet Light/Hydrogen Peroxide

During normal operation, the SCC monitors system process variables such as UVT, flow rate, lamp intensity, and lamp power; verifies the log removal; and monitors and controls the operating capacity of each reactor. Operation of the UV/H_2O_2 system is fully automated with a variety of alarms to prevent under-treated water from exiting the UV system. UV dose, H_2O_2 dose, and UVT are monitored continuously, and all alarms and compliance values are based on a 15-minute running average. Major alarm conditions shut down the UV/H_2O_2 system, while less-critical alarms notify operators via the SCADA system that the UV process requires attention.

2.2.10.4 Granular Activated Carbon

The GAC PLC allows for either manual or auto modes of operation. In manual mode, the GAC PLC isolates the GAC train by closing all valves; the operator can manually open and close any of the valves. The GAC contactors normally operate in auto mode, where the corresponding modes are auto online, auto offline, and auto backwash. The GAC PLC automatically opens, closes, and modulates the filter cell valves during remote auto mode. A combined free chlorine and total chlorine analyzer is provided for the GAC effluent downstream of ammonium sulfate addition, to ensure that there is no chlorine residual in the GAC effluent. Alarms (with operator-adjustable setpoints) for differential pressure, flowrate, and effluent free chlorine residual are provided through the GAC PLC.

2.2.10.5 Reverse Osmosis System

A level indicator, a combined free ammonia and monochloramine residual analyzer, and a combined free chlorine and total chlorine analyzer are provided for the RO feed tank. The plant PLC allows for either local manual, remote manual, and remote auto modes for the RO bypass valve.

The cartridge filters are equipped with instruments to monitor and indicate inlet pressure, differential pressure, inlet turbidity, outlet oxidation-reduction, outlet total chlorine, outlet pH and temperature, outlet conductivity, outlet turbidity, and outlet pH. All instruments send signals to the SCADA system, which communicates with the RO PLC. The RO PLC controls the feed-water-to-waste valve that is located downstream of the cartridge filters for off-spec conditions. A flow meter, conductivity and pH analyzer, and pressure transmitter are provided on the brine header for each RO train. A flow meter, conductivity analyzer, and pressure transmitter are provided on the permeate header for each RO train. The RO system normally operates in remote auto mode with the flow split evenly between the online equipment. Alarms (with operator adjustable setpoints) are provided through the plant PLC for RO feed tank level, feed tank effluent free chlorine, free ammonia, monochloramine levels, pump discharge pressure level, RO bypass flow meter and valve, cartridge filter inlet pressure and pressure differential, inlet and outlet turbidity, outlet ORP, outlet total chlorine, outlet pH, outlet temperature, outlet conductivity, RO feed pump pressure, permeate pressure, reject pressure, RO train failure, and valve failure.

2.2.10.6 Decarbonators

A differential pressure indicator is provided for each decarbonator to measure the head loss through the media bed. A level indicator, pressure-transducer type level indicator, and high-high level switch are provided for the decarbonator effluent tank. The decarbonator blowers normally operate in remote auto mode. Flow is equally distributed to each decarbonator and can be manually throttled to balance flow using the isolation valves on the decarbonator inlets.

Alarms (with operator-adjustable setpoints) for effluent tank level and blower failure are provided through the plant PLC.

2.3 Operator Certifications, Reporting, and Record Keeping

2.3.1 Operator Certifications

The Olympic AWTF is classified as a Treatment 5 (T5) facility per Title 22, CCR, Section 64413.1. A completed treatment classification worksheet can be found in Appendix G. This requires a chief operator with at least a T5 certification and shift operator(s) with at least a T3 certification.

2.3.2 Reporting and Recordkeeping

Operational records will be maintained at the Olympic AWTF. Records will be maintained by the City, and exceptions will be reported to the Division. Major equipment and process failures and corrective actions taken will also be recorded and the records will be maintained by the City for a minimum of five years.

2.4 Water Quality and Process Monitoring

2.4.1 Source Monitoring

The City must conduct source water monitoring for all active sources. All production wells treated by the AOP and GAC treatment system must be monitored. In addition, the City must follow the monitoring requirements of CCR, Title 22, Division 4, Chapter 15. The source monitoring program is shown in Table 22 below.

Table 23: Source Monitoring Program for Sources Olympic AWTF

Sample Location and PS Code	Parameter	Frequency
Well SM-8 (CA1910146_072_072) Well SM-9 (CA1910146_076_076)	Complete Title 22 VOCs	Monthly
	1,4-Dioxane	Monthly
	Nitrate	Monthly
	Nitrite	Monthly
	Alkalinity	Monthly
	Calcium	Monthly
	Total Hardness	Monthly
	Iron	Monthly
	Manganese	Monthly
	Sulfate	Monthly
	Total Dissolved Solids (TDS)	Monthly
	Specific Conductance	Monthly
	UV Transmittance (Grab)	Monthly
	Total Coliform/E. coli	Monthly
	HPC	Monthly
	1,2,3-TCP	Monthly
	PFAS	Quarterly
	VOCs and SVOCs (report TICs)	Annually
	Total Organic Carbon (TOC)	Annually
	Nitrosamines	Annually
	Cr(VI)	Annually
	Title 22 Inorganic Chemicals (Table 64431-A), except asbestos	Annually
	Perchlorate	Annually
	Langelier Index	Annually

2.4.2 Treatment Process Monitoring

The City must conduct compliance monitoring as well as monitoring to evaluate performance of treatment processes. Additional details must be provided in an OMMP approved by the Division. Monitoring is subject to Division review and approval. All analytes must be sampled with drinking water analytical methods that meet those specified in CCR, Title 22, Section 64415 (Laboratory and Personnel). Unregulated chemicals must be monitored with methods approved by the Division.

Table 24: Treatment Process Monitoring at Olympic AWTF

Sample Location and PS Code	Parameter	Monitoring Frequency
UV/AOP Combined Influent (Before H_2O_2 addition) (CA1910146_072_010)	Complete Title 22 VOCs	Weekly for one year of operation. Monthly after one year of operation pending review and approval by the Division.
	1,4-Dioxane	Weekly for one year of operation. Monthly after one year of operation pending review and approval by the Division.
	UV Transmittance (Online)	Continuous monitoring with online analyzer.
	UV Transmittance (Grab)	Weekly
	Nitrate	Monthly
	Nitrite	Monthly
	Alkalinity	Monthly
	Calcium	Monthly
	Total Hardness	Monthly
	Sulfate	Monthly
	Total Dissolved Solids (TDS)	Monthly
	Specific Conductance	Monthly
	pH (Grab)	Monthly
	Total Coliform/E. coli	Monthly
	HPC	Monthly
	Temperature	Monthly
	Total Organic Carbon (TOC)	Monthly
	Nitrosamines	Monthly
UV/AOP Combined Influent (After H_2O_2 addition) (CA1910146_072_011)	Hydrogen peroxide	Continuous monitoring with online analyzer or chemical feed flow meter.
	Hydrogen peroxide (Grab)	Weekly
	UV Transmittance (Grab)	Weekly
UV/AOP Combined Effluent (CA1910146_072_012)	Complete Title 22 VOC	Once after system initial start-up or re-startup per the approved OMMP. Weekly
	1,4-Dioxane	Weekly
	Nitrosamines	Monthly
	Nitrate	Monthly

