

Appendix F2

PFAS Technical Memorandum

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Pure Water Southern California PFAS Technical Memorandum

Prepared by

**AECOM &
BC TEAM**

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Acronym List

A.K. Warren Water Resource Facility	(Warren Facility)
Advanced Water Purification	(AWP)
California Environmental Quality Act	(CEQA)
Carbon to Fluorine	(C-F)
Comprehensive Environmental Response, Compensation, and Liability Act	(CERCLA)
Department of Toxic Substances Control	(DTSC)
Division of Drinking Water	(DDW)
Limits of Quantitation	(LOQs)
Los Angeles County Sanitation Districts	(Sanitation Districts)
Maximum Contaminant Level Goals	(MCLGs)
Maximum Contaminant Levels	(MCLs)
Method Detection Limits	(MDLs)
Metropolitan Water District of Southern California	(Metropolitan)
Monitoring Reporting Program	(MRP)
Nanofiltration	(NF)
National Pollutant Discharge Elimination System	(NPDES)
National Pollution Discharge Elimination System	(NPDES)
National Primary Drinking Water Regulations	(NPDWRs)
Notice of Intent	(NOI)
Notification Levels	(NLs)
Part per Billion	(ppb)
Polyfluoroalkyl Substances	(PFAS)
Potentially Responsible Parties	(PRPs)
Public Health Goals	(PHGs)
Pure Water Southern California	(Pure Water)
Regional Screening Level	(RSL)
Regional Screening Levels	(RSLs)
Regional Water Quality Control Board	(RWQCB)
Resource Conservation and Recovery Act	(RCRA)
Response Levels	(RLs)
Reverse Osmosis	(RO)
State Water Resources Control Board	(SWRCB)
Stormwater Pollution Prevention Plan	(SWPPP)
Waste Discharge Requirements	(WDRs)

I. Introduction

Pure Water Southern California (Pure Water) is a proposed partnership between The Metropolitan Water District of Southern California (Metropolitan) and the Los Angeles County Sanitation Districts (Sanitation Districts) to beneficially reuse cleaned wastewater that currently is discharged to the Pacific Ocean from the Sanitation Districts' A.K. Warren Water Resource Facility (Warren Facility), located in the City of Carson. At full buildout, Pure Water would produce approximately 150 million gallons per day (nearly 155,000 acre-feet per year) of sustainable, high-quality water to supplement existing supplies in the Southern California region.

Pure Water generally entails the following components:

- The construction of a new Advanced Water Purification (AWP) Facility located on property within and adjacent to the Sanitation Districts' Warren Facility, and the construction of a workforce training center located just north of the Warren Facility.
- The construction of an approximately 39-mile backbone conveyance pipeline, which will traverse the Los Angeles Coastal Plain between the City of Carson in the southwest and the City of Azusa in the northeast and will cross under or adjacent to waterways and through areas of residential, agricultural, commercial, industrial, and transportation land uses.
- The operation of the AWP Facility, which would further treat a portion of the Warren Facility's cleaned wastewater (approximately 180 million gallons per day) to produce approximately 150 million gallons per day of purified water. Among other things, this treatment process would involve the use of fine screening filtration, membrane bioreactor treatment, reverse osmosis (RO), ultraviolet and advanced oxidation processes, water stabilization and chlorine disinfectant for indirect potable reuse.
- The operational return of the AWP Facility's waste stream, blended with existing RO concentrate originating from the Warren Facility to the Pacific Ocean, through the Warren Facility's existing outfall pipeline.
- The operational distribution of the Pure Water's purified water through the backbone pipeline to locations within the Los Angeles coastal plain, where the purified water would be used primarily for indirect and direct potable re-use and non-potable industrial use, following any supplemental treatment if needed.

This Report analyzes each of those Pure Water components in relation to chemicals of emerging concern known as per- and polyfluoroalkyl substances (PFAS) and provides information for purposes of informational disclosure under the California Environmental Quality Act (CEQA), Public Resources Code, § 21000 et seq. PFAS Overview of Physical Characteristics and Effects

A. PFAS Background

PFAS are a large group of synthetic (i.e., man-made) chemicals with a history of use across a wide range of industrial and manufacturing sectors. The popularity of PFAS in various applications is generally driven by their unique physical and chemical properties (e.g., water, oil, and stain repellency, chemical and thermal stability, etc.). Many of the desirable physical and chemical properties of PFAS in industrial and manufacturing applications cause PFAS to persist in the environment (i.e., be resistant to microbial degradation), making them challenging to treat.

PFAS are generally characterized by the carbon to fluorine (C-F) bond, widely considered one of the strongest bonds in the field of organic chemistry. Due to the strength of the hallmark C-F bond, PFAS compounds are often referred to as “forever chemicals” based on their general resistance to degradation under normal environmental conditions.

Typical PFAS of regulatory concern and those routinely encountered in the environment are distinguished by their characteristic “head” and “tail” structure. The typical PFAS compound is comprised of a hydrophobic (i.e., water fearing) C-F “tail” and a hydrophilic (i.e., water loving) “head” group (see Figure 2-1). The divergent qualities of the “head” and “tail” structure of these PFAS impart surfactant-like qualities (surfactants lower the surface tension between two materials). These surfactant-like qualities affect a preference for PFAS to accumulate at interfaces (e.g., liquid-solid interface) or even to self-assemble.

