2025 Public Health Goals Triennial Report for 2022-2024

City of Tracy

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2025 Public Health Goal Triennial Report for 2022-2024

City of Tracy

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ABBREVIATIONS

ACWA	Association of California Water Agencies
AFY	acre-feet per year
BAT	best available technology
CA	California
CCR	California Code of Regulations
CCT	corrosion control treatment
City	City of Tracy
Cr3	trivalent chromium
Cr6	hexavalent chromium
CVP	Central Valley Project
DBP	disinfection by-products
DBPR	Disinfectants and Disinfection Byproducts Rule
DDW	Division of Drinking Water
DGWTP	Nick C. DeGroot Water Treatment Plant
DLR	Detection Limit for Purposes of Reporting
DMC	Delta-Mendota Canal
DWR	Department of Water Resources
E. coli	Escherichia coli
ENR	Engineering News-Record
EPA	Environmental Protection Agency
Escalon	City of Escalon
GAC	granular activated carbon
gpm	gallons per minute
HSC	California Health and Safety Code
JJWTP	John Jones Water Treatment Plant
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MG	million gallons
mg/L	milligrams per liter
MGD	million gallons per day

MRDL	maximum residual disinfectant level
ND	non-detect
NF	nanofiltration
O&M	operations and maintenance
OEHHA	Office of Environmental Health Hazard Assessment
PFAS	per- and polyfluoroalkyl substances
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PHG	Public Health Goal
RO	reverse osmosis
RTCR	Revised Total Coliform Rule
SCWSP	South County Water Supply Program
SOCs	Synthetic Organic Chemicals
SSJID	South San Joaquin Irrigation District
SWRCB	State Water Resources Control Board
USBR	United States Bureau of Reclamation
USEPA	United States Environmental Protection Agency

1 INTRODUCTION

1.1 Background and Purpose

Section 116470(b) of the California Health and Safety Code (HSC) requires public water systems that serve more than 10,000 service connections to prepare a written report, referred to herein as a Public Health Goal (PHG) Report, every three years if any contaminants have been detected in drinking water at concentrations exceeding their respective PHGs during the preceding three-year reporting period.

The PHGs are non-enforceable, health-based goals published by the California Office of Environmental Health Hazard Assessment (OEHHA) that represent the concentrations of contaminants in drinking water below which there are no known or expected risks to human health. Unlike enforceable standards, such as Maximum Contaminant Levels (MCLs) set by the United States Protection Agency (US EPA) and the California State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW), PHGs are set by the OEHHA solely based on public health risk and do not consider factors such as analytical detection limits, available treatment technologies, or associated treatment costs. In cases where a PHG has not yet been established for a specific contaminant, the Maximum Contaminant Level Goal (MCLG) set by the US EPA must be evaluated in its place until a PHG is adopted by OEHHA. Like PHGs, MCLGs are non-enforceable and are based solely on considerations of public health risk.

The primary purpose of the PHG Report is to provide the public with information about contaminants detected in drinking water at levels that, although they may be below MCLs, exceed the PHGs or MCLGs. While these contaminants may meet enforceable regulatory standards, they may still pose potential health risks. As such, the PHG Report is intended to provide consumers with information about their drinking water beyond what is required to be included in the annual Consumer Confidence Reports per California Code of Regulations (CCR) Title 22 § 64480 through 64483 and HSC § 116470.

The PHG Report must identify contaminants with concentrations that exceeded their PHGs or MCLGs during the preceding three-year reporting period and include a discussion of public health risks associated with these exceedances. Additionally, the PHG Report must include an estimation of the cost to reduce the concentrations to levels at or below the PHGs or MCLGs. It is important to note that only contaminants with both a state or federal MCL and an established PHG or MCLG are required to be considered in the PHG Report,[1] and only those detected at levels exceeding a PHG or MCLG must be discussed.

There is currently no formal guidance from California's regulatory agencies, including DDW and OEHHA, for the preparation of PHG Reports. Therefore, the City of Tracy (City) has developed this

[1] A list of contaminants that must be considered in the PHG reporting process can be found in Attachment 1 of the Association of California Water Agencies' (ACWA's) *Public Health Goals Report Guidelines* (Guidelines; ACWA, 2025).

PHG Report using the Association of California Water Agencies (ACWA) Guidelines, dated April 2025 (ACWA, 2025).

1.2 Applicability to the City of Tracy

HSC § 116470(b)

(b) On or before July 1, 1998, and every three years thereafter, public water systems serving more than 10,000 service connections that detect one or more contaminants in drinking water that exceed the applicable public health goal, shall prepare a brief written report in plain language that does all of the following:

(1) Identifies each contaminant detected in drinking water that exceeds the applicable public health goal.

(2) Discloses the numerical public health risk, determined by the office, associated with the maximum contaminant level for each contaminant identified in paragraph (1) and the numerical public health risk determined by the office associated with the public health goal for that contaminant.

(3) Identifies the category of risk to public health, including, but not limited to, carcinogenic, mutagenic, teratogenic, and acute toxicity, associated with exposure to the contaminant in drinking water, and includes a brief plainly worded description of these terms.

(4) Describes the best available technology, if any is then available on a commercial basis, to remove the contaminant or reduce the concentration of the contaminant. The public water system may, solely at its own discretion, briefly describe actions that have been taken on its own, or by other entities, to prevent the introduction of the contaminant into drinking water supplies.

(5) Estimates the aggregate cost and the cost per customer of utilizing the technology described in paragraph (4), if any, to reduce the concentration of that contaminant in drinking water to a level at or below the public health goal.

(6) Briefly describes what action, if any, the local water purveyor intends to take to reduce the concentration of the contaminant in public drinking water supplies and the basis for that decision.

The City currently provides water service to more than 27,000 service connections. Given that the number of service connections served by the City exceeds 10,000, the City is required to prepare a PHG Report in accordance with HSC § 116470(b) if one or more contaminants are detected in drinking water at levels that exceed the applicable PHG or MCLG. As such, the City has prepared this PHG Report, which includes the following:

- The identification of contaminants detected above their applicable PHGs;
- The numerical public health risk associated with each detected contaminant at both the MCL and PHG levels, as determined by OEHHA;
- A discussion of the type of risk to public health (e.g., carcinogenic, mutagenic) associated with each detected contaminant;
- A description of the best available technology (BAT) for contaminant removal or reduction of each detected contaminant;
- An estimation of the total and per-customer cost to reduce contaminant levels to meet PHGs for each detected contaminant; and

- A summary of recommended actions.

Development of this PHG Report follows the guidance presented in the ACWA Guidelines, with additional Sections 2 and 3 included to enhance readability and provide context on the City's potable water system. The report is organized as follows:

- Section 1: Introduction
- Section 2: Water Distribution System
- Section 3: Methodology
- Section 4: Constituents Detected That Exceed the PHG or MCLG
- Section 5: Recommendations for Further Action
- Section 6: References

2 WATER DISTRIBUTION SYSTEM

The City's service area is located in southwestern San Joaquin County, California, approximately 68 miles south of Sacramento and 60 miles east of San Francisco. The municipal potable water system currently provides water service to approximately 27,078 active connections for the purposes of residential, commercial (including institutional/governmental), industrial, and landscapes use (City of Tracy, 2025d). The City provides water service to all customers within the City Limits, the majority of which are associated with single-family residential accounts, as well as approximately 118 residences in the Larch-Clover Community Services District (City of Tracy, 2021; City of Tracy, 2025d).

The City utilizes a combination of surface water and groundwater for its potable water supply, relying on the following sources:

- Surface water from the Stanislaus River, treated and supplied by South San Joaquin Irrigation District (SSJID);
- Surface water from the Delta-Mendota Canal, treated at the City's John Jones Water Treatment Plant (JJWTP); and
- Groundwater from eight City-operated production wells, seven of which are currently active[2].

The annual water production volumes for each supply source over the three-year reporting period are summarized in **Table 1** below. As shown therein, from 2022 to 2024, surface water accounted for approximately 96% of the City's potable water supply on average, ranging from a minimum of 94% in 2022 and 2024 to a maximum of 99% in 2023. Groundwater from the City's production wells made up the remaining supply, averaging 4.4% from 2022 to 2024, with a minimum of 1.2% in 2023 and a maximum of 6.0% in 2022 and 2024 (City of Tracy, 2025c).