Sample Location and PS Code	Parameter	Monitoring Frequency
	Nitrite	Monthly
	Alkalinity	Monthly
	Calcium	Monthly
	Total Hardness	Monthly
	Sulfate	Monthly
	Total Dissolved Solids (TDS)	Monthly
	Specific Conductance	Monthly
	UV Transmittance (Grab)	Weekly
	Total Organic Carbon (TOC)	Monthly
	pH (Grab)	Monthly
	Total Coliform/E. coli	Monthly
	HPC	Monthly
	Temperature	Monthly
	Hydrogen peroxide (Grab)	Weekly
	Formaldehyde	Annually
	Glyoxal	Annually
	Chloropicrin	Annually
	Acetaldehyde	Annually
	Total Trihalomethanes (TTHM)	Annually
	Haloacetic Acids - Five (HAA5)	Annually
Individual GAC Vessel Effluents	Hydrogen peroxide (Grab)	Weekly at lag vessel effluent If >0.2 mg/L at Combined GAC Effluent, perform corrective actions per OMMP and put train back in operation, Test again and confirm peroxide less than 0.2 mg/L.
	Total Coliform/E. coli	If positive for Total Coliform at Combined GAC Effluent, sample each Vessel within 48 hours

Sample Location and PS Code	Parameter	Monitoring Frequency
	Arsenic Antimony Iron Manganese Aluminum Nickel Uranium	After each time vessel is loaded with new media, backwashed, and soaked per approved OMMP. After sufficient data collection, and per approval from the Division, this monitoring may be moved to GAC combined effluent.
GAC System Combined Effluent (Compliance Point) (CA1910146_072_013)	Hydrogen peroxide (Grab)	Weekly
	Complete Title 22 VOCs	Monthly
	1,4-Dioxane	Monthly
	Nitrosamines	Annually
	1,2,3-TCP	Monthly
	PFAS	Quarterly
	Total Coliform/E. coli	Monthly Once after system initial start-up or re-startup
	HPC	Monthly Once after system initial start-up or re-startup
	Nitrate	Continuous monitoring with on-line analyzer.
	Nitrate (Grab)	Weekly
	pH (Grab)	Weekly
	VOC and SVOCs with TIC reported	Annually
	Total Organic Carbon (TOC)	Annually
	Cr(VI)	Annually
	Perchlorate	Annually

2.4.3 Water Quality Surveillance Plan

The Process Memo 97-005-R2020 notes that "supplemental monitoring wells are typically required to provide periodic glimpses of the original contamination and to provide an early warning in the case of unexpectedly high concentrations or new contaminants. The water quality surveillance plan should include specific proposed monitoring wells to provide early warning of any unexpected increases in contaminant concentrations or detections of additional contaminants, so that appropriate actions can be taken (97-005-R2020, p. 11). Early monitoring allows verification if existing treatment is adequate for new contaminants or concentrations.

The City must conduct monitoring at upgradient monitoring wells between the origin of the contamination and the production wells treated in this Project per the upgradient surveillance plan in an OMMP reviewed and approved by the Division.

3. APRAISAL OF SANITARY HAZARDS & PUBLIC SAFETY HAZARDS

3.1 California Environmental Quality Act

The California Environmental Quality Act (CEQA) applies to proposed projects initiated by, funded by, or requiring discretionary approvals from state or local government agencies. The proposed Olympic Well Field Restoration and Arcadia Water Treatment Plant Expansion Project (Project) constitutes a project as defined by CEQA (California Public Resources Code, Section 21065). The City is proposing to obtain financial assistance for the approved project through the Local Resources Program (LRP) that is administered by Metropolitan Water District of Southern California. The LRP provides financial incentives to public and private water agencies to encourage local development of water recycling, groundwater recovery, and seawater desalination.

A Mitigated Negative Declaration (MND) was prepared by the City to analyze and disclose the approved project's environmental impacts pursuant to the CEQA. The MND (State Clearinghouse No. 2020070129) was adopted by the Santa Monica City Council on November 23, 2020. The project described and analyzed in the MND is composed of three primary elements: (1) Olympic Well Field Restoration, (2) Olympic Pipeline, and (3) Olympic AWTF and Arcadia WTP Production Efficiency Enhancement and Expansion (Arcadia WTP Expansion).

3.2 Evaluation of Process Memo 97-005 Submittal

The Division issued the original Policy Memo 97-005 on November 5, 1997, as a policy guidance for direct domestic use of extremely impaired sources. The Policy Memo 97-005 was revised on September 21, 2020 (SWRCB-DDW, 2020). The purpose of the Revised Process Memo 97-005 is to set forth the process and principles by which the Division would evaluate the proposals, establish appropriate permit conditions, and approve the use of an extremely impaired source for direct potable use. The Revised Process Memo's evaluation elements that must be addressed are listed below.

1. Drinking water source assessment and contaminant assessment
2. Full characterization of raw water quality
3. Drinking water source protection
4. Effective treatment and monitoring
5. Human health risks associated with failure of proposed treatment
6. Completion of the CEQA review of the project
7. Submittal of permit application
8. Public hearing
9. Drinking evaluation and recommendations

Completion of CEQA requirements, Item 6, is discussed in Section 3.1 of this report. A permit amendment application was submitted to the Division by the City on 02/08/2023, which satisfies Item 7 noted above. A copy of the permit amendment application is included in Appendix A of this report. The first five elements listed above have been submitted by the City to the Division in final technical reports dated May 2020, August 2021, October 2020, July 2022, and October 2022. The 97-005 technical reports were reviewed by the Division and an acknowledgment letter was issued by the Division to the City dated November 23, 2022. Evaluation of the 97-005 Elements one through five follows.

3.2.1 Drinking Water Source Assessment and Contaminant Assessment

This section includes a discussion of Drinking Water Source Assessment (SA) and Contaminant Assessment (CA), based on Step 1 of 97-005 Evaluation Report submitted by the City.

The SA section provides an assessment of the physical boundaries and chemical characteristics of groundwater that may flow to and be pumped by the production wells. The assessment delineates the groundwater capture zone and identifies origins of contaminants found in the source water, predicts contaminant trends, and possible contaminating activities within the capture zone. The purpose of the CA is to provide a characterization of the contamination of soils and groundwater at and around the contamination and former contamination sites located within the long-term capture zone or watershed areas of the drinking water source. Relevant investigations, cleanup, and monitoring wells are discussed as well as regulated and non-regulated chemicals.