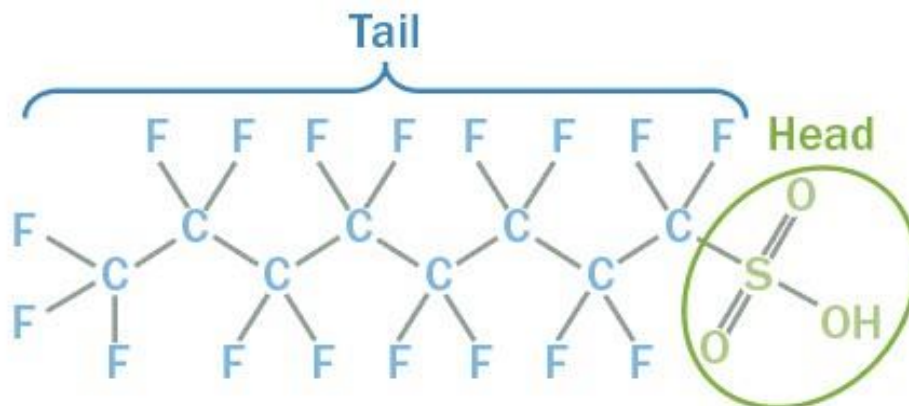


Figure 2-1. Perfluorooctane sulfonic acid (PFOS) molecule depicting the hydrophobic tail and hydrophilic head

The structure of PFAS molecules can be tuned by modifying the basic structural elements of the compound to produce desired effects in industrial or manufacturing processes. PFAS manufacturers have developed many variants to differentiate themselves in the PFAS marketplace. The U.S. Environmental Protection Agency (EPA) has documented a growing number of PFAS chemistries, with current counts exceeding 15,000 unique PFAS compounds (NIEHS). Many sub-groups of PFAS compounds fall within the PFAS family tree. However, the main focus of regulatory actions to date has been focused on perfluoroalkyl acids (PFAAs) and, as such, PFAAs also will be the main focus of discussion in this technical memorandum.

B. History, Uses, and Occurrence

PFAS were first synthesized in the 1930s, but widespread commercial use proliferated in the 1950s and onward. Historically, PFAS have been used in many industries for their favorable properties, including stain resistance, low surface tension, lubrication, thermal and chemical stability, etc. Considering these favorable qualities, PFAS have been used extensively in consumer products that tout:

- Water resistance, e.g., waterproof boots, rain jackets, fabric structures, and shelters.
- Oil and grease resistance, e.g., food packaging and fast-food containers, and machine and tool coatings.
- Stain resistance, e.g., carpeting, furniture.
- Thermal resistance, e.g., children's pajamas and car seats, firefighting foams, firefighting turnout gear, and
- Chemical resistance, e.g., Teflon™, which is a largely inert product that can be used in a variety of applications.

Early PFAS formulations were generally predominated by long chain PFAAs. As the name implies, long chain PFAAs, relative to short chain PFAAs, are characterized by the length of the perfluorinated chain (e.g., "tail") component of the compound. As a result of their popularity in early PFAS applications, initial research on the occurrence and toxicological implications of PFAS focused on long chain PFAAs. Under the resulting increased regulatory scrutiny, long chain PFAA chemistries were voluntarily phased out by major manufacturers beginning in the early to mid-2000's (EPA 2000, EPA 2023h).

Following the phase out of long chain PFAAs in commercial applications, PFAS manufacturers, and the industries they serviced, transitioned to alternative PFAS formulations, including short chain PFAAs (ITRC 2023).

While alternative PFAS chemistries were viable replacements for industrial applications, the differences in their physical and chemical properties had a marked impact on their fate and transport in natural and engineered systems, in addition to their potential human health impacts.

For instance, short chain PFAAs are more mobile within the environment relative to long chain PFAAs and are often more challenging to remove with treatment technologies effective for removal of their long chain counterparts. However, based on existing toxicological information, it appears that short chain PFAAs are less bio accumulative and do not pose the same extent of human health concerns at the low concentrations associated with long chain PFAAs (ITRC 2023). In general, human health-based state and federal drinking water concentrations for short chain PFAAs are typically less stringent compared to those for long chain PFAAs. More information regarding the state and federal PFAS regulations is presented in Section 3.

The widespread use of and release of PFAS-containing materials over 50 years has led to the near ubiquitous presence of PFAS in the environment. Once released, the stability and mobility of PFAS in the environment promotes their widespread movement through natural and engineered systems. Much of the recent discourse around PFAS has been based on improved analytical techniques, which are now able to reliably measure PFAS down to sub-ng/L concentrations in water, and sub-ng/g concentrations in solids. EPA Method 1633, Revision A (Table 2-1) analyzes PFAS in various samples using liquid chromatography – tandem mass spectrometry (LC-MS/MS).

Pooled Method Detection Limits (MDLs) indicate the lowest detectable concentration, while Limits of Quantitation (LOQs) represent the lowest concentration that can be accurately measured.