Surface Water

From 2022 to 2024, treated water supplied by SSJID accounted for approximately 58% of the City's surface water supply, with raw surface water from the Delta Mendota Canal comprising the remaining 42%. The City purchases treated surface water from SSJID through the South County Water Supply Program (SCWSP), which is a partnership between the City, SSJID and the cities of Manteca, Lathrop, and Escalon. Under the SCWSP, the City has a total contractual entitlement of 13,135 acre-feet per year (AFY), or 4,280 million gallons per year (MGY), of Stanislaus River Water, including the following: 10,000 AFY, or 3,259 MGY, from its original contract with SSJID; 1,120 AFY, or 365 MGY, purchased from the City of Lathrop[3]; and 2,015 AFY,

[2] The City owns and operates nine municipal wells. However, only eight of these wells are production wells. The remaining well (Well 8) is utilized for the City's Aquifer Storage and Recovery (ASR) Program.

[3] In August 2013, the City acquired an additional 1,120 AFY of SCWSP water from the City of Lathrop through the Lathrop-Tracy Purchase (City of Tracy, 2021).

or 657 MGY, purchased on an interim basis from the City of Escalon (Escalon)[4]. The City anticipates that its temporary contract with Escalon will terminate after 2025, at which point the City's contractual allocation of SCWSP water will be reduced to 11,120 AFY, or 3,623 MGY (City of Tracy, 2021).

The City's SCWSP water from the Stanislaus River is treated at the Nick C. DeGroot Water Treatment Plant (DGWTP), which is located in Stanislaus County, California, near the Woodward Reservoir. The DGWTP currently has a treatment capacity of 36 million gallons per day (MGD), of which 17 MGD is allocated for the City. Raw Stanislaus River influent undergoes a multi-step treatment process at the DGWTP, including pre-chlorination, coagulation, dissolved air flotation pretreatment for the removal of solids and dissolved materials, chemical stabilization to reduce pipe corrosion, membrane filtration, and disinfection through chlorination (City of Tracy, 2021).

In addition to purchased water from SSJID, the City also purchases Central Valley Project (CVP) water from the Delta-Mendota Canal (DMC; conjunctively referred to as DMC/CVP water) through contracts with the United States Bureau of Reclamation (USBR) and the Byron Bethany Irrigation District (BBID). The City's DMC/CVP water is treated at the John Jones Water Treatment Plant (JJWTP), which is located east of the DMC and the California Aqueduct in the southern portion of the City. The JJWTP currently has a permitted treatment capacity of 30 MGD, which is adequate to treat the entirety of the City's DMC/CVP water supply[5]. At the plant, the treatment process of raw DMC/CVP influent includes chemical oxidation, temperature equalization, coagulation, flocculation, sedimentation, filtration using granular activated carbon, ultraviolet (UV) and free chlorine disinfection, followed by chloramination for residual disinfectant.

Groundwater

The City's purchased surface water supply is supplemented by local groundwater pumped from the Tracy Subbasin (Department of Water Resources [DWR] 5-22.15) of the San Joaquin Valley Groundwater Basin (DWR 5-22). As stated above, from 2022 to 2024, approximately 4.4% of the City's water supply was provided by local groundwater production (City of Tracy, 2025c). The City currently owns and operates nine municipal wells, eight of which are production wells and one of which is utilized for the City's ASR Program[6]. The pumping capacity of these production wells ranges between 1,400 gallons per minute (gpm) and 2,500 gpm. Of the City's eight production wells, Wells 1 through 4 (shown in **Table 1** below) are located at the City's JJWTP, while the remaining four wells (Lincoln Well, Lewis Manor Well [Well 5], Park and Ride Well [Well 6], and

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[4] In March 2006, the City entered into a temporary contract with Escalon to purchase Escalon's allocation of 2,015 AFY of SCWSP supply until Escalon constructs the necessary infrastructure needed to convey the SCWSP water (City of Tracy, 2021).
[5] The JJWTP is hydraulically designed for an ultimate treatment capacity of 45 MGD, which may be utilized in the future for expanded plant capacity (City of Tracy, 2021).
[6] Well 8 (shown in **Table 1** below) is currently used for the City's ASR Program but can be utilized as an extraction well when needed (City of Tracy, 2021).

Ball Park Well [Well 7]) are located throughout the City. Well 5 was not in active use during the 2022 to 2024 reporting period. Groundwater pumped from the City's production wells is either treated at the wellhead or at the JJWTP (City of Tracy, 2021).

Table 1. Potable Water Production Volumes by Source

Potable Water Source	Annual Water Production (MG)			Average Annual Production (2022-2024) (MG)
	2022	2023	2024	
Surface Water				
SSJID	3,822	2,770	3,744	3,445
JJWTP	2,045	3,306	2,273	2,541
Total Surface Water Supply [a]	***5,867***	***6,076***	***6,017***	***5,987***
Groundwater				
Lincoln Well	3.7	0.047	155	53
Well 1	94	59	102	85
Well 2	181	6.1	99	95
Well 3	32	5.7	19	19
Well 4	3.0	1.4	4.3	2.9
Well 5 (Lewis Manor Well) [b]	0	0	0	0
Well 6 (Park and Ride Well)	31	0.14	4.9	12
Well 7 (Ball Park Well)	29	0.059	0.90	10
Well 8 [c]	0	0	0	0
Total Groundwater Supply	***374***	***72***	***385***	***277***
TOTAL SUPPLY	**6,241**	**6,148**	**6,402**	**6,264**

Abbreviations:
"ASR" = Aquifer Storage and Recovery
"JJWTP" = John Jones Water Treatment Plant
"MG" = million gallons
"SSJID" = South San Joaquin Irrigation District

Notes:
[a] Totals may not sum due to rounding.
[b] Well 5 was inactive during the 2022 through 2024 PHG reporting period.
[c] Well 8 is currently used as an ASR well and is not considered by the City to be a groundwater production well at this time.

3 METHODOLOGY

As stated in Section 1.1, neither DDW nor OEHHA has published guidance for the preparation of PHG reports. Therefore, the City has prepared this PHG Report using the suggested ACWA Guidelines, with supplemental sections included to provide context on the City's potable water system and the report's development. Specifically, this section offers a detailed discussion of the City's water quality data and the methodology used to prepare this report.

3.1 Water Quality Data and Analysis

The ACWA Guidelines recommend that water quality data from the three consecutive calendar years preceding the reporting year should be evaluated for inclusion in the PHG Report (ACWA, 2025). Accordingly, this report utilizes available water quality data from the following sources for the 2022 through 2024 period to determine whether any of its water supplies exceeded applicable PHGs or MCLGs as part of the preparation of this PHG Report[7]:

- Treated surface water, purchased from SSJID and sampled at the DGWTP after disinfection (2022 through 2024);
- Treated surface water, obtained from the DMC/CVP and sampled at the City's JJWTP following disinfection (2022 through 2024);
- Groundwater from each production well following disinfection (2022 through 2024);
- Copper and lead monitoring at water service taps throughout the City's distribution system (2024); and
- Monthly (and in some cases, weekly) total coliform and Escherichia coli (*E. coli*) monitoring at water service taps throughout the City's water distribution system (2022 through 2024).

Consistent with the ACWA Guidelines and DDW guidance, non-detect results, or results that were reported below the state regulatory Detection Limit for Purposes of Reporting (DLR) established in the CCR Title 22 § 64432 & § 64445.1, were treated as zero for inorganic, organic, and radioactive contaminants for purposes of comparing to the PHGs and MCLGs (ACWA, 2025). For purposes of this PHG Report, the only exception to this practice is gross alpha particle activity, for which half of the DLR is used to calculate the annual average[8]. This approach is taken due to

[7] Consistent with the recommendations in the ACWA Guidelines, the City analyzed post-treatment water quality data, and individual well data was utilized in the case that the well fed directly into the City's distribution system.

[8] Only one of the City's groundwater production wells was monitored for gross alpha during the 2022 to 2024 reporting period, with sampling conducted in 2023 (City of Tracy, 2025a). Although the result was non-detect, the methodology used to determine average concentrations and interpret non-detect values for gross alpha particle activity is included in this report for completeness.

the fact that some laboratories report results lower than the state-established DLR (ACWA, 2025).

In the context of PHGs, there are no specific regulatory definitions for what constitutes a PHG "exceedance". As such, the ACWA Guidelines recommend applying the same procedures used to determine compliance with MCLs, as outlined in Title 22 of the CCR, to assess exceedances of PHGs or MCLGs (ACWA, 2025). For example, in cases where Title 22 requires averaging multiple sample results from a single source to compare against the MCL for determining exceedance, the same averaging method should be used to assess whether the PHG, or MCLG in the case that no PHG has been established, has been exceeded.