For the CA, all contaminants with potential health effects must be identified and considered. The project applicants must also identify the list of contaminants of concern and the potential contaminants of concern for the proposed drinking water sources. The contaminant concentration ranges ascertained in the CA are used in the subsequent step of estimating the concentration of contaminants at the inlet of the proposed treatment equipment. If contaminants are found to be detectable at the production wells, their treatability must be evaluated to see if they can be removed.

The following is the condensed information from the detailed discussions in the 97-005 report prepared by ICF dated May 2020.

The City has been producing water from the Olympic Well Field since the mid-1970s. Volatile organic compounds (VOCs) were first observed in drinking water wells in the late 1970s. At that time, very little was understood regarding the occurrence and distribution of VOCs in the Olympic Well Field. By the mid-1980s, it became apparent to the City that The Gillette Company (Gillette) had conducted activities since the 1950s that likely led to the release of VOCs, including PCE, TCE, and 1,4-dioxane to the groundwater. Later, a facility formerly operated by The Boeing Company (Boeing) was also identified as a VOC source. The City directed both Gillette and Boeing to conduct site investigations to define the occurrence and distribution of dissolved-phase VOCs in groundwater at and adjacent to their respective sites.

In 2008, LA-RWQCB issued a cleanup and abatement order (CAO) to Gillette. In late 2012, LA-RWQCB issued a CAO to Boeing. Both CAOs required ongoing site cleanup, additional site investigation, and monitoring. In 2011 and 2012, the City entered into settlement and release agreements (SRAs) with Gillette and Boeing, respectively. As part of the SRAs, the City assumed responsibility for the restoration of groundwater quality in the Olympic Well Field. Restoration activities included as-needed plume delineation, demonstration of plume control, and on-going quarterly monitoring. In addition to these requirements, the City volunteered to prepare a numerical groundwater flow and transport model to confirm previously conducted analytical flow modeling and to assist in the long-term management of Olympic Well Field.

Groundwater in the Olympic Well Field occurs principally in four zones: B-, C-, and D-Zones (local designations) and the Sunnyside Aquifer (regional designation). The two existing and operational production wells in the Olympic Well Field, SM-4 and SM-3, produce from all four zones. VOC contamination has been observed in B- and C-Zones from the extensive groundwater monitoring well network. Monitor wells in the Olympic Well Field have been subject to quarterly sampling and monitoring for nearly two decades. Analytical and aquifer parameter data collected from the monitoring wells have enabled the City to develop a comprehensive understanding of the occurrence and distribution of well field contamination. In summary, four VOCs have been detected in monitoring wells and production wells at or above MCLs) or notifications levels (NLs): PCE, TCE, 1,4-dioxane, and 1,2,3-TCP. The City is required to provide quarterly monitoring reports to LARWQCB to demonstrate that the PCE and TCE contaminant plumes, which are subject to the SRAs, are within the pumping radius of influence (i.e., capture zone) of the production wells. This requirement has been met since

2011 via monitoring results, which include, groundwater flow maps and contaminant iso-concentration maps, and by numerical groundwater modeling.

3.2.2 Full Characterization of Raw Water Quality

The end product of this step is to characterize the quality of the water that will be fed into the treatment system so that the treatment system is properly designed. This should include an evaluation of all the contaminants found present in the CA and whether they are or will eventually appear at the production or extraction wells and plant influent (SWRCB-DDW, 2020, p. 8).

The following is condensed information from the detailed discussions in the 97-005 report prepared by Advisian dated August 2021 (Appendix D).

A series of data analyses were conducted to evaluate raw water quality to meet the primary objective of characterizing influent water quality that will enter the planned treatment system so that an appropriate level of monitoring and treatment can be designed. This included screening of water quality data against specific criteria and regulatory values to identify constituents of potential concern (COPCs), analyzing water quality data to estimate future treatment plant influent concentrations, trend analysis for historical water quality to understand how water quality trends have changed over time, and analysis of variability to develop an understanding of how water quality has changed under the influence of certain factors such as pumping and seasonal variation in precipitation. An initial screening of water quality data indicated 42 COPCs based on constituents detected in production wells (or constituents with three or more detections in monitoring wells), with a ratio of maximum concentration to maximum contaminant level (MCL) or notification level (NL) greater than 0.05 (5%). The list of COPCs was then further refined to determine which would drive treatment system design based on constituents which are synthetic organics and had a ratio of maximum concentration to MCL or NL greater than 0.5 (50%).

The results of Statistical analysis and flow-weighting calculations indicated four COPCs are projected to be at concentrations above their respective MCL or NL in treatment plant influent. These COPCs are 1,4-dioxane, PCE, TCE, and 1,2,3-TCP.

Trend analysis was performed on available temporal production well data for COPCs to inform potential future concentration trends and design of the treatment system. Key outcomes from the trend analysis include the identification of statistically significant increasing trends for PCE and 1,4-dioxane. Although no statistically significant trend was identified for TCE, visual assessment of trend charts indicates that recent concentrations collected between 2018 and 2020 are rebounding to the elevated levels recorded between 2012 and 2014. No statistically significant or visual trend was identified for 1,2,3-TCP. Visual assessment indicated nitrate and nitrite (as nitrogen) exhibited variability since the start of the analysis period in 2012 with no discernible trend identified. Visual assessment of other COPC trends generally indicated that parameters with concentrations above detection limits remained stable during the analysis period between 2012 and 2020.

3.2.3 Drinking Water Source Protection

Pursuant to Process Memo 97-005, for an extremely impaired source to be used as an approved drinking water supply, there needs to be a program in place to prevent the level of contamination from rising and to minimize dependence on treatment for contaminant removal.

The 97-005 Report submitted by the City to address this step prepared by ICF dated October 2020 provides the information related to the various remediation programs, cleanup actions, mitigation measures, and regulations applicable to the protection of the drinking water source for Olympic Well Field capture zones (Appendix D).

3.2.4 Effective Treatment and Monitoring

Pursuant to Process Memo 97-005, the project submittal must include a treatability assessment for all contaminants projected to be detectable at the production or extraction wells. The project must address all contaminants of health concern and to treat down to the lowest concentration feasible. The submittal must also include a sampling and analysis plan for the drinking water source(s) and at appropriate locations in the treatment plant. Monitoring associated with a proposal to use an extremely impaired source as a drinking water supply will also require more extensive monitoring, in terms of frequency of testing as well as numbers of contaminants, than is associated with typical drinking water sources. The water quality surveillance plan should include specific proposed monitoring wells or monitoring locations and a proposed sampling and analysis plan. The purpose of these requirements is to provide early warning of any unexpected increases in contaminant concentrations or detections of additional contaminants so that appropriate actions can be taken. The City has addressed these elements in a 97-005 report submittal prepared by Brown and Caldwell dated September 2022 (Appendix D). The MCL-equivalent assessment was conducted under two separate scenarios for the initial and contingency design and resulted in sums of ratios being less than 1 for all groups of contaminants, including contaminants with acute endpoints, chronic cancer endpoints, and chronic non-cancer endpoints. MCL-equivalent tables can be found in the Step 4 97-005 Evaluation Report in Appendix D.