Table 2-1: EPA Method 1633A Pooled Method Detection Limits and Limits of Quantitation

Compound	Aqueous (ng/L)		Solid (ng/g)	
	Pooled MDL	Range of Limit of Quantitation (LOQs)	Pooled MDL	Range of LOQs
PFBA	0.79	4–16	0.15	0.64–1.6
PFPeA	0.54	2–8	0.07	0.32–0.8
PFHxA	0.46	1–4	0.06	0.16–0.4
PFHpA	0.37	1–4	0.05	0.16–0.4
PFOA	0.54	1–4	0.07	0.16–0.4
PFNA	0.45	1–4	0.14	0.16–1.3
PFDA	0.52	1–4	0.06	0.16–0.4
PFUnA	0.45	1–4	0.12	0.16–0.5
PFDoA	0.40	1–4	0.06	0.16–0.4
PFTTrDA	0.46	1–4	0.07	0.16–0.4
PFTeDA	0.49	1–4	0.05	0.16–0.4
PFBS	0.37	1–4	0.05	0.16–0.4
PFPeS	0.50	1–4	0.08	0.16–0.4
PFHxS	0.54	1–4	0.08	0.16–0.4

Compound	Aqueous (ng/L)		Solid (ng/g)	
	Pooled MDL	Range of Limit of Quantitation (LOQs)	Pooled MDL	Range of LOQs
PFHpS	0.50	1-4	0.07	0.16-0.4
PFOS	0.63	1-4	0.07	0.16-0.4
PFNS	0.47	1-4	0.07	0.16-0.4
PFDS	0.60	1-4	0.08	0.16-0.4
PFDoS	0.60	1-4	0.06	0.16-0.4
4:2FTS	1.69	4-15	0.20	0.64-1.5
6:2FTS	2.45	4-15	0.39	0.64-1.5
8:2FTS	2.50	4-15	0.31	0.64-1.5
PFOSA	0.32	1-4	0.04	0.16-0.4
NMeFOSA	0.43	1-4	0.07	0.16-0.4
NEtFOSA	0.45	1-4	0.07	0.16-0.4
NMeFOSAA	0.68	1-4	0.08	0.16-0.4
NEtFOSAA	0.59	1-4	0.08	0.16-0.4
NMeFOSE	3.81	10-40	0.36	1.6-4.0
NEtFOSE	4.84	10-40	0.35	1.6-4.0
HFPO-DA	0.51	2-8	0.25	0.64-1.6
ADONA	0.50	2-8	0.23	0.64-1.5
PFEESA	1.17	2-8	0.08	0.32-0.7
PFMPA	1.46	4-16	0.07	0.32-0.8
PFMBA	1.41	4-15	0.05	0.32-0.8
NFDHA	0.75	2-7	0.20	0.32-0.8
9Cl-PF3ONS	1.38	4-15	0.22	0.64-1.5
11Cl-PF3OUdS	1.67	4-15	0.18	0.64-1.5
3:3FTCA	2.47	5-20	0.23	0.80-5.0
5:3FTCA	9.59	25-100	0.86	4-10
7:3FTCA	8.71	25-100	0.87	4-10

(Courtesy of Black & Veatch/CDM Smith)

c. Environment Fate and Transport

Due to the stability of the C-F bond, PFAS are generally considered recalcitrant (i.e., resistant) to biotic or abiotic degradation processes encountered in the environment. The persistence of PFAS in the environment is compounded by their relatively high mobility, leading to a “PFAS cycle” analogous to the global cycling of other conserved compounds (e.g., water).

For example, impacted groundwater can contaminate a drinking water source, drinking water can spread PFAS to residential and agricultural users, their discharged wastewater can impact receiving waters, and biosolids can leach into soils. For this reason, disrupting and ultimately breaking the PFAS cycle is a primary objective of national and international regulatory efforts.

Compared to other organic contaminants, the aqueous solubility of PFAS is relatively high, and their surfactant-like properties favor their accumulation at gas-liquid and liquid-solid interfaces. When introduced into natural (e.g., groundwater aquifer) or engineered (e.g., wastewater treatment facility) systems, the preference for PFAS to accumulate at interfaces manifests as partitioning behavior. PFAS are commonly observed to be associated with both solid phase media (e.g., soil, biosolids) and liquid phase media (e.g., groundwater, recycled water, treated wastewater effluent).

The degree of partitioning is largely dictated by compound specific properties. In relative terms, larger, more hydrophobic PFAS (e.g., long chain PFAAs) are more likely to associate with the solid phase while smaller, more hydrophilic PFAS (e.g., short chain PFAAs) are more likely to associate with the liquid phase. The variation of these properties within the PFAS family of compounds ultimately impacts the fate and transport of individual PFAS in natural and engineered systems. Resulting from the cyclic movement of PFAS throughout the various compartments of both natural and engineered systems, it is helpful to understand common sources and sinks (i.e., system compartments where PFAS accumulate for extended periods of time) of PFAS.