Based on this guidance, average concentrations for inorganic, organic, and radioactive contaminants were calculated by water source and compared to the applicable PHG or MCLG. For lead and copper, in accordance with Title 22 of the CCR, the 90th percentile concentrations were calculated from samples collected at water service taps throughout the City's distribution system and compared to the respective PHGs. For microbial contaminants, such as total coliform and *E. coli*, the total number of positive detections during the 2022 through 2024 reporting period was identified, with each positive sample considered an exceedance of the MCLG[9].

Several contaminants with established PHGs or MCLGs were not analyzed for in some or all of the City's water supply sources during the 2022 through 2024 reporting period. These contaminants, along with the reasons they were not monitored during the reporting period, are outlined below:

- **Asbestos**: The City is required to monitor asbestos throughout its distribution system every nine years. The most recent monitoring was completed in August 2017, with the next round due in August 2026. As a result, asbestos monitoring was not conducted during the 2022 through 2024 reporting period, and data for this timeframe are not available.
- **Gross Alpha Particle Activity**: The City is required to monitor gross alpha particle activity once every nine years for each of its water supply sources, assuming the monitoring results in results below the DLR of 3.0 pCi/L for gross alpha. During the 2022 through 2024 period, the potable water source for the City requiring monitoring for Gross Alpha was Well 5 (Lewis Manor Well), which was monitored in 2023 and yielded a non-detect result.
- **Gross Beta Particle Activity, Strontium-90, and Tritium**: Based on the City's annual inspection reports, because the City's water supplies were previously determined to not be vulnerable to contamination by nuclear facilities, the City is not required to monitor

[9] A PHG has not been established by OEHHA for either total coliform or *E. coli* (OEHHA, 2025). However, an MCLG of zero has been set for both, which is interpreted as no allowable positive detections from 2022 through 2024 (ACWA, 2025). As such, any detection of total coliform or *E. coli* within the three-year reporting period is considered an exceedance of the MCLG and must be reported in this PHG Report.

gross beta particle activity, strontium-90, and tritium. Compliance with radioactive contaminant standards is assessed solely based on gross alpha particle activity.

- **Hexavalent Chromium (Cr6):** Based on the SWRCB DDW's *Hexavalent Chromium Compliance Plan Guidance*, published in November 2024, the City is required to sample Cr6 from its raw groundwater and surface water sources prior to treatment (SWRCB, 2024). In accordance with this guidance, the City did not sample Cr6 in treated surface water purchased from SSJID or in effluent from its JJWTP during the three-year reporting period, as these are considered treated water.
- **Radium, Radon, and Uranium**: Consistent with CCR Title 22 § 64442(f), the City does not monitor radium-226, radium-228, radon, or uranium because gross alpha particle activity in its water sources consistently remains below the MCL of 5 picocuries per liter (pCi/L).
- **Synthetic Organic Chemicals (SOCs)**: The City is required to monitor SOCs once every nine years. During the reporting period from 2022 through 2024, the following SOCs were monitored in one or more of the City's water supplies at least once during the three-year reporting period:
    - *Atrazine* – Atrazine was monitored at least once in all eight of the City's production wells, as well as in treated water from both SSJID and the JJWTP, and all results were non-detect.
    - *Alachlor* – Alachlor was monitored only in treated water from SSJID during the 2022 through 2024 period, resulting in a non-detect.
    - *Dibromochlorpropane* – Dibromochloropropane was monitored in 2024 for all of the production wells, with the exception of Well 2 and Well 7 (Ball Park Well), with all results yielding non-detects. Additionally, dibromochloropropane was monitored in treated water from the JJWTP in 2022 and 2023 and yielded non-detects but was not monitored in SSJID treated water during the 2022 through 2024 period.
    - *Ethylene* – Ethylene was monitored in 2024 for all of the production wells, with the exception of Well 2 and Well 7 (Ball Park Well), with all results yielding non-detects. Additionally, ethylene was monitored in treated water from the JJWTP in 2022 and 2023 and yielded non-detects but was not monitored in SSJID treated water during the 2022 through 2024 period.
    - *Simazine* – Simazine was monitored and yielded non-detects for all of the City's water sources at least once during the 2022 through 2024 period, with the exception of Well 2 and Well 7 (Ball Park Well).

3.2 Assessment of Public Health Risk

Pursuant to HSC § 116470(b), the PHG Report must include the numerical public health risk, as determined by OEHHA, for each identified contaminant at both the MCL and PHG. The report must also specify the associated category of risk (e.g., carcinogenic, mutagenic) for each identified contaminant and include a brief description of the associated category of risk in plain language.

The category of public health risk associated with each identified contaminant, along with the corresponding numerical health risks, was determined using OEHHA's *Health Risk Information for Public Health Goal Exceedance Reports* (OEHHA, 2025). Additionally, PHG technical support documents developed by OEHHA have been developed for each chemical with an established PHG, which include information on the adverse health effects associated with each chemical. These documents, which are available on the OEHHA website[10], were utilized to gather information for a brief description of health effects for each identified contaminant.

Categories of public health risk for each identified contaminant are outlined in Sections 4.1.3, 4.2.3, 4.3.3, 4.4.3, and 4.5.3.

3.3 Estimation of Treatment Cost

Pursuant to HSC § 116470(b), the PHG Report must include a description of the BAT[11] for the removal or reduction of each identified contaminant, along with estimated total and per-customer costs to reduce contaminant concentrations to below the applicable PHG or MCLG. CCR Title 22 § 64447 through § 64447.4 presents the BATs for the removal or reduction of specific contaminants. For the purposes of this PHG Report, the BAT, or BATs in the case that more than one is appropriate, for the removal of each identified contaminant were selected based on those presented in the CCR. It is important to note that the BATs presented in the CCR are intended to achieve compliance with MCLs, and not necessarily to reach the more stringent PHG or MCLG levels. As such, it is unclear whether the BATs presented in the CCR would adequately reduce contaminant concentrations to below the applicable PHG or MCLG in all cases.

Preliminary cost estimates for treating the City's water sources that exceeded the applicable PHG or MCLG during the 2022 through 2024 reporting period were developed using unit cost data from Attachment 3 of the ACWA Guidelines. These unit costs represent a range of installation and operational expenses for various BATs and were compiled from multiple sources, including: (1) a 2012 ACWA member agency survey, (2) independently gathered data from other agencies, and (3) historical data from previous ACWA guidance documents (ACWA, 2025). The estimates reflect a variety of system sizes, source water types, and target contaminants for reduction or removal. All unit costs presented in Attachment 3 of the ACWA Guidelines were updated to 2024 dollars using the average 2024 Engineering News-Record (ENR) Cost Index and include both

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[10] https://oehha.ca.gov/water/public-health-goals-phgs

[11] The California HSC does not explicitly define the term "BAT". In CCR Title 22 § 64447, § 64447.2, and § 64447.4, the term is used specifically in the context of achieving compliance with established MCLs. Based on guidance provided in the ACWA Guidelines and HSC § 116470(b)(4), for the purposes of this report, it is assumed that the "BAT" refers to the best available technology to reduce the contaminant to a level at or below the PHG of MCLG.

annualized capital and operations and maintenance (O&M) costs (ACWA, 2025)[12]. Using this information, cost estimates, including the annual and per-service connection costs, were calculated based on the selected BAT or BATs for each identified contaminant and the production capacity of each of the City's water facilities with exceedances during the 2022 through 2024 reporting period.

The cost estimates presented in Section 4 of this PHG Report are preliminary in nature and do not reflect site-specific constraints related to the City's water supplies or additional considerations, such as space limitations, operational constraints, or the effectiveness of each selected BAT in reducing the contaminant levels to meet PHG or MCLG targets. Rather, the preliminary cost estimates included herein are intended to provide a general range of potential treatment costs. As such, the true cost of implementation and O&M for each selected BAT could be significantly higher or lower than those presented in this PHG Report.

[12] As part of the 2025 update to the ACWA Guidelines, ACWA provided revised treatment cost information, updating the values previously published in its 2022 guidelines. Accordingly, the unit cost estimates used in this PHG Report reflect the updated 2025 values and may differ slightly from those presented in the City's 2022 PHG Report for the 2019 to 2021 reporting period for the same treatment technologies (ACWA, 2025).