3.2.5 Human Health Risks Associated with Failure of Proposed Treatment

The Process Memo 97-005 calls for an evaluation of the risks of failure of the proposed treatment system and an assessment of the potential health risks associated with such failures. The City has addressed these elements in a 97-005 report submittal prepared by Brown and Caldwell dated July 2022 (Appendix D).

Concentrations of COPCs expected from the Olympic Wells and anticipated removals from each treatment process were used to calculate expected COPC concentrations in Arcadia WTP's final treated water. Critical events were identified and translated into potential treatment failures, and the impact of these failures on the final treated water COPCs was evaluated. The potential failure scenarios included complete failure of the Olympic AWTF and Arcadia WTP. Failure was conservatively assumed to occur twice over a 20-year period. Concentrations of COPCs expected at the final treated water of the Arcadia WTP were used to calculate carcinogenic risk and noncarcinogenic hazard estimates associated with exposure to untreated or insufficiently treated water. Two scenarios were considered: with all groundwater wells operating at the design flow (Olympic, Arcadia, and Charnock wells) or with only the Olympic Wells.

The results of the human health risk assessment indicate that the total cancer risks will not exceed the threshold of $1x10^{-6}$ if all the treatment processes of the Olympic AWTF and Arcadia WTP completely fail (including duty and standby units) and only the Olympic wells are in operation.

Total Hazard Index values remained at the threshold level of 1.0 if the Olympic AWTF and Arcadia WTP completely fail (i.e., failure of the duty and standby units of all treatment processes) while they are treating all groundwater wells. The total Hazard Index values increase to 2.9 if the Olympic AWTF and Arcadia WTP are treating the Olympic wells only. To address this, the City noted that treating water from the Olympic wells only while all the treatment process units of the Olympic AWTF and Arcadia WTP have failed is extremely unlikely considering the preventive methods and design features that are in place. In such an extreme situation, both the Olympic AWTF and Arcadia WTP would be shut down and the City would distribute water treated by Metropolitan Water District of Southern California.

3.2.6 Completion of California Environmental Quality Act Requirements

CEQA for this permit has been completed as discussed in Section 3.1 of this report.

3.2.7 Commissioning and Acceptance Testing

The Olympic AWTF Performance Test was conducted on September 22, 2023, and October 2, 2023 through October 5, 2023 to confirm the Olympic greensand filters, UV/AOP, and GAC systems satisfy operational and treatment performance criteria.

The City submitted the Acceptance Test Report to the Division on June 5, 2024 (Appendix H). Acceptance testing was the final phase of start-up and performance testing for the Olympic AWTF. The objective was to verify performance and reliability of all Olympic AWTF equipment (i.e., greensand filters, UV/AOP, GAC, and FRRO) across anticipated ranges of treatment conditions over a seven (7) day period. The 7-day acceptance test was conducted from February 12, 2024 through February 18, 2024 and

confirmed that the UV/AOP, GAC, and FRRO systems satisfy treatment and operational performance criteria during full operation of the expanded Arcadia WTP and Olympic AWTF.

During the 7-day acceptance test period, the Arcadia WTP and Olympic AWTF were operated fully and in automatic mode for seven consecutive days. Source water quality monitoring samples were collected for the Olympic wells (SM4) and the greensand effluent from the Charnock WTP. New and modified unit processes and finished water were monitored and sampled daily to confirm operational and treatment performance. Each treatment process during the test period was monitored for COPCs to document removals across each treatment unit. The existing reservoir aeration system was not operated during the 7-day acceptance test as the mechanical surface aeration system was removed following DDW approval on June 23, 2023. All treated water during the acceptance test period was discharged to the reservoir, where it was subsequently pumped to the storm drain system via temporary pumps.

Importantly, the testing included evaluating the accuracy of the UV/AOP control equations for predicting contaminant log reductions. The UV/AOP system achieved the 1,4-dioxane compliance log removal setpoint and programmable logic controller (PLC)-predicted log removal for all tests under design conditions with a 2.4-log removal target, scavenging term of 130,000 s^{-1}, UVT greater than 96 percent, and flow ranging from 1,000 to 2,000 gpm. All UV/AOP effluent samples during the 7-day Acceptance Test were below the method reporting limit for 1,4-dioxane, PCE, and TCE. Based on the results of the testing, the City will use the UV/AOP's "Dynamically Adjusted Control Algorithm" with a variable lamp power and H_2O_2 dose. Compliance log removal setpoints will be 2.4-log, 2.2-log, and 2.3-log for 1,4-dioxane, TCE, and PCE respectively. The system will be operated with an operational log removal setpoint of 10% greater than the compliance log removal with design scavenging term of 130,000 s^{-1}.

The GAC system quenched all H_2O_2 residual to non-detect for all test conditions during the 7-day acceptance test period. All RO trains were operated in flow reversal mode at 90 percent recovery and 1,900 gpm feed flow. For the duration of the duration of the test period, pH was above 6.6 and antiscalant (Vitec 4000) was dosed at 4.5 mg/L. The full suite of COPC water quality sampling was collected daily on the RO feed and RO combined permeate. The full suite of COPC water quality sampling was collected daily on the decarbonator influent and decarbonator effluent. All COPCs were below the DLR in the decarbonator feed except for TCE at 2.7 to 4.4 µg/L. TCE was measured in the RO feed contributed by the 4-15 µg/L in the Charnock WTP source water and not well removed by RO. The decarbonator reduced TCE to below the reporting limit for all test conditions, except for Day 1 at 0.57 µg/L, which is below the MCL of 5 µg/L.

The Arcadia final effluent samples met the primary MCLs, secondary MCLs, action levels, and notification levels goals, as wells as a COPC MCL-equivalent of less than 1.

3.2.8 Public Hearing and Comment

Public comment may be part of the permitting process for extremely impaired sources. The City has informed its customers of the proposed treatment facilities, the contaminants of primary concern, and the added wells that are designated as extremely impaired sources.

The City invited public comment and informed its customers of the methods of comment, the duration of the comment period, and the repository locations of the Division's draft permit and engineering report subject to public comment. The public notice instructed that interested parties should submit comments to the City starting XX XX, 202X and that the comments must be dated or postmarked no later than XX XX, 2024. The Division's draft permit and engineering report were available for review at xxx and online at the City's website. The public comment period was concluded on XX XX, 202X and a public hearing meeting was held at xxx on XX XX, 202X.