D. Common Sources and Sinks for PFAS in Natural and Engineered Systems

Sources of PFAS into natural and engineered systems are numerous. Fundamentally, manufacturers of PFAS raw materials and additives (e.g., Chemours, 3M, Dupont, etc.) are the originators of PFAS; however, the vast majority of PFAS releases into the environment are from end users of PFAS containing products. As listed by EPA in the PFAS Strategic Roadmap, industrial and manufacturing categories commonly associated with PFAS use include:

- Aviation and aerospace
- Cosmetics and personal care products
- Pulp, paper, and paperboard manufacturing
- Textile mills
- Electroplating
- Metal finishing
- Leather tanning and finishing
- Paint formulating
- Electrical and electronic components
- Firefighting
- Plastics molding and forming

The above identified sources of PFAS may be associated with current or historical releases of PFAS directly into the environment or indirectly via discharges to a sanitary sewer. Sources of lower PFAS concentrations in the environment are often diffuse and more difficult to identify. One common source is residential septic systems, as people excrete PFAS and dispose of PFAS-containing products through their septic systems. Waste from other consumer products, such as food packaging, clothing, cosmetics, and furniture, are also likely sources of low-level PFAS contamination.

Water treatment residuals, while not the original sources of PFAS, can contain PFAS. These include wastewater treatment residuals (e.g., biosolids) and drinking water treatment residuals. Land application of treatment residuals, and biosolids in particular, has been under increasing scrutiny, with several states enacting numerical PFAS thresholds or enacting outright bans on land application.

Landfills are a common sink for PFAS in the engineered environment, based on their integration of numerous waste streams over many years of operation. As previously stated, pervasive use of PFAS across various industries and manufacturing processes has generated large volumes of PFAS-containing waste that is routinely disposed of at municipal solid waste landfills. Modern landfill designs often include leachate collection systems; however, many senior or decommissioned landfills do not. Landfill leachate often contains elevated concentrations of PFAS, comprised of a unique mixture of PFAS compounds reflective of the types of waste contained in the landfill (Masoner et al. 2020). Adequate landfilling procedures for PFAS-containing waste may serve to disrupt the PFAS cycle in the near and/or long-term; however, the ultimate release of PFAS-containing leachate does not permanently break the PFAS cycle.

E. Toxicological Effects of PFAS

The human and ecological health effects associated with PFAS exposure remain an active area of research with a developing state of understanding. Given that PFAS are a class of thousands of chemicals, the specific health and environmental impacts of many PFAS are not well understood. EPA has noted that the potential for adverse health effects from PFAS is exacerbated by the persistence of PFAS in the environment, creating the potential for continuous and cumulative human exposure long after immediate release has occurred, and the mobility of the chemicals, which can cause them to migrate far from the point of initial release through groundwater, surface water, and other media.

Most human epidemiology studies focusing on human populations (the general population, communities with contaminated drinking water, or occupationally exposed workers) have been published within the last 10 years (ITRC 2023). Studying population-level impacts in humans is complicated by the number of different PFAS compounds, which are typically present as mixtures in the environment. As a result, most (but not all) risk-based toxicity factors relied upon for the development of regulatory limits are based upon extrapolations of dose-response relationships observed in animal studies.

To date, most toxicology studies have focused on the health impacts associated with a small number of PFAS. From a toxicology standpoint, PFOS and PFOA are the most widely studied PFAS and, as such, have the longest history of regulation. Although the EPA currently classifies PFOA and PFOS as “likely human carcinogens” (EPA 2024a), the regulatory limits and screening levels proposed by EPA are based on non-cancer thresholds. PFAS have been linked to a range of health effects, including increased blood pressure, decreased fertility, developmental delays in infants and children, reduced immune system efficiency and/or vaccine response, increased cholesterol, and obesity (ITRC 2023). Because of this apparent threat to public health, EPA designated PFOA and PFOS as hazardous substances under CERCLA in April 2024.

In September 2024, the EPA released final recommended criteria and benchmarks for PFOS, PFOA, and eight other PFAS. These recommendations are detailed in Table 2-2 for freshwater aquatic life and Table 2-3 for saltwater aquatic life. These water quality criteria and benchmarks represent the highest concentrations of pollutants in surface water that would not have an impact on aquatic species, defined as impacts to organism survival, growth, and reproduction. The criteria and benchmarks are not regulatory but serve as an initial reference for which future regulatory standards may be developed.

Table 2-2. Freshwater Aquatic Life Criteria for PFOA and PFOS

Criteria Component	Acute Water Column (mg/L)	Chronic Water Column (mg/L)	Invertebrate Whole-Body (mg/kg)	Fish Whole-Body (mg/kg)	Fish Muscle (mg/kg)
PFOA Magnitude	3.1	0.10	1.18	6.49	0.133
PFOS Magnitude	0.071	0.00025	0.028	0.201	0.087
Duration	1- hour average	4-day average	Instantaneous	Instantaneous	Instantaneous
Frequency	Not to be exceeded more than once in three years, on average	Not to be exceeded more than once in three years, on average	Not to be exceeded	Not to be exceeded	Not to be exceeded

Table 2-3. Acute Saltwater Aquatic Life Benchmarks for PFOA and PFOS

Chemical	PFOA (mg/L)	PFOS (mg/L)
Magnitude	7.0	0.55
Duration	1-hour average	
Frequency	Not to be exceeded more than once in three years, on average	

II. PFAS Regulatory Background

PFAS substances are still at the onset of study and regulation, the federal and state laws that govern PFAS creation, disposal, storage, testing, and tracking are still evolving. For CEQA purposes, determining whether impacts are potentially significant involves using the established drinking water standards and other relevant metrics. CEQA requires lead agencies to evaluate the significance of environmental impacts based on established criteria.