4 CONSTITUENTS DETECTED THAT EXCEED THE PHG OR MCLG

As discussed in Section 1.1 and in accordance with HSC § 116470(b), the PHG Report must identify each contaminant detected in drinking water that exceeds the applicable PHG, or the MCLG in the case that a PHG has not yet been set for a contaminant. For each identified contaminant, the report must also: disclose the numerical public health risk associated with both the MCL and the PHG, as determined by OEHHA; identify the category of public health risk; discuss the BAT for removing or reducing the concentration of the contaminant; and provide an estimate of the cost to implement the BAT to reduce the concentration to a level at or below the PHG. Following the methodology outlined in Section 3 of this PHG Report, the City identified the following contaminants at levels above the PHG or MCLG in one or more of the City's potable water supplies during the 2022 through 2024 reporting period:

- Arsenic;
- Copper;
- Cr6;
- Perfluorooctanoic acid (PFOA); and
- Total Coliform/*E. coli*.

This section provides further detail on the above contaminants detected in the City's water system, including observed concentrations, associated health risks, typical sources of contamination, and BAT options and associated estimated implementation costs.

4.1 Arsenic

4.1.1 Comparison to PHG/MCLG

Arsenic has a state MCL (CA MCL) of 0.010 milligrams per liter (mg/L), or 10 micrograms per liter (µg/L), and a PHG of 0.000004 mg/L, or 0.004 µg/L (OEHHA, 2025). Because both an MCL and PHG have been established for arsenic, the City is required to consider arsenic in the PHG reporting process and identify any instances where detected concentrations exceeded the PHG during the 2022 through 2024 reporting period.

The City tested each of its potable water sources for arsenic at least once during the three-year period. Purchased surface water from both SSJID and DMC/CVP water treated at the JJWTP was tested annually in 2022, 2023, and 2024, with all results being non-detect. Additionally, each of the City's groundwater wells, including the City's ASR well (Well 8), were tested for arsenic in 2024. Six of the wells yielded non-detect results for arsenic, while two wells (Well 5 [Lewis Manor Well] and Well 6 [Park and Ride Well]) reported arsenic concentrations exceeding the PHG of 0.004 µg/L (City of Tracy, 2025a). Although arsenic levels in these two wells were approximately three orders of magnitude above the PHG, they remained well below the CA MCL. A summary of these results by water source is provided below in **Table 2**.

Table 2. Average Arsenic Concentration by Source (2022-2024)

Potable Water Source	Average Arsenic Concentration (2022-2024) (µg/L)
Surface Water [a]	
SSJID	ND
JJWTP	ND
Groundwater [b]	
Lincoln Well	ND
Well 1	ND
Well 2	ND
Well 3	ND
Well 4	ND
Well 5 (Lewis Manor Well) [c]	2.7
Well 6 (Park and Ride Well)	3.0
Well 7 (Ball Park Well)	ND
Well 8 [d]	ND

Abbreviations:
"ASR" = Aquifer Storage and Recovery
"JJWTP" = John Jones Water Treatment Plant
"ND" = non-detect
"SSJID" = South San Joaquin Irrigation District
"µg/L" = micrograms per liter

Notes:
[a] Treated surface water from both SSJID and JJWTP was tested once per year for arsenic during the 2022 through 2024 period, with all results yielding non-detects.
[b] Each of the City's nine groundwater wells was tested once for arsenic during the 2022 through 2024 period in 2024. Therefore, the results shown in Table 2 for the City's groundwater wells reflect a single testing event rather than an average of multiple events over the reporting period.
[c] Well 5 was inactive during the 2022 through 2024 PHG reporting period.
[d] Well 8 is currently used as an ASR well and is not considered by the City to be a groundwater production well at this time.

4.1.2 Contaminant Sources

Arsenic in drinking water primarily originates from natural sources, as it is a naturally-occurring element found in the earth's crust. In many regions, arsenic can dissolve into groundwater from surrounding geologic formations, particularly in areas with high natural mineral content (OEHHA, 2004). While natural sources are the most common, arsenic can also enter water supplies through human activities such as mining, waste chemical disposal, industrial processes involving the combustion of fossil fuels, and the improper use of arsenic-containing pesticides (OEHHA, 2004).

The presence of arsenic in the City's groundwater supplies is primarily due to natural mineral deposits in the surrounding area. Specifically, arsenic in the region's groundwater supplies can primarily be attributed to the reductive dissolution of iron or manganese oxyhydroxides in Sierra Nevada sands or to the desorption of aquifer sediments under high-pH conditions (Dubrovsky et. al, 1991; Fram, 2017). A more recent study in the Western San Joaquin Valley further supports this conclusion, finding that pesticides are not a likely source of arsenic in the region's groundwater and that its presence is primarily due to natural sources (Fram, 2017).

4.1.3 Public Health Risk

Ingestion of arsenic may lead to gastrointestinal symptoms such as nausea, vomiting, diarrhea, and irritation of the digestive tract (OEHHA, 2004). Long-term exposure to lower concentrations of arsenic has been linked to a range of health effects, such as the reduced production of red and white blood cells, cardiovascular irregularities, damage to blood vessels, liver and/or kidney impairment, and nerve dysfunction, particularly in the hands and feet (OEHHA, 2004). Additionally, long-term ingestion of arsenic has been linked to an increased risk of cancer, particularly in the lungs, bladder, kidneys, and liver. Chronic exposure has also been associated with skin abnormalities that may progress to skin cancer, and ingesting large doses of arsenic may be fatal (OEHHA, 2004).

For these reasons, OEHHA classifies arsenic as a carcinogen, meaning that long-term exposure may increase the risk of developing cancer (OEHHA, 2025). At the CA MCL of 10 µg/L, OEHHA estimates the lifetime cancer risk from arsenic exposure to be 2.5 per one thousand, while at the PHG of 0.004 µg/L, the estimated lifetime cancer risk is one per one million (OEHHA, 2025)[13].

4.1.4 Estimation of Treatment Cost

Table 64447.2-A of CCR Title 22 § 64447.2 identifies the following BATs for removing or reducing arsenic concentrations to levels below the CA MCL:

- Activated Alumina;
- Coagulation/Filtration;
- Ion Exchange;
- Lime Softening;
- Reverse Osmosis;
- Electrodialysis; and
- Oxidation/Filtration.

The estimated costs associated with implementing three of the above BATs for arsenic – coagulation/filtration, ion exchange, and reverse osmosis – were calculated using cost data

[13] The OEHHA cancer risk values, along with the corresponding Health Risk Categories, for contaminants required for consideration in the PHG Report are provided in Table 1 of Attachment 2 to the ACWA Guidelines (ACWA, 2025).

provided in Attachment 3 of the ACWA Guidelines[14]. Per the ACWA Guidelines, the estimated unit costs, which include both annualized capital expenses and ongoing O&M costs, are as follows:

- **Coagulation/Filtration**: $0.50 per one thousand gallons, based on a case study of arsenic removal costs at a 2.9 MGD treatment facility in San Bernardino County, California;
- **Ion Exchange**: $2.65 per one thousand gallons, based on a case study of the reduction of arsenic in groundwater in Coachella Valley, California; and
- **Reverse Osmosis**: $8.99 per one thousand gallons, based on an arsenic removal study conducted in the City of Scottsdale, Arizona, for a 1.0 MGD plant operated at 40% capacity (ACWA, 2025).

Using these estimated unit costs, the annual treatment costs for the City's groundwater wells, as well as the associated cost per service connection, were calculated for each BAT based on the production capacity of wells with PHG exceedances and are presented in **Table 3** below. As shown therein, the estimated annual treatment costs for implementation across the City's groundwater wells with reported PHG exceedances are $1,060,000 for coagulation/filtration, $5,610,000 for ion exchange, and $19,000,000 for reverse osmosis.

Table 3. Estimated Costs for Arsenic Treatment

Parameter	Annual Treatment Cost, $/year		
	Coagulation/Filtration	Ion Exchange	Reverse Osmosis
Estimated unit cost ($/one thousand gallons)	$0.50	$2.65	$8.99
Well 5 and Well 6 Total ($/year) [a]	$1,190,000	$6,290,000	$21,300,000
Total per service connection ($/year)	$45	$241	$818

Abbreviations:
"MGD" = million gallons per day

Notes:
[a] The annual treatment cost for each selected BAT is estimated based on the individual production capacities of wells with reported PHG exceedances during the 2022 through 2024 reporting period for arsenic. Well 5 (Lewis Manor Well) and Well 6, both of which reported exceedances, have a capacity of 3.6 MGD and 2.9 MGD, respectively (City of Tracy, 2023). As such, the annual treatment cost for each BAT is estimated as the cost associated with treating 6.5 MGD of groundwater supply from these two wells.

[14] The three BATs identified herein were selected for cost estimation because the ACWA Guidelines provide relevant case studies and cost data for arsenic reduction, making them suitable for evaluating potential implementation at the City's groundwater wells.