4. CONCLUSIONS AND RECOMMENDATIONS

The State Water Resources Control Board, Division of Drinking Water finds that the sources, works, and operation, as described in this report can provide safe, wholesome, and potable water supply. It is anticipated, based upon available information, that the quality of water delivered will meet all applicable State Drinking Water Standards. Issuance of an amended domestic drinking water supply permit by the Division to the City of Santa Monica is recommended subject to the following conditions:

General Conditions

1. This document amends and adds to the domestic water supply permit issued to City of Santa Monica (City) by the Division on xx xx, xxxx and subsequent amendments. If any provision of this amendment conflicts with the permit and its subsequent amendments, the provisions of this amendment must be followed.

2. The City must comply with all requirements set forth in the California Safe Drinking Water Act, California Health and Safety Code, and any regulations, standards, or orders adopted thereunder.

3. The only sources approved for potable water supply are listed below. No other source can be used without first obtaining an amended permit from the Division.

Groundwater Sources

Source	PS Code	Status	Capacity (gpm)
Santa Monica Well 1	CA190146_012_012	Active	250
Arcadia Well 5	CA190146_001_001	Active	250
Arcadia Well 4	CA190146_003_003	Active	250
Charnock Well 13	CA190146_005_005	Active	1,500
Charnock Well 16	CA190146_008_008	Active	2,098
Charnock Well 18	CA190146_010_010	Active	1,800
Charnock Well 19	CA190146_011_011	Active	2,000
Charnock Well 20	CA190146_073_073	Active	1,200

Groundwater Sources Added in this Permit

Source	PS Code	Status	Capacity (gpm)	Comments
Santa Monica Well 8	CA1910146_072_072	Active	700	Approved source for Olympic Advanced Water Treatment Facility
Santa Monica Well 9	CA1910146_073_073	Active	900	

Interconnections

Source	PS Code	Status	Capacity (gpm)
MWD Connection SMN-1	CA190146_024_024	Active	19.4 MGD
MWD Connection SMN-2	CA190146_025_025	Active	15 MGD

4. The only treatment facilities approved and permitted for use by the City are listed in the table below. No other sources and/or treatment facilities other than those outlined can be added and no changes, modifications, or additions to the treatment processes listed in this provision can be made without receiving approval through an amended domestic water supply permit from the Division.

Treatment Facilities

Facility	Treatment	Classification
Charnock (WTF)	Treat Charnock Wells 13, 16, 18, 19, and 20 with Greensand filtration (pre-treatment) and GAC treatment for VOCs, MTBE, and TBA	T5
Olympic AWTF	Treat water produced by Wells SM-8 and SM-9 with Ultraviolet Advanced Oxidation Process (UV/AOP) and LGAC for 1-4-dioxane and VOCs	
Arcadia WTP	Greensand filtration (pre-treatment), reverse osmosis (RO), decarbonation, fluoridation	

The primary station codes (PS codes) associated with Olympic Advanced Water Treatment Facility (AWTF) are provided in the table below.

Olympic AWTF Sample Points

Treatment Facility	Sampling Point Name	PS Code
Olympic AWTF	UV/AOP Combined Influent (Before H_2O_2 addition)	CA1910146_072_010
	UV/AOP Combined Influent (After H_2O_2 addition)	CA1910146_072_011
	UV/AOP Combined Effluent	CA1910146_072_012
	GAC System Combined Effluent	CA1910146_072_013

5. All water supplied by the City for domestic purposes must meet all maximum contaminant levels (MCLs) established by the Division. If the water quality does not comply with California drinking water standards, additional treatment must be provided to meet standards, subject to permit approval.

6. The City must maintain a current water quality emergency notification plan (WQENP) identifying how customers will be notified in the event of a water quality emergency. The City must refer to the WQENP for phone numbers to contact the Division after normal business hours in the event of a water quality emergency. The City must immediately notify, in accordance with the WQENP on file, the purveyors receiving the treated water and the Division after learning that the City treated water contains total coliform or fails to comply with any maximum contaminant level (MCL), any provision in this permit, or any order issued under applicable laws and regulations.

Cross-Connection Control Program

7. The City must comply with the Division's Cross-Connection Control Policy Handbook and subsequent regulations and policy handbooks to prevent the water system and treatment facility from being contaminated by possible cross-connections. The City must maintain a

program for the protection of the domestic water system against backflow from premises having dual or unsafe water systems in accordance with the Division's Cross-Connection Control Policy Handbook and subsequent regulations and policy handbooks. All backflow preventers must be tested at least annually.

Additives

8. The City must only use direct additives in water that have been tested and certified as meeting the specifications of National Sanitation Foundation International/American National Standard Institute (NSF/ANSI) Standard 60, pursuant to CCR, Title 22, Section 64590. This requirement must be met under testing conducted by an ANSI accredited product certification organization.

9. The City must only use indirect additives, chemicals, materials, lubricants, or products that have been tested and certified as meeting the specifications of NSF/ANSI Standard 61, pursuant to CCR, Title 22, Section 64591, in the production, treatment, or distribution of drinking water that will result in its contact with the drinking water. This includes process media, protection materials (i.e. coating, linings, liners), joining and sealing materials, pipe and related products, and mechanical devices used in treatment/transmission/distribution systems, unless conditions listed in CCR, Title 22, Section 64593 are met. This requirement must be met under testing conducted by a product certification organization accredited for this purpose by ANSI.

Annual Reports

10. The City must submit an electronic Annual Report (eAR) to the Division of Drinking Water each year, documenting specific water system information for the prior year. The report must be in the format specified by the Division.

11. The City must prepare and submit an annual report to the Division, which must include the status and condition of the Olympic AWTF, technical review and summary of performance and compliance with the permit, any treatment failures, upsets, or difficulties encountered by the City in the year prior. The report should also note if there is an increase in concentration for contaminants not reliably removed by the existing treatment system, if there are changes to MCLs, notification levels (NLs), response levels (RLs), public health goals (PHGs), or United States Environmental Protection Agency (USEPA) health advisories, and should evaluate the potential impact on the MCL-equivalent calculations.

12. The City must prepare and submit annually to the Division a report, which must provide an evaluation and technical review of the water quality data gathered from the upgradient surveillance wells and other upgradient production wells and discuss any changes in the characteristics of the plume and the possible impact on the wells feeding Olympic AWTF.

Consumer Confidence Report

13. The City must prepare a Consumer Confidence Report on an annual basis at a minimum, which must be distributed to customers and a copy provided to the Division by July 1 of each year.