A. Safe Drinking Water Act

On April 26, 2024, EPA issued the final National Primary Drinking Water Regulations (NPDWRs) and health-based Maximum Contaminant Level Goals (MCLGs) for six PFAS.² In the final rule, EPA set individual Maximum Contaminant Levels (MCLs) for five PFAS: PFOA at 4.0 ng/L, PFOS at 4.0 ng/L, PFHxS at 10 ng/L, PFNA at 10 ng/L, and HFPO-DA (also known as GenX) at 10 ng/L. EPA also set MCLGs for PFOA and PFOS at zero. In addition, EPA set a Hazard Index-based MCL and an MCLG of 1 (unitless) for mixtures of at least two of PFHxS, PFNA, HFPO-DA, and PFBS. These MCLs and MCLGs are shown in Table 3-1 below. Public Water Systems must come into compliance with the MCLs by 2029.

Table 3-1 MCLGs for listed chemicals

Chemical	Maximum Contaminant Level Goal (MCLG)	Maximum Contaminant Level (MCL)
PFOA	0	4.0 ppt
PFOS	0	4.0 ppt
PFHxS	10 ppt	10 ppt
HFPO-DA (GenX Chemicals)	10 ppt	10 ppt
PFNA	10 ppt	10 ppt
Mixture of two or more: PFHxS, PFNA, HFPO-DA, and PFBS	Hazard Index of 1 (unitless)	Hazard Index of 1 (unitless)

In California, the State Water Resources Control Board has set Notification Levels (NLs) and Response Levels (RLs) for PFOA, PFOS, PFHxS, and PFBS as listed in Table 3-2 below.

On September 18, 2024, the Office of Environmental Health Hazard Assessment recommended an NL for PFHxA of 1 part per billion (ppb). Notification levels are health-based advisory levels established by the Division of Drinking Water (DDW) for chemicals in drinking water that lack MCLs.

When chemicals are found at concentrations greater than their NLs, certain requirements and recommendations apply. A Response Level is the level at which DDW recommends removal of a drinking water source from service. The state has also adopted Public Health Goals (PHGs) for PFOA and PFOS, with the PHG for PFOA set at 0.007 ng/L and the PHG for PFOS set at 1 ng/L.

Table 3-2 Notification and Response Levels for PFAS Constituents

PFAS Constituent	Notification Level (ng/L or ppt)	Response Level (ng/L or ppt)
Perfluorobutanesulfonic acid (PFBS)	500	5,000
Perfluorohexanesulfonic acid (PFHxS)	3	20
Perfluorooctanesulfonic acid (PFOS)	6.5	40
Perfluorooctanoic acid (PFOA)	5.1	10

California has enacted several laws restricting the use of PFAS in consumer products, such as AB 347, which enforces existing PFAS restrictions on textile articles, juvenile products, and cookware/food packaging, and AB 2515, which prohibits the manufacture, sale, or distribution of menstrual products containing regulated PFAS. Proposition 65 also requires businesses to provide warnings about significant exposures to chemicals that cause cancer, birth defects, or other reproductive harm, including certain PFAS.

Metropolitan, the Districts, and other local agencies follow the standards set by the California State Water Resources Control Board and the EPA for monitoring and managing PFAS in drinking water and other environmental media.

B. CERCLA

On May 8, 2024, EPA issued a final rule designating PFOS and PFOA as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), effective July 8, 2024.³ The rule empowers private parties or EPA to seek out and impose cleanup liability on potentially responsible parties (PRPs) for releases of PFOS and PFOA into the environment.

In guidance, EPA has provided that it will exercise its CERCLA enforcement discretion to focus on entities who significantly contributed to the release of PFAS contamination into the environment, including parties that manufactured PFAS or used PFAS in the manufacturing process, federal facilities, and other industrial parties.

EPA does not intend to pursue entities where equitable factors do not support seeking response actions or costs under CERCLA, such as community water systems, publicly owned treatment works, municipal separate storm sewer systems, publicly owned or operated municipal solid waste landfills, publicly owned airports and local fire departments, and farms where biosolids are applied to land.⁴ In addition, several bills have been introduced in Congress to limit water systems' potential CERCLA liability for PFAS, namely S.1430 – *Water Systems PFAS Liability Protection Act*.

Soil screening levels (Table 3-3) and water screening levels (Table 3-4) under CERCLA are used to identify areas that may require further investigation or remediation based on potential human health risks.

² PFAS National Primary Drinking Water Regulation, 89 Fed. Reg. 32532 (Apr. 26, 2024).