4.2 Copper

4.2.1 Comparison to PHG/MCLG

While an MCL for copper has not yet been established, OEHHA has set a PHG for copper in drinking water of 0.3 mg/L, or 300 µg/L (OEHHA, 2025). In addition to this PHG, per CCR Title 22 § 64678, the 90th percentile concentration of copper at water service taps throughout a distribution system may not exceed an action level of 1.3 mg/L, or 1,300 µg/L. During the 2022 through 2024 reporting period, copper was not detected at levels exceeding the PHG in any of the City's water supplies outlined in **Table 2**. However, tap monitoring conducted in 2024 yielded a 90th percentile copper concentration of 0.42 mg/L, or 420 µg/L, based on 35 samples collected throughout the City's distribution system. While these concentrations were consistently below the action level for copper of 1,300 µg/L, because the 90th percentile concentration of the samples collected exceeded 300 µg/L, the PHG for copper was exceeded based on the ACWA Guidelines.

4.2.2 Contaminant Sources

The presence of copper throughout the human environment is very widespread, as it is both a naturally-occurring element found in many minerals and a commonly-used material in industrial and household applications. Copper is present in the air due to both anthropogenic activities, such as mining, smelting, metal processing, and fuel combustion, and natural sources, including volcanic eruptions, windblown dust, and ocean spray. Additionally, copper is present in soil due to its natural occurrence in minerals and atmospheric deposition and through sources such as treated wastewater discharge, urban runoff from household or industrial use, agriculture, and mining activities (OEHHA, 2008).

Copper in soil can leach into groundwater or run off into surface water, potentially contaminating drinking water sources. Additionally, copper may enter drinking water through the corrosion of copper pipes in the distribution system, depending on the water's alkalinity and hardness (OEHHA, 2008). Since copper concentrations in the City's source water are below the PHG, it is likely that the copper detected during tap monitoring primarily originates from copper household service pipelines and plumbing rather than leaching or runoff.

4.2.3 Public Health Risk

Copper is an essential nutrient that supports several fundamental bodily functions, such as red blood cell formation, carbohydrate metabolism, and connective tissue development (OEHHA, 2008). However, consuming water with high levels of copper can lead to a range of adverse health effects. Mild symptoms may include nausea, vomiting, diarrhea, abdominal cramps, dizziness, and headaches. More severe symptoms, such as liver and kidney damage, hepatic and renal necrosis, coma, and death, are also associated with exposure to elevated copper concentrations in cases of copper poisoning (OEHHA, 2008).

For these reasons, OEHHA classifies copper as posing a “digestive system toxicity” health risk, meaning that exposure may cause digestive issues (OEHHA, 2025). OEHHA has not yet quantified the numerical health risk associated with the long-term ingestion of copper at levels at or above the MCL or PHG (OEHHA, 2025). As such, no such numerical health risks are identified herein.

4.2.4 Estimation of Treatment Cost

CCR Title 22 Chapter 17.5 establishes monitoring requirements, action levels, treatment techniques, and public notification provisions for lead and copper in drinking water systems, primarily focusing on corrosion control to minimize leaching from plumbing materials. While the CCR does not explicitly define a BAT for copper reduction in drinking water, CCR Title 22 Chapter 17.5 § 64670 identifies the optimization of corrosion control treatment (CCT) as a common method used to minimize copper concentrations at consumers’ taps.

Corrosion control chemicals are currently added to the City’s treated DMC/CVP surface water supply through polyorthophosphate injection at JJWTP. Beyond the corrosion control measures implemented at JJWTP, no corrosion control chemicals are added to the City’s groundwater sources or to surface water purchased from SSJID. To further reduce the concentration of copper in water service taps throughout the distribution system, the City could install corrosion control chemical addition systems at each well site. However, given that copper concentrations in the City’s distribution system are consistently below the action level, the use of additional corrosion control chemicals is not recommended, as the addition of these chemicals could introduce additional water quality concerns and would not necessarily guarantee the reduction of copper concentrations to below the PHG. As such, a cost estimate for implementing CCT has not been prepared for inclusion in this PHG Report.

As a public water system, the City is required to comply with the Lead and Copper Rule outlined in CCR § 64670 and in the past, has consistently complied with the monitoring requirements and action levels for both copper and lead. In accordance with Table 64675-A of CCR § 64675, the City conducts reduced tap monitoring for copper and lead every three years at a minimum of 30 sites throughout the distribution system based on the number of service connections served by the City. As discussed in Section 4.2.1, the last reduced tap monitoring event was conducted by the City between July and August 2024, during which 35 sites were sampled. As such, the next reduced tap monitoring event will occur during or before July 2027 (City of Tracy, 2025b).

In addition to reduced tap monitoring, the City conducts weekly monitoring of corrosion-related parameters**,** such as pH and water temperature**,** throughout the distribution system, as well as annual monitoring of parameters like specific conductance, hardness, alkalinity, and total dissolved solids (TDS) at various system entry points. In the case that a monitoring event results in an exceedance of the action level for copper or lead, the City will implement appropriate measures to ensure effective corrosion control in response to the observed conditions.

4.3 Hexavalent Chromium (Cr6)

4.3.1 Comparison to PHG/MCLG

Cr6 has a CA MCL of 0.01 mg/L, or 10 µg/L,[15] and a PHG of 0.00002 mg/L, or 0.02 µg/L (OEHHA, 2025). Because both an MCL and PHG have been established for Cr6, the City is required to consider Cr6 in the PHG reporting process and identify any instances where detected concentrations exceeded the PHG during the 2022 through 2024 reporting period.

Between 2022 and 2024, each of the City's groundwater wells, including the City's ASR well (Well 8), were tested for Cr6 in 2024. Seven of the wells reported concentrations exceeding the PHG of 0.02 µg/L, with only one well (Well 5 [Lewis Manor Well]) yielding a non-detect result (City of Tracy, 2025a). Although Cr6 levels in the wells with PHG exceedances ranged from approximately one to three orders of magnitude above the PHG, they remained below the CA MCL. A summary of these results by water source is provided below in **Table 4.**

[15] The CA MCL of 10 µg/L for Cr6 went into effect on 1 October 2024 (AWSDA, 2025).

Table 4. Average Cr6 Concentration by Source (2022-2024)

Potable Water Source	Average Cr6 Concentration (2022-2024) (µg/L)
Surface Water [a]	
SSJID	--
JJWTP	--
Groundwater [b]	
Lincoln Well	0.40
Well 1	7.0
Well 2	6.3
Well 3	4.5
Well 4	4.3
Well 5 (Lewis Manor Well) [c]	ND
Well 6 (Park and Ride Well)	1.3
Well 7 (Ball Park Well)	7.2
Well 8 [d]	0.95

Abbreviations:
"ASR" = Aquifer Storage and Recovery
"Cr6" = Hexavalent Chromium
"JJWTP" = John Jones Water Treatment Plant
"ND" = non-detect
"SSJID" = South San Joaquin Irrigation District
"µg/L" = micrograms per liter

Notes:
[a] As indicated in Section 3.1, the City did not test for Cr6 in its treated surface water supplies during the 2022 through 2024 period, as Cr6 sampling is only required for the City's raw water supplies.
[b] Each of the City's nine groundwater wells was tested once for Cr6 during the 2022 through 2024 period, in 2024. Therefore, the results shown in Table 2 for the City's groundwater wells reflect a single testing event rather than an average of multiple events over the reporting period.
[c] Well 5 was inactive during the 2022 through 2024 PHG reporting period.
[d] Well 8 is currently used as an ASR well and is not considered by the City to be a groundwater production well at this time.

4.3.2 Contaminant Sources

Chromium is a naturally-occurring metal that is also widely used in various industrial processes. Of its two common ionic forms, hexavalent chromium (Cr6) is significantly more toxic, more water-soluble, and more readily absorbed by living cells than trivalent chromium (Cr3). In the environment, chromium is typically found in crustal rocks and soils, primarily as an insoluble oxide. It can be released into the air through natural processes such as windblown dust, sea spray, or erosion, as well as through human activities like smelting and tobacco smoke (OEHHA, 2011).

In water, chromium can exist in either the Cr3 or Cr6 form. Chromium found in drinking water sources may originate from industrial activities, such as electroplating, leather tanning, and textile manufacturing, or from natural processes like the erosion and leaching of chromium-rich rocks (OEHHA, 2011). Studies of the region's groundwater indicate that the presence of Cr6 in the City's groundwater supply is likely due to naturally occurring chromium in the local geology. Specifically, Cr6 concentrations within the region have been found to correlate strongly with areas containing serpentine rock outcrops (Hausladen et al., 2018; Morrison et al., 2009). Additionally, it has been suggested that agricultural activities in the region could contribute to Cr6 concentrations in groundwater through the oxidation of Cr3 during irrigation cycles (Hausladen et al., 2018).