Records

14. The City must maintain an operator logbook detailing the operator's daily notes related to the operation of Olympic AWTF. The status and production of wells must be recorded daily. The treatment facilities must be inspected daily for any abnormal occurrences including, but not limited to, leaks, unusual noises, or pressure readings. The logbook must be kept for at least five years and made available for the Division to review when requested.

15. All instruments, including but not limited to, chemical analyzers and flow meters, must be calibrated at the frequencies and by methods recommended by their respective manufacturers. Records for all instrument calibrations must be maintained by the City and made available to the Division when requested. Records of the calibrations must be maintained for at least five years.

16. The City must keep complete records of any emergency and scheduled interruptions in water service. These records should include:

    a. Location of the problem
    b. Cause of the interruption
    c. Date and approximate time of the problem
    d. Precautions taken to minimize contamination of the supply and notification of affected users.

Production Wells

17. Prior to operation, all wells must be demonstrated to be in accordance with California Department of Water Resources (DWR) Bulletins 74-81 and 74-90 and American Water Works Association (AWWA) Standard A100-06 for Water Wells. If wells are not in accordance, the City must obtain written waiver or approval from the Division.

18. Well production data must be recorded at least monthly.

19. The City must monitor its active sources for all primary inorganic and organic chemicals, radionuclides, and secondary standard constituents in accordance with CCR, Title 22, Chapter 15; the most recent Vulnerability Assessment and Monitoring Frequency Guidelines issued by the Division; and specific permit provisions.

20. If any regulated chemicals are newly detected in the wells that were not previously detected during any monitoring event, the City must do the following:
    a. As soon as possible within 24 hours, notify the Division of the detection.
    b. Within seven days of being notified by the laboratory, resample to confirm the presence and concentration of the detected contaminant.
    c. If confirmed, contact the Division and discuss the subsequent monitoring schedule for the newly detected chemical.

21. If any unknown chemicals or Unregulated Chemicals Requiring Monitoring (UCMR) are newly detected in the wells, that were not previously detected, during any monitoring, the City must notify the Division within seven days to discuss a sampling plan.

22. Notification levels are health-based advisory levels established by the Division for chemicals in drinking water that lack maximum contaminant levels (MCLs). Notification levels are advisory levels and not enforceable standards. If a chemical is detected above its notification level in a drinking water source, the City must notify the local governing bodies within 30 days of being informed of the confirmed detection.

23. Bacteriological samples must be taken from the wells and the result confirmed to be negative before placing the wells into service after a repair, after a well is permitted, or after a well has not been in operation for more than three months. The City must monitor the wells for total coliform, and E. coli whenever necessary, in accordance with the Groundwater Rule. The results of the monitoring must be reported to the Division by the tenth day of the month following the reported month. Triggered bacteriological groundwater source monitoring must be conducted in accordance with Groundwater Rule.

24. Any well testing positive for fecal coliform or E. coli in their repeat sample set must be removed from service, disinfected, pumped to waste until zero chlorine residual is obtained, and re-sampled after 24 hours for coliform and heterotrophic bacteria using the cycle test procedure. All re-samples must be negative for coliform and have a heterotrophic plate count (HPC) less than 500 colonies/mL prior to placing the source back into service. If removal of the well from service may result in a water outage or failure of a drinking water standard, the City must contact the Division to discuss interim requirements for the use of this source.

25. Prior to operation of Wells SM-8 and SM-9, the City must collect the required samples from Wells SM-8 and SM-9 to fully characterize their water quality pursuant to the guidelines specified in Process Memo 97-005 and submit the analytical results to the Division for review and approval.

Olympic Advanced Water Treatment Facility General Conditions

26. Wells SM-8 and SM-9 are the only approved sources for Olympic AWTF and all water produced by SM-8 and SM-9 must be treated by all Olympic AWTF treatment processes.

27. Olympic AWTF is approved for a maximum flow capacity of 2,000 gallons per minute of treated water. It must not be operated at a daily flow in excess of this capacity without first applying for and obtaining an amended permit from the Division.

28. Olympic AWTF, using two trains of greensand filters, two trains of UV advanced oxidation process (UV/AOP) in duty/standby mode, and four granular activated carbon (GAC) trains in lead/lag configuration (8 vessels), is an approved water treatment facility for 1,4-dioxane and volatile organic chemicals for Wells SM-8 and SM-9. Changes in treatment, sources, or chemicals treated will require a permit amendment. Changes in operation require Division review and approval.

29. Olympic AWTF must be operated, maintained, and monitored per the approved Operations, Maintenance, and Monitoring Plan (OMMP) and any accompanying manufacturer's specifications or manuals. Subsequent changes and revisions to operations are subject to Division review and approval. At any time, the Division may require a plan to be modified due to changing conditions, changes in laws or regulations, or concerns of the public.

30. Within 120 days of receiving this permit amendment, the City must submit a revised Olympic AWTF OMMP to the Division for review and approval. The City must revise the OMMP to incorporate all the conditions specified in this permit amendment and changes in operation procedures.

31. At least once every five years, the City must prepare and submit a report to the Division including updated MCL-equivalent calculations for Olympic AWTF to verify the MCL-equivalent is 1 or less and re-evaluating the project components impacted by significant changes such as changes in influent or upgradient water quality, detection of new chemicals, and increasing concentration trends that may not be reliably removed by the existing treatment system. If new or revised MCLs, NLs, RLs, PHGs, or USEPA Health Advisories have been published, the report must also include updated MCL-equivalent calculations. Accordingly, raw water quality for the capture zones must be updated based on the most current water quality data. Updated groundwater modeling will be required if warranted by significant differences between the actual field data and information provided in the current 97-005 report.

Ultraviolet Light Advanced Oxidation Process

32. Each TrojanUVFlex reactor treatment train must be operated within the highest demonstrated flow rate of 2,000 gpm per train. There is no treatment bypass allowed.

33. The UV/AOP treatment system objective is to deliver treated water with 1,4-dioxane and VOC concentrations that are non-detect and less than the detection limit for purposes of reporting (DLR). If these levels are exceeded at the UV/AOP combined effluent, corrective action must be taken immediately.

34. Unless otherwise approved by the Division in writing, the UV/AOP system must be operated with the following conditions as noted in the approved OMMP:

    a. Utilizing the programmable logic controller (PLC) automatic control function to control electrical energy input and H_2O_2 dose in response to the changing flow rates and UV transmittances.
    b. Setting the 1,4-dioxane; PCE; and TCE log removal values in the PLC automatic control system to be no less than 2.4-log, 2.3-log, and 2.2-log, respectively. After one year of operation and collection of data, this setting may be adjusted per Division review and approval.
    c. Setting the Hydroxyl Radical Scavenging Demand Term in the PLC automatic control system to no less than 150,000 s^{-1}.