³ Designation of Perfluorooctanoic Acid (PFOA) and Perfluorooctanesulfonic Acid (PFOS) as CERCLA Hazardous Substances, 89 Fed. Reg. 39124 (May 8, 2024).

Table 3-3: List of Select EPA PFAS Soil Screening Levels (SSL)

PFAS	Risk-based SSL (µg/kg)	MCL-based SSL (µg/kg)
PFPrA	2.1	-
PFBA	6.5	-
PFHxA	2.4	-
PFOA	0.000040	0.061
PFNA	0.25	0.042
PFUnDA	45	-
PFDoDA	170	-
PFTeDA	9,400	-
PFODA	220,000	-
PFBS	0.3	-
PFHxS	0.017	0.0042
PFOS	0.0015	0.030
HFPO-DA	0.0015	0.010

⁴ Memorandum from David Uhlmann, Assistant EPA Administrator, to Regional Administrators and Deputy Regional Administrators, Regional Counsels, and Deputy Regional Counsels (Apr. 19, 2024), <https://www.epa.gov/system/files/documents/2024-04/pfas-enforcement-discretion-settlement-policy-cercla.pdf>.

Table 3-4: Available Water Screening Levels

PFAS	California Notification Levels (ng/L) [^]	California Reporting Levels (ng/L) [^]	USEPA Tap Water RSLs (ng/L) [*]	USEPA Final MCLs (ng/L) [†]	SEPA HBWCs (ng/L)
PO-DA (GenX) [^]	--	--	1.5	10	10
4,8-dioxa-3H-perfluorooctanoic acid (ADONA)		Requested	--	--	-
PFBS	500	5,000	600	-	2000
PFBA	--	--	1,800	--	-
PFHxS	3	20	39	10	9
PFHxA		Requested	990	--	-
PFHpA		Requested	--	--	-
PFOS	6.5	40	0.2	4	-
PFOA	5.1	10	0.0027	4	-
PFNA		Requested	5.9	10	10
PFDA		Requested	0.004	--	-
PFUDA	--	--	600	--	-
PFDoDA	--	--	100	--	-
PFTetA	--	--	2,000	--	-
PFODA	--	--	80,000	--	-
PFPrA	--	--	980	--	-
TFSI	--	--	590	--	-

Note: Regional Screening Levels (RSLs) are based upon a target cancer risk of 1E-06 and a target noncancer hazard quotient of 0.1 (November 2024).
[^] The California DDW has requested that the OEHHA develop public health goals (PHGs) for several PFAS. Tap water RSLs are highly conservative for water captured during construction dewatering activities; however, they are provided in the absence of values specific to construction waste as a preliminary screening value.
[†] The (EPA 2023d) MCLs and HBWCs used in the calculation of the HI are also presented.

(Courtesy of Black & Veatch/CDM Smith)

Regional screening levels (RSLs) should not be applied as cleanup levels; rather, they should be used to assist remedial Pure Water managers, on-scene coordinators, risk assessors, and others involved in decision-making to determine whether PFAS are present at the site that may warrant further investigation or management. An exceedance of the RSL does not inherently mean that a risk will be realized at the site or special management will be necessary. Results of the analytical testing also should be considered in site safety plans to be protective of onsite workers (additional discussion follows).

Construction Worker Health–Based Screening Levels due to construction activity are more likely to result in increased dust generation and incidental ingestion of soils than non-intrusive activities. Therefore, precautions should be taken to minimize exposure to the extent practicable.

The EPA regional screening level (RSL) calculator tool was used to calculate health-based concentrations of PFAS in soils that would not result in unacceptable risk to construction workers (EPA 2024). These screening levels are based on the November 2024 update of the RSL tables and should be reviewed following updates to the RSL tables (May and November each year).

Default EPA exposure assumptions for construction workers were adopted and, consistent with California guidance, the particulate emission factor was set equal to 1 x 10⁶ cubic meters per kilogram (m³/kg) and the adherence factor was set equal to 0.8 milligram per cubic centimeter (mg/cm²) (Department of Toxic Substances Control [DTSC] 2014). A construction worker would work 8-hour days, 5 days a week, for 50 weeks in a year.

Table 3-5 summarizes the construction worker–specific screening levels, comparing EPA toxicity values and San Francisco Bay Regional Water Quality Control Board interim final environmental screening levels (2020) for PFOS and PFOA. As shown, the California-specific screening levels are less conservative than EPA defaults based upon toxicity values available as of January 2024 for these two analytes. Values should be recalculated using updated toxicological values as they become available.

Table 3-5: Construction Worker Health–Based Soil Screening Levels (SSL)

PFAS	Construction Worker Soil Screening Level (µg/kg)	
	According to EPA Toxicity Values	According to SFRWQCB Toxicity Values
HFPO-DA (GenX)	1,352	--
PFBS	16,500	-
PFBA	204,000	--
PFHxS	375	-
PFHxA	9,150	--
PFNA	54.9	--
PFUDA	5,490	--
PFDODA	915	--
PFTetA	18,300	--
PFODA	732,000	--
PFPrA	17,000	--
TFSI	10,200	--
PFOS	51.0	290 *
PFOA	54.9	86

Note: Construction worker soil screening levels were calculated using EPA's RSL Calculator in November 2024.