4.3.3 Public Health Risk

The long-term ingestion of water containing elevated levels of Cr6 has been linked to increased risk of cancer, particularly stomach cancer, as well as liver and kidney damage (OEHHA, 2011). Because of its toxicity and associated potential health effects, OEHHA classifies Cr6 as a carcinogen, meaning that long-term exposure may increase the risk of developing cancer (OEHHA, 2025). At the CA MCL of 10 µg/L, OEHHA estimates the lifetime cancer risk from Cr6 exposure to be five per ten thousand, while at the PHG of 0.02 µg/L, the estimated lifetime cancer risk is one per one million (OEHHA, 2025)[16].

4.3.4 Estimation of Treatment Cost

Table 64447.2-A of CCR Title 22 § 64447.2 identifies the following BATs for removing or reducing Cr6 concentrations to levels below the CA MCL:

- Ion Exchange;
- Reverse Osmosis; and
- Reduction/Coagulation/Filtration.

The estimated costs associated with implementing two of the above BATs for Cr6 – ion exchange and reduction/coagulation/filtration – were calculated using cost data provided in Attachment 3 of the ACWA Guidelines[17]. Per the ACWA Guidelines, the estimated unit costs, which include both annualized capital expenses and ongoing O&M costs, are as follows:

- **Ion Exchange**: $2.19 to $9.16 per one thousand gallons, based on a case study conducted in Los Angeles County, California, evaluating the reduction of Cr6 concentrations to below 1 µg/L for flow rates ranging from 100 to 2,000 gpm.

[16] The OEHHA cancer risk values, along with the corresponding Health Risk Categories, for contaminants required for consideration in the PHG Report are provided in Table 1 of Attachment 2 to the ACWA Guidelines (ACWA, 2025).
[17] A relevant case study for reverse osmosis for the purposes of the removal or reduction of Cr6 was not provided as part of Attachment 3 to the ACWA Guidelines. As such, an estimated cost was not prepared for reverse osmosis. Rather, the estimated costs associated with ion exchange and reduction/coagulation/filtration were calculated based on cost estimates provided in Attachment 3 to the ACWA Guidelines.

- **Reduction/Coagulation/Filtration**: \$2.14 to \$13.38 per one thousand gallons, based on a case study conducted in Los Angeles County, California, evaluating the reduction of Cr6 concentrations to below 1 µg/L for flow rates ranging from 100 to 2,000 gpm.

Using these estimated unit cost ranges, the minimum and maximum annual treatment costs for the City's groundwater wells with PHG exceedances, as well as the associated cost per service connection, were calculated for each BAT based on the City's total well production capacity, with the exclusion of Well 5, and are presented in **Table 5** below. As shown therein, the estimated annual treatment cost for implementation across the City's groundwater wells with PHG exceedances for Cr6 ranges from \$19,700,000 to \$82,200,000 for ion exchange and \$19,200,000 to \$120,000,000 for reduction/coagulation/filtration.

Table 5. Estimated Costs for Cr6 Treatment

Parameter	Annual Treatment Cost, \$/year			
	Ion Exchange		Reduction/Coagulation/Filtration	
	Minimum	Maximum	Minimum	Maximum
Estimated unit cost (\$/one thousand gallons)	\$2.19	\$9.16	\$2.14	\$13.38
Wells 1-4, 6-8, and Lincoln Well Total (\$/year) [a]	\$19,700,000	\$82,200,000	\$19,200,000	\$120,000,000
Total Annual Cost per service connection (\$/year)	\$754	\$3,150	\$737	\$4,610

Abbreviations:
"MGD" = million gallons per day

Notes:
[a] Annual treatment costs are estimated based on the individual production capacities of the City's groundwater wells, which range from 2.2 to 3.6 MGD (City of Tracy, 2023). Since all of the City's wells, with the exception of Well 5 (Lewis Manor Well), reported Cr6 concentrations exceeding the PHG during the 2022 through 2024 reporting period, the total annual treatment costs included in Table 5 reflect the estimated cost of treating the City's total groundwater production capacity, excluding Well 5.

4.4 Perfluorooctanoic Acid (PFOA)

4.4.1 Comparison to PHG/MCLG

While a CA MCL has not yet been established for PFOA, a federal MCL has been set by the USEPA of 4×10^{-6} mg/L, or 0.004 µg/L[18]. Additionally, OEHHA has established a PHG of 7×10^{-9} mg/L, or 7×10^{-6} µg/L, for PFOA (OEHHA, 2025). Because both an MCL and PHG have been established for

[18] The federal MCL of 0.004 µg/L for PFOA went into effect on 25 June 2024 (USEPA, 2025a).

PFOA, the City is required to consider PFOA in the PHG reporting process and identify any instances where detected concentrations exceeded the PHG from 2022 through 2024.

Each of the City's groundwater wells, including the City's ASR well (Well 8), were tested for PFOA at least once during the 2022 through 2024 reporting period, with the exception of Well 5 (Lewis Manor Well)[19]. Of the eight wells tested for PFOA, six yielded non-detect results across all samples collected, while two wells (Well 2 and Well 3) showed concentrations exceeding the PHG in one or more samples. Specifically, at Well 2, five samples were collected between 2023 and 2024, with an average PFOA concentration of 0.0041 µg/L and two of these samples exceeding both the PHG and MCL. At Well 3, the average concentration from five samples collected during the same period was 0.0019 µg/L, with two non-detect results and three samples exceeding the PHG but below the MCL (City of Tracy, 2025a).

Additionally, treated surface water from SSJID and effluent from the JJWTP were each tested for PFOA during four separate sampling events in 2024, all of which yielded non-detect results (City of Tracy, 2025a). A summary of these results by water source is provided below in **Table 6.**

[19] Well 5 (Lewis Manor Well) was not tested for PFOA or perfluorooctanesulfonic acid (PFOS) during the 2022 through 2024 reporting period due to the well being inactive during this period.

Table 6. Average PFOA Concentration by Source (2022-2024)

Potable Water Source	Number of Sampling Events (2022-2024)	Average PFOA Concentration (2022-2024) (µg/L)
Surface Water		
SSJID	4	ND
JJWTP	4	ND
Groundwater [a]		
Lincoln Well	2	ND
Well 1	5	ND
Well 2	5	0.0041
Well 3	5	0.0019
Well 4	3	ND
Well 5 (Lewis Manor Well) [b]	--	--
Well 6 (Park and Ride Well)	1	ND
Well 7 (Ball Park Well)	1	ND
Well 8 [c]	2	ND

Abbreviations:
"ASR" = Aquifer Storage and Recovery
"JJWTP" = John Jones Water Treatment Plant
"ND" = non-detect
"PFOA" = perfluorooctanoic acid
"SSJID" = South San Joaquin Irrigation District
"µg/L" = micrograms per liter

Notes:
[a] Each of the City's nine groundwater wells was tested at least once for PFOA during the 2022 through 2024 period, with the exception of Well 5.
[b] Well 5 was inactive during the 2022 through 2024 PHG reporting period. As such, this well was not sampled for PFOA.
[c] Well 8 is currently used as an ASR well and is not considered by the City to be a groundwater production well at this time.

4.4.2 Contaminant Sources

PFOA is a synthetic compound that belongs to the broader class of per- and polyfluoroalkyl substances (PFAS), which are characterized by their strong carbon-fluorine bonds. These bonds make PFAS highly resistant to biological and environmental degradation, which allows them to persist in the environment for long periods of time. Historically, PFOA was widely used in the manufacturing of consumer and industrial products, such as nonstick cookware, stain-resistant carpets, cleaning agents, and aqueous film-forming foam used in firefighting. Due to its classification as a carcinogen, the United States voluntarily phased out the use of PFOA by 2015 (OEHHA, 2024).

Despite this phase-out, PFOA remains present in the environment due to its environmental persistence and bioaccumulative nature. PFOA can enter both surface water and groundwater sources through multiple pathways, such as runoff or leaching from industrial sites, landfills, wastewater treatment plant discharges, or areas where PFAS-containing firefighting foams were historically used (OEHHA, 2024). The presence of PFOA in the City's groundwater supply is possibly attributable to the widespread historical use of PFOA-containing products, particularly through runoff from areas where such products were used or disposed.

4.4.3 Public Health Risk

The long-term ingestion of water containing elevated levels of PFOA has been associated with increased total cholesterol, liver and immune system toxicity, thyroid toxicity, and developmental/reproductive toxicity in humans, as well as preeclampsia and pregnancy-related hypertension. Additionally, exposure to PFOA has been linked to an increased risk of cancer, specifically related to the kidneys (OEHHA, 2024).