35. Unless alternative lamps are approved for use by the Division, all replacement lamps for the TrojanUVFlex reactors must be identical to the lamps used during the 2023 performance testing (TrojanUV Solo™ Lamp 1000 W, part number: 908081-005). Specifications for the replacement lamps must be identified in the OMMP.

36. To verify the effectiveness of the TrojanUVFlex reactors in removing 1,4-dioxane and VOCs, the City must sample the combined effluent of the UV reactors for 1,4-dioxane and VOCs at approved frequencies in this permit. When 1,4-dioxane or VOCs are detected in

the combined effluent of the UV reactors, the City must sample individual UV trains for the detected chemical(s) in order to identify the reactor(s) in question.

37. The City must monitor the formation of the oxidation by-products and must sample the combined effluent of the UV reactors for potential oxidation by-products such as: Acetaldehyde, formaldehyde, glyoxal, and any other by-products detected subsequently at the approved frequencies listed in the table in Condition 54.

Liquid Phase Granular Activated Carbon (GAC)

38. The GAC treatment system objective is to deliver treated water with H_2O_2 concentrations less than 0.2 mg/L and 1,2,3-TCP below the DLR. If these levels are exceeded at the GAC combined effluent, corrective action must be taken immediately.

39. The GAC treatment system must not be operated above its maximum design capacity of 1,000 gpm per vessel. In addition, the GAC vessels must not be operated below a minimum of 500 gpm, to minimize the potential of channeling effect caused by insufficient pressure drop across the vessel. The minimum empty bed contact time (EBCT) for each GAC vessel must be 5 minutes. There is no treatment bypass allowed.

40. The City must conduct GAC treatment startup monitoring for the constituents listed in Condition #54 for initial start-up after each GAC loading or re-start up after the GAC system has been removed from service.

41. Both the initial and replacement carbon media utilized in the GAC vessels must be in accordance with the specifications identified in the OMMP reviewed and approved by the Division. The GAC adsorbers must be maintained according to the manufacturer's specifications. Any change of the carbon specifications must be approved in writing by the Division.

42. The carbon media must be changed out and replaced according to the criteria specified in the OMMP reviewed and approved by the Division. The City must implement a Division approved arsenic leach test protocol for all new GAC media installations and obtain Division written approval prior to placing vessels with new or replacement media into service.

43. Replacement carbon must be new carbon that complies with ANSI/NSF 61. Replacement carbon must meet the specifications identified in the OMMP. Any change of carbon specifications must be approved in writing by the Division.

Reverse Osmosis

44. The RO membrane elements must be operated under the conditions of flux, RO feed pressure, differential pressure and percent recovery specified by their manufacturer. Weekly conductivity profiles of permeate from each pressure vessel in each RO train must be recorded as a means of verifying the performance and integrity of the RO membranes.

45. The RO bypass flow must not exceed the percentage of the total flow specified in the Division-approved OMMP.

Olympic AWTF Upgradient Surveillance Wells Monitoring and Reporting

46. The designated monitoring wells must be sampled and monitored in accordance with the OMMP reviewed and approved by the Division which will include the constituents, frequency, and analytical methods in order to provide early detection of any new constituents or significant changes to concentrations of previously identified constituents that may impact the production wells. If any of these monitoring wells become unavailable, then the City must propose and drill replacement monitoring wells and continue the same monitoring program.

Olympic AWTF Source and Treatment Monitoring and Compliance

47. Except for bacteriological analyses and constituents without analyte codes, all water quality monitoring results obtained at a certified laboratory must be submitted to the Division's California Laboratory Intake Portal (CLIP) in an electronic deliverable format using the assigned PS codes.

48. All water samples for compliance purposes must be analyzed at a laboratory accredited by the Division's Environmental Laboratory Accreditation Program (ELAP) for each analytical technique. If no accreditation is available for a particular compound, the method and detection limit must be submitted for approval by the Division on a case-by-case basis.

49. The laboratory performing the analyses must be instructed to report all calibrated peaks on gas chromatographic/mass spectroscopic (GC/MS) analyses. Uncalibrated peaks on chromatographic analyses must be reported according to the September 10, 2003 Division guidance documents *Analysis and Reporting of Volatile Non-Target Organic Compounds in Extremely Impaired Water Sources and Recycled Water by Methods 524.2*, and *Analysis and Reporting of Non-Target Semi-Volatile Organic Compounds in Extremely Impaired Water Sources and Recycled Water Using Methods 3510C/8270 C*.

50. The City must monitor Olympic AWTF, including raw water and treated water, in accordance with the approved OMMP. Any proposed change in the monitoring frequencies of the raw water or treated water is subject to prior review and approval from the Division. The City must revise its raw water monitoring plan if additional chemicals were found in the upgradient surveillance wells that might threaten the quality of water produced by the production wells, new chemicals detected at the production wells, or the monitoring data indicate a rapid change in the contaminant concentrations and that more frequent monitoring is necessary.

51. If necessary, the Division may modify the monitoring requirements specified in this amendment based upon the review of operation and monitoring records. The City may request for modification of any monitoring requirements based upon substantiating operation and monitoring data.

52. Any change in the monitoring frequency of the raw water and treated water is subject to review and approval from the Division.

53. The sources for Olympic AWTF must be sampled for constituents noted below at frequencies no less than the minimum noted.

Olympic AWTF Source and Influent Monitoring Requirements

Sample Location and PS Code	Parameter	Frequency
Well SM-8 (CA1910146_075_075) Well SM-9 (CA1910146_076_076)	Complete Title 22 VOCs	Monthly
	1,4-Dioxane	Monthly
	Nitrate	Monthly
	Nitrite	Monthly
	Alkalinity	Monthly
	Calcium	Monthly
	Total Hardness	Monthly
	Iron	Monthly
	Manganese	Monthly
	Sulfate	Monthly
	Total Dissolved Solids (TDS)	Monthly
	Specific Conductance	Monthly
	UV Transmittance (Grab)	Monthly
	Total Coliform/E. coli	Monthly
	HPC	Monthly
	1,2,3-TCP	Monthly
	PFAS	Quarterly
	VOCs and SVOCs (report TICs)	Annually
	Total Organic Carbon(TOC)	Annually
	Nitrosamines	Annually
	Cr(VI)	Annually
	Title 22 Inorganic Chemicals (Table 64431-A), except asbestos	Annually
	Perchlorate	Annually
	Langelier Index	Annually

54. The Olympic AWTF UV/AOP unit process must be sampled for constituents noted below at frequencies no less than the minimum noted.

Olympic AWTF UV/AOP Monitoring Requirements

Sample Location and PS Code	Parameter	Frequency
UV/AOP Combined Influent (Before H_2O_2 addition) (CA1910146_072_010)	Complete Title 22 VOCs	Weekly for one year of operation. Monthly after one year of operation pending review and approval by the Division.
	1,4-Dioxane	Weekly for one year of operation. Monthly after one year of operation pending review and approval by the Division.
	UV Transmittance (Online) UV Transmittance (Grab)	Continuous monitoring with online analyzer. Weekly
	Nitrate	Monthly
	Nitrite	Monthly
	Alkalinity	Monthly
	Calcium	Monthly
	Total Hardness	Monthly
	Sulfate	Monthly
	Total Dissolved Solids (TDS)	Monthly
	Specific Conductance	Monthly
	pH (Grab)	Monthly
	Total Coliform/E. coli	Monthly
	HPC	Monthly
	Temperature	Monthly
	Total Organic Carbon (TOC)	Monthly
	Nitrosamines	Monthly
UV/AOP Combined Influent (After H_2O_2 addition) (CA1910146_072_011)	Hydrogen peroxide	Continuous monitoring with online analyzer or chemical feed flow meter.
	Hydrogen peroxide (Grab)	Weekly
	UV Transmittance (Grab)	Weekly

UV/AOP Combined Effluent (CA1910146_072_012)	Complete Title 22 VOC	Weekly Once after system initial start-up or re-startup per the approved OMMP.
	1,4-Dioxane	Weekly
	Nitrosamines	Monthly
	Nitrate	Monthly
	Nitrite	Monthly
	Alkalinity	Monthly
	Calcium	Monthly
	Total Hardness	Monthly
	Sulfate	Monthly
	Total Dissolved Solids (TDS)	Monthly
	Specific Conductance	Monthly
	UV Transmittance (Grab)	Weekly
	Total Organic Carbon (TOC)	Monthly
	pH (Grab)	Monthly
	Total Coliform/E. coli	Monthly
	HPC	Monthly
	Temperature	Monthly
	Hydrogen peroxide (Grab)	Weekly
	Formaldehyde	Annually
	Glyoxal	Annually
	Chloropicrin	Annually
	Acetaldehyde	Annually
	Total Trihalomethanes (TTHM)	Annually
	Haloacetic Acids – Five (HAA5)	Annually

55. The Olympic AWTF GAC unit process must be sampled for constituents noted below at frequencies no less than the minimum noted.

Olympic AWTF GAC Monitoring Requirements

Individual GAC Vessel Effluents	Hydrogen peroxide (Grab)	Weekly at lag vessel effluent If >0.2 mg/L at combined GAC effluent, perform corrective actions per OMMP and put train back in operation, test again and confirm peroxide less than 0.2 mg/L.
	Total Coliform/E. coli	If positive for total coliform at combined GAC effluent, sample each lag vessel effluent within 48 hours.
	Arsenic Antimony Iron Manganese Aluminum Nickel Uranium	After each time vessel is loaded with new media, backwashed, and soaked per approved OMMP. After sufficient data collection, and per approval from the Division, this monitoring may be moved to GAC combined effluent.
GAC System Combined Effluent (Compliance Point) (CA1910146_072_013)	Hydrogen peroxide (Grab)	Weekly
	Complete Title 22 VOCs	Monthly
	1,4-Dioxane	Monthly
	Nitrosamines	Annually
	1,2,3-TCP	Monthly
	PFAS	Quarterly
	Total Coliform/E. coli	Monthly Once after system initial start-up or re-startup
	HPC	Monthly Once after system initial start-up or re-startup
	Nitrate (Grab)	Weekly
	pH (Grab)	Weekly
	VOC and SVOCs with TIC reported	Annually
	Total Organic Carbon (TOC)	Annually
	Cr(VI)	Annually
	Perchlorate	Annually

56. Treatment compliance of Olympic AWTF for primary and secondary MCLs is calculated from all samples collected at the combined effluent of the GAC treatment system, PS code CA1910146_072_013. Calculation procedures must follow the specific contaminant and must be below the MCL.

Olympic AWTF Operation and Maintenance

57. All personnel who operate the treatment facilities must be certified in accordance with CCR, Title 22, Section 63765. The City is required to be operated by a chief operator possessing a minimum grade T5 operator certificate and a shift operator with a minimum T3 operator certificate.

58. The alarm set points as presented in the OMMP must not be changed without prior approval from the Division. In the event of an emergency, where changes to the alarm set points must be made immediately, the Division must be notified by the end of the next business day following an emergency change in the alarm set points.

59. The alarms and automatic shutdowns of the plant must be physically tested at least quarterly. Records of the quarterly testing must be maintained by the City and made available to the Division when requested.

60. Sampling ports, including for the production wells, the TrojanUVFlex reactors, and GAC vessels, must be maintained in good operating condition.

61. The City must establish a maintenance schedule for lamps, and set lamp life alarms, according to the recommendations of the manufacturer. Said recommendations must consider any estimated reduction in lamp life resulting from repeated lamp starts. The maintenance schedule and alarm set points must be included in the OMMP.

62. The City must minimize system downtime by working with the carbon supplier to arrange for timely carbon change out. However, if the shutdown lasts over two weeks, the vessels must be maintained according to manufacturer recommendations and as specified in the Division-approved OMMP. When the vessels are started up again, startup monitoring must be completed, and the carbon beds must be checked to see if disinfection of carbon bed is required. Once disinfection is completed, the vessel must be backwashed prior to startup.

63. If bacteriological growth in the GAC vessels causes the deterioration of bacteriological quality of the treated water, the City must remove the affected GAC trains from service until the cause of the excess growth is remedied and the facilities are cleaned.

Records and Reporting

64. A monthly monitoring report of Olympic AWTF must be submitted to the Division by the tenth day of the following month. At a minimum, the report must include:

    a. A summary of analytical results received by the City in the reporting calendar month.

    b. If the level of any of the contaminants treated in the Olympic AWTF effluent exceeds the treated water goals per the approved Olympic AWTF OMMP, the City must prepare and submit an updated MCL-equivalent assessment and calculation using the most recent analytical results at the Olympic AWTF effluent.

c. Any problem related to the testing of reliability features of the treatment facilities together with corrective action taken.

d. A summary of all contaminants in the upgradient surveillance wells, production wells, and the Olympic AWTF effluent detected at or above MCLs or NLs.

e. A summary of the bacteriological quality of the GAC combined system effluent.

f. A summary of Olympic AWTF operational records, including:

- The daily operation, time of use, and production of the wells.
- The daily operation, length of time in use, and production through each UV/AOP and GAC train.
- When the GAC carbon was last changed out
- Summary of all process monitoring
- Operation schedule and problems; both scheduled interruptions and any unscheduled interruption.

65. Copies of reports, inspections, and all treatment plant records must be kept for at least five years. Water quality records must be kept for at least ten years.

66. Within 24 hours of receiving notification from the laboratory, the City must notify the Division of any exceedance of an MCL or NL in the finished water leaving Olympic AWTF.