*Indicates value is protective of carcinogenic endpoints. All other values are protective of noncancer effects.

c. Resource Conservation and Recovery Act

On February 8, 2024, EPA published a pair of proposed rules that would list nine PFAS as hazardous constituents under the Resource Conservation and Recovery Act (RCRA) and expand the agency's authority to require cleanups at certain RCRA-permitted facilities for chemicals that it has not formally found to constitute hazardous waste but exhibit certain characteristics of hazardous waste.

Rules apply to facilities that are permitted under RCRA to treat, store, or dispose of hazardous waste, like hazardous waste incinerators or hazardous waste landfills. These rules do not propose to list any PFAS as hazardous waste under RCRA, the rules are not expected to limit options to destroy or dispose of materials containing PFAS except to the extent entities like municipal and non-hazardous waste landfills preemptively enact policies to refuse PFAS-impacted materials to limit future liability, in anticipation of future regulation. Other indirect impacts from hazardous constituent designations could be an increase in cost associated with movement and disposal of impacted soils, as well as restrictions on beneficial reuse or backfilling of excavations.

d. Clean Water Act

In guidance, EPA has recommended that states use the most current sampling and analysis methods in their National Pollution Discharge Elimination System (NPDES) programs to identify sources of PFAS and to take action using pretreatment and permitted authorities to limit discharges of PFAS.⁶

Pure Water would disturb more than one acre of land during construction and hence be subject to conditions of the State Water Resources Control Board (SWRCB) National Pollutant Discharge Elimination System (NPDES) Construction General Permit (General Permit; Order WQ 2022-057-DWQ). The General Permit requires, among other actions, submitting a Notice of Intent (NOI), a risk assessment and preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP). Monitoring would be conducted per the SWPPP by a Qualified SWPPP Practitioner in accordance with the General Permit conditions.

Construction dewatering activities would also be covered under the General Permit, which would be issued by the SWRCB via the local Regional Water Quality Control Board (RWQCB). Attachment J of the General Permit describes dewatering requirements including discharge, monitoring, and reporting requirements. The Project would be considered a linear underground Pure Water and has specific monitoring, reporting, and record keeping requirements. There are also separate Waste Discharge Requirements (WDRs) for Discharges of Groundwater from Construction and Pure Water Dewatering to Surface Water in Coastal Watersheds of Los Angeles and Ventura Counties (Order No. R4-2023-0429) that are not covered under the NPDES Construction General Permit. To receive coverage under the WDRs, the discharger must prepare a NOI in accordance with the requirements described in Order No. R4-20230949.

As of January 2024, specific PFAS limits are not identified in the WDRs, but a Monitoring Reporting Program (MRP), specific to the Project, could include effluent limitations for priority pollutants stipulated as part of the State's authorization to discharge groundwater to surface waters. Annual monitoring requirements for PFAS are described in Order No. R4-2023-0429 Attachment F.VII. D.

If analytical results detect PFAS, or any contaminants in the water, that have effluent limitations described in the MRP, the analytical data will be reported according to the MRP. If it is determined that the results show that the discharge water is out of compliance, then a treatment program would be required. If the water cannot be treated to meet levels suitable for discharge, or a waiver is not granted by the Regional Board, then the water may have to be transported and disposed of at a hazardous waste site in accordance with all applicable transport and disposal regulations.

⁵ *Listing of Specific PFAS as Hazardous Constituents, 89 Fed. Reg. 8606 (Feb. 8, 2024).*

⁶ *Memorandum from Radhika Fox, Assistant EPA Administrator, to EPA Regional Water Division Directors (Dec. 5, 2022), https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf.*

E. EPA Guidance on Disposal of Materials Containing PFAS

In the 2020 National Defense Authorization Act, Congress directed EPA to publish guidance on the destruction and disposal of PFAS and materials containing PFAS—including soil, biosolids, and spent filters or membranes from water treatment—and update the guidance at least once every three years.⁷ In the most recent version of the guidance, issued in April 2024, EPA surveys current and potential methods of destroying or disposing of PFAS and materials containing PFAS.⁸

“The primary audience of this guidance is decision-makers who need to identify the most effective means for destroying or disposing of PFAS-containing materials and wastes.”⁹ PFAS destruction or disposal methods have their limitations, the choice of destruction or disposal method depends on factors like the nature of the waste, location, potential for environmental release, and potential for direct human exposure.¹⁰

EPA highlights three destruction or disposal technologies that the agency considers to “have a lower potential for environmental release of PFAS” compared to other technologies: underground injection in permitted Class 1 non-hazardous industrial or hazardous waste injection wells; permitted hazardous waste landfills, “when PFAS levels of the waste are relatively high and landfill disposal is the selected option”; and thermal treatment through EPA observes that underground injection wells “are only suited for the disposal of liquids and are restricted to locations with suitable geology.”¹² Indeed, “the limited number of wells currently receiving PFAS and accepting off-site waste, well location, and waste transportation logistics may significantly limit the type and quantity of PFAS-containing fluids appropriate for underground injection.”¹³

As for landfills, EPA observes that both hazardous waste and municipal solid waste landfills “are feasible and effective disposal options for PFAS and PFAS-containing materials.”

Hazardous waste landfills are effective at minimizing PFAS releases into the environment, but they may not be appropriate for disposal of biodegradable PFAS-containing wastes like biosolids, which can produce landfill gas, because hazardous waste landfills typically do not have landfill gas collection and control systems.¹⁴

⁷ 15 U.S.C. § 8961.

⁸ EPA, *INTERIM GUIDANCE ON THE DESTRUCTION AND DISPOSAL OF PERFLUOROALKYL AND POLYFLUOROALKYL SUBSTANCES AND MATERIALS CONTAINING*

⁹ *Id.* at 1.

¹⁰ *Id.* at 9

¹¹ *Id.* at 1–2.

¹² *Id.* at 92.

¹³ *Id.* at 86

¹⁴ *Id.* at 56.

¹⁵ *Id.* at 65

¹⁶ *Id.* at 74

¹⁷ *Id.* at 50.

¹⁸ *Id.* at 115.

¹⁹ *Id.* at 111–13.

Without suggesting any numeric concentration thresholds, EPA suggests that municipal solid waste landfills “present a good opportunity to dispose of lower-concentration PFAS waste such as biosolids, phytoremediation biomass, and contaminated soils.”¹⁵ EPA contrasts these sorts of wastes from industrial or commercial wastes with high PFAS content, such as wastes from leather tanneries, chrome plating operations, and the textile industry.¹⁶

Finally, as to thermal treatment of PFAS-containing materials, EPA favors hazardous waste combustion technologies, which may provide sufficiently high temperatures and residence times to break the strong carbon-fluorine bond that defines PFAS.¹⁷

Further field research is required on the operating conditions necessary for adequate PFAS destruction and evaluation of the products of incomplete combustion from different PFAS-containing materials.¹⁸ EPA acknowledges that there are still significant data gaps on the performance of thermal treatment, landfills, injection wells, and emerging technologies in managing PFAS; the agency identifies further research on thermal treatment and landfills as the highest priority.¹⁹

III. Pure Water Area Existing Conditions | Baseline

As encouraged by the regulations that implement CEQA (California Code of Regulations, title 14, [State CEQA Guidelines], § 15125), the environmental setting and the baseline conditions used for purposes of the factual analysis in this Report are the on-the-ground, physical conditions that existed at the time that Metropolitan issued its CEQA Notice of Preparation for the Pure Water in 2022. However, the information cited herein also reflects more recent factual and legal developments for the sake of providing an accurate discussion, where necessary. A summary of existing conditions, relevant to PFAS, for each of Pure Water’s major site-dependent elements is presented below.

A. Location of the Proposed Advanced Water Purification Facility and Workforce Training Center

As for the writing of this technical memorandum, there is limited PFAS data for the AWP Facility site and nearby properties. More broadly, in the greater Los Angeles County area, there is scarcity of surface soil data concerning PFAS, which is commonly found in urban areas. As such, a conservative approach must be taken to assume PFAS will be on-site at the proposed AWP Facility and workforce training center locations.

This approach aligns with the relatively high likelihood of PFAS use associated with the former Fletcher Oil and Refining Company facility, which previously occupied the site where the AWP Facility would be situated.

B. Alignment of the 39-Mile Backbone Conveyance Pipeline

Land use plays a crucial role in determining PFAS contamination levels in soils, surface water, and groundwater, with urban areas typically exhibiting higher contamination than rural ones, and industrial areas typically exhibiting higher contamination than residential areas. Pure Water would be located primarily in urban and industrial areas, which are often linked to PFAS presence.

Research indicates that PFAS concentrations are higher in high-density residential/industrial zones compared to medium-density areas. Stormwater management in these regions typically involves collecting and conveying runoff to surface waters, with spreading basins adjacent to several areas potentially receiving both stormwater and Pure Water deliveries.

PFAS can wash off during rain events, migrating to surface water and spreading basins. Broadly, the majority of state and local PFAS sampling efforts have been focused on groundwater, with a limited dataset associated with soil sampling.

Pure Water would span various areas with distinct land uses. Several Superfund sites exist along the backbone conveyance pipeline which have been cleaned up and closed. Given the designation of PFOA and PFOS as hazardous substances under CERCLA, these sites may be reopened.

Using publicly available as well as existing project-specific data and source identification tools, known PFAS sources and areas with a relatively higher potential for PFAS contamination based on industry, land use, and recognized environmental conditions have been identified along the backbone conveyance pipeline. During construction, site-specific sampling plans will be developed as appropriate for sites with, or proximate to, known or suspected of PFAS contamination.

The soil sampling strategy will generally comprise non-biased sampling protocols based on appropriate intervals and specific construction methods in combination with biased sampling protocols based on proximity to areas considered to pose higher risks of PFAS impacts.

The non-biased groundwater sampling strategy will account for applicable construction methods, proximity to the water table, and whether dewatering is expected to be necessary. Site-specific plans will outline the frequency and scope of PFAS sampling for groundwater and soil.

Additionally, site-specific plans will establish guidelines for