For these reasons, OEHHA classifies PFOA as a carcinogen, meaning that long-term exposure may increase the risk of developing cancer (OEHHA, 2025). At the PHG of 7×10^{-6} µg/L, OEHHA estimates the lifetime cancer risk to be one per one million (OEHHA, 2025). Given that a CA MCL has not yet been established for PFOA, OEHHA has not yet quantified the numerical health risk associated with the long-term ingestion of PFOA at the CA MCL or the federal MCL (OEHHA, 2025). As such, no such numerical health risk associated with the MCL is identified herein.

4.4.4 Estimation of Treatment Cost

CCR Title 22 § 64447 through § 64447.4 does not identify the BATs for the removal or reduction of any PFAS, including PFOA. However, as part of the final PFAS National Primary Drinking Water Regulation, the USEPA identified the following BATs for removing or reducing concentrations of PFAS, including PFOA, to levels below the federal MCLs:

- Granular Activated Carbon (GAC);
- Anion Exchange;
- Reverse Osmosis; and
- Nanofiltration (USEPA, 2024).

Because a BAT for PFOA removal is not identified in CCR Title 22 § 64447 through § 64447.4, the ACWA Guidelines do not include cost estimates for implementing each of the above BATs for the purposes of PFOA removal (ACWA, 2025). Therefore, unit cost estimates, including both annualized capital and O&M costs, were developed using cost estimate data from a March 2024 USEPA technical guidance document (2024 USEPA document) outlining treatment technologies for PFAS removal (USEPA, 2024).

Given the differences between the cost estimation information provided in the ACWA Guidelines and the 2024 USEPA document, the methodology used to estimate treatment costs for each BAT for PFOA removal differs from that described in Section 3.3[20]. Specific details about the assumptions and estimation approach, as well as the annual total and per-connection costs associated with each BAT, are included below in **Table 7**[21]**.** As shown therein, the estimated annual treatment costs for implementation across the City's groundwater wells with reported PFOA exceedances (Well 2 and Well 3) ranges from approximately $1,460,000 for both pressure and gravity GAC to $3,280,000 for reverse osmosis/nanofiltration.

[20] Unlike the ACWA Guidelines, which provide the total estimated annual cost (including capital and O&M costs) for the implementation of each BAT in 2024 dollars, the 2024 USEPA document provides the necessary information to calculate the *lifetime* capital and *annual* O&M costs in 2022 dollars based on the system's design size and average flow, respectively (USEPA, 2024). For comparison purposes and consistency with the estimates provided in the ACWA Guidelines, estimated costs calculated using the 2024 USEPA document were annualized and converted to 2024 dollars using the ENR Construction Cost Index for 2024, consistent with the methodology used in the ACWA Guidelines (ACWA, 2025).

[21] The 2024 USEPA document provides cost estimation information for two types of GAC systems, pressure GAC and gravity GAC, as well as a single cost estimation approach applicable to both reverse osmosis and nanofiltration systems. Additionally, the document provides information to estimate the cost of implementing anion exchange (USEPA, 2024). Accordingly, costs were estimated using each of these provided methods, as shown in **Table 7.**

Table 7. Estimated Costs for PFOA Treatment

Parameter	BAT [a]			
	Pressure GAC	Gravity GAC	Anion Exchange	RO/NF
Estimated unit cost ($/one thousand gallons) [b]	$0.69	$0.69	$0.80	$1.55
Capital Cost				
Well 2 and Well 3 ($/lifetime) [c]	$9,593,000	$8,990,000	$6,710,000	$13,600,000
Annualized Well 2 and Well 3 Capital Cost ($/year) [d]	$640,000	$599,000	$447,000	$906,000
Annualized capital cost per service connection ($/year)	$25	$23	$17	$35
Annual O&M Cost				
Well 2 and Well 3 ($/year) [e]	$819,000	$859,000	$1,250,000	$2,380,000
Annual O&M cost per service connection ($/year)	$31	$33	$48	$91
Total Annual Treatment Cost ($/year) [f]	$1,460,000	$1,460,000	$1,690,000	$3,280,000
Total Annual Cost per service connection ($/year)	$56	$56	$65	$126

Abbreviations:
"ACWA" = Association of California Water Agencies
"BAT" = million gallons per day
"ENR" = Engineering News-Record
"GAC" = granular activated carbon
"NF" = nanofiltration
"RO" = reverse osmosis

Notes:
[a] The ENR Construction Cost Index for 2024 was used to adjust cost estimates calculated using the 2024 USEPA document from 2022 to 2024 dollars for consistency with the ACWA Guidelines and other cost estimates included in this PHG Report. Totals in Table 7 may not sum due to rounding.
[b] Estimated unit costs per one thousand gallons treated are not provided in the 2024 USEPA document. Estimated unit costs included in Table 7 were calculated based on the estimated total annual treatment cost and the total production capacity of wells with PHG exceedances. As such, estimated unit costs are included herein solely for comparison purposes.
[c] The total capital cost associated with each BAT was calculated based on the individual production capacities of wells with PHG exceedances for PFOA (Wells 2 and 3). Given that the 2024 USEPA document provides guidance for calculating total capital costs based on design capacity, design capacity was assumed to be equal to the production capacity of each well exceeding the PHG, which was 2.9 MGD in both cases.
[d] For consistency with the ACWA Guidelines and other cost estimates included in this PHG Report, total capital costs estimated using the 2024 USEPA document were annualized based on a standard assumed BAT lifespan of 15 years.
[e] The total annual O&M cost for each BAT was calculated based on the individual production capacities of each well with recorded PHG exceedances for PFOA (Wells 2 and 3). Given that the 2024 USEPA document provides guidance for calculating total annual O&M cost based on average flow, average flow was assumed to be equal to the production capacity of each well exceeding the PHG, which was 2.9 MGD in both cases. Because the City's production wells are not expected to operate at their full production capacity on average, the estimated annual O&M costs are considered conservative.
[f] The estimated total annual treatment cost reflects the sum of annualized capital and O&M costs associated with each BAT.

4.5 Total Coliform/Escherichia coli (*E. Coli*)

4.5.1 Comparison to PHG/MCLG

The federal Revised Total Coliform Rule (RTCR) became effective in April 2016, establishing new routine and repeat sampling requirements for water suppliers, replacing the total coliform MCL, and setting an MCL and MCLG for *E. coli.* Following the adoption of the federal RTCR, the California RTCR became effective in July 2021. Revisions in the California RTCR include a new Coliform Treatment Technique requirement, a new *E. coli* MCL regulatory limit, and guidance for monthly reporting requirements and exceedances of total coliform and *E. coli*. Although PHGs have not been set by OEHHA, because both MCLs and MCLGs have been established for total coliform and *E. coli*, the City is required to consider them in the PHG reporting process and identify any instances of MCLG exceedances during the 2022 through 2024 reporting period.

<u>Total Coliform</u>

An MCLG of zero has been established for total coliform. Based on guidance provided in the ACWA Guidelines, the MCLG of zero for total coliform can be interpreted as zero samples positive during the 2022 through 2024 reporting period. As such, any total coliform detections that occur throughout the three-year period would be considered exceedances of the MCLG and must be included in this PHG report. Additionally, for systems collecting at least 40 total coliform samples per month,[22] a monthly MCL of 5.0% has been set for total coliform, meaning that no more than 5.0% of the samples collected by a water system in any given month can be total coliform-positive.

Of the over 3,000 samples taken for total coliform throughout the City's distribution system from 2022 through 2024, 17 were positive (City of Tracy, 2025a). During this three-year period, the highest monthly percent of samples positive for total coliform was 4.9%. As such, the total coliform MCLG was exceeded during nine of the 36 months corresponding to these exceedances, but the monthly MCL of 5.0% was consistently complied with.

<u>*E. coli*</u>

Based on guidance provided in the ACWA Guidelines, the MCLG of zero for *E. coli* can be interpreted as zero samples positive during the 2022 through 2024 reporting period. As such, any *E. coli* detections that occur throughout the three-year period would be considered exceedances of the MCLG and must be included in this PHG report. In addition to the MCLG, under the RTCR, a water system would exceed the *E. coli* MCL when any of the following triggers are met:

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[22] Pursuant to Table 64423-A of CCR Title 22 § 64423, the City is required to take a minimum of 90 routine total coliform samples per month throughout its distribution system. As such, the monthly MCL for total coliform of 5.0% is applicable to the City.

- An *E. coli*-positive repeat sample is observed following a total coliform-positive routine sample;
- A total coliform-positive repeat sample is observed following an E*. coli*-positive routine sample;
- A water system fails to collect all required repeat samples following a positive *E. coli* routine sample; or
- A water system fails to test for *E. coli* when any repeat sample is positive for total coliform.

Of the over 3,000 samples taken for *E. coli* throughout the City's distribution system from 2022 through 2024, only one sample was positive for *E. coli* in August 2023 (City of Tracy, 2025a). As such, the MCLG for *E. coli* was exceeded for that month. However, both the follow-up total coliform and E. coli samples were negative; therefore, the MCL for *E. coli* was not exceeded.

4.5.2 Contaminant Sources

Total coliforms are a broad group of naturally occurring bacteria found in the environment, including soil, surface water, and the intestines of warm-blooded animals. *E. coli*, a type of fecal coliform, is specifically associated with the intestinal tracts of animals, and its presence in water typically indicates recent fecal contamination. Coliform bacteria can enter drinking water sources and distribution systems through various pathways, including inadequate treatment, bacterial regrowth within the distribution system, or intrusion through cracks or breaks in the distribution infrastructure (USEPA, 2025b).

4.5.3 Public Health Risk

While most total coliform bacteria are not harmful to humans, their presence in drinking water may indicate the presence of other, potentially harmful pathogens (i.e., bacteria, parasites, and viruses). Specifically, *E. coli*, a type of fecal coliform bacteria, is commonly used as an indicator of fecal contamination, as it is a fecal coliform bacteria found in the feces of animals, including humans. Although not necessarily harmful itself, the presence of *E. coli* suggests an increased risk of exposure to harmful pathogens and fecal contamination. As such, total coliforms and E. coli can be used to evaluate the effectiveness of water treatment processes and the integrity of distribution systems (USEPA, 2013; USEPA, 2025b).

Because coliform bacteria are generally not pathogenic, OEHHA has not established a numerical health risk associated with long-term exposure to total coliforms or *E. coli* (OEHHA, 2025). As such, no such numerical health risk is identified herein.

4.5.4 Estimation of Treatment Cost

CCR Title 22 § 64447 identifies the following BATs for achieving compliance with the *E. coli* MCL:

- Appropriate placement and construction of groundwater wells to protect from fecal contamination;
- Maintenance of an adequate disinfectant residual throughout the distribution system;
- Proper maintenance of the distribution system;
- Filtration and/or disinfection of surface or groundwater sources; and
- For systems utilizing groundwater for their supply, compliance with the Drinking Water Source Assessment and Protection Program.

Although the BATs included in CCR Title 22 § 64447 are identified for achieving compliance with the *E. coli* MCL, the ACWA Guidelines suggest that these BATs are also generally applicable to total coliforms. Additionally, the ACWA Guidelines indicate that many systems likely already implement the identified BATs and that the most effective action to reduce the presence of total coliforms in a system would likely be to increase the disinfectant residual (ACWA, 2025). While this approach may help mitigate health risks associated with microbial pathogens, it may also lead to elevated levels of disinfection by-products (DBPs), which are associated with potential chronic health effects. As such, any increase in disinfectant residual should be evaluated prior to implementation to ensure compliance with the maximum residual disinfectant levels (MRDLs) established under the Disinfectants and Disinfection Byproducts Rule (DBPR; ACWA, 2025).

As discussed in Section 2, the City's surface water supplies are treated through multi-step processes and are disinfected prior to entering the City's distribution system. Specifically, DMC/CVP water treated at the JJWTP is disinfected with free chlorine, and a chloramine residual is established through the addition of both chlorine and ammonia. Surface water purchased from SSJID is treated at the DGWTP, with disinfection by chlorine as the final treatment step. Ammonia can also be added to treated SSJID water at the Mossdale Pump, which delivers water from SSJID to the City's distribution system, for the purposes of chloramine formation. In addition, in the City's surface water supply, chlorine is added for disinfection at several of the City's active groundwater production wells (City of Tracy, 2022).

The City conducts weekly monitoring of total chlorine and chloramine residuals at all locations where total coliform samples are collected and regularly performs maintenance, such as routine flushing, throughout the distribution system. In the event that chlorine concentrations need to be boosted to ensure an adequate disinfectant residual throughout the distribution system, chlorine can be added at the Linne Reservoir or the Northeast Industrial Reservoir (City of Tracy, 2022).

The City aims to maintain a combined chlorine (monochloramine) concentration of at least 1.8 mg/L, with typical levels ranging from 1.0 to 2.5 mg/L. This target is well below the MRDL of 4.0

mg/L "as Cl_2", ensuring compliance with regulatory limits and avoiding potential adverse health impacts. Given that the free chlorine concentration in surface water from SSJID's DGWTP is typically 1.0 mg/L or less, following the addition of ammonia, the combined chlorine concentration of this surface supply is typically 1.0 mg/L or lower due to the conversion of free chlorine to monochloramine (City of Tracy, 2022).

Several of the City's wells currently utilize chlorine as a disinfectant. When chlorinated well water is blended with chloraminated surface water, the free chlorine can react with monochloramine, potentially oxidizing it to dichloramine, trichloramine, or complete oxidation of the ammonia to nitrogen gas. The extent of these reactions depends on the concentrations of chlorine and monochloramine in the respective sources, as well as the blending ratio. These interactions can lead to the consumption of both disinfectants, potentially resulting in inadequate chloramine or monochloramine residuals in the treated water (City of Tracy, 2022).

During the 2022 through 2024 reporting period, the City completed a project to modify two of its production wells to allow for the addition of both chlorine and ammonia in order to establish a chloramine residual directly in the well water. This improvement was made to enhance the stability of the disinfectant residual in the well water and help reduce the potential for reactions with treated surface water that could otherwise deplete disinfectant levels within the distribution system (City of Tracy, 2022).

To reduce the potential for MCLG exceedances for total coliforms, the City could increase disinfectant residuals within its distribution system. However, higher disinfectant residuals may lead to increased formation of DBPs and associated potential health risks. Elevated free chlorine residuals can also impact secondary drinking water standards, such as taste and odor. Given the need to balance regulatory compliance, aesthetic water quality, and the minimization of both microbial contamination and DBP formation, it is not recommended that the City increase disinfectant residuals for the purposes of reducing total coliforms given that the City consistently complies with the MCLs for both total coliform and *E. coli.*

5 RECOMMENDATIONS FOR FURTHER ACTION

As discussed in Section 4, the City identified exceedances of PHGs or MCLGs in one or more of its groundwater wells during the 2022 through 2024 reporting period for the following contaminants: arsenic, copper, Cr6, PFOA, and total coliform and E. coli. Despite these exceedances, the City's drinking water supply consistently complied with all enforceable drinking water standards established by the SWRCB and USEPA to protect public health throughout the three-year reporting period.

During the PHG reporting period, the City completed a project to modify two of its groundwater wells to allow for the addition of both chlorine and ammonia, enabling the formation of a chloramine residual directly within the well water. With these modifications completed, the City anticipates that these improvements will enhance the stability and consistency of disinfectant residuals throughout the distribution system, thereby reducing the system's vulnerability to microbial contamination. By maintaining a more effective residual disinfectant, the project is expected to reduce potential health risks associated with the consumption of pathogenic microorganisms in the City's drinking water supply and decrease the likelihood of MCLG exceedances for total coliforms, including *E. coli*.

To reduce the concentrations of additional contaminants identified in this PHG report, additional treatment processes would be required. The BATs for contaminants with PHG or MCLG exceedances, along with the estimated total annual implementation costs for each treatment option, are discussed in Section 4. However, as noted in Section 3.3, the BATs identified in the CCR and included in this PHG Report are intended to achieve compliance with MCLs, not necessarily to reach the more stringent PHGs or MCLGs. As such, it is uncertain whether these BATs would be sufficient to reduce contaminant concentrations below the respective PHGs or MCLGs.

Given the uncertainty surrounding the public health benefits of implementing additional BATs, the significant capital and O&M costs associated with such projects, and the fact that the City's water supply remained consistently in compliance with the MCLs for the contaminants identified in this PHG Report, no further treatment is proposed at this time beyond the City's ongoing improvement efforts, such as the well modification project. Instead, it is recommended that the City continue maintaining its wells, treatment processes, and distribution system in good operational condition and continue routine water quality monitoring to ensure ongoing compliance with enforceable drinking water standards. Should future monitoring indicate that water quality no longer meets these standards, the City may consider implementing the appropriate BATs identified in this PHG Report based on the specific contaminant of concern.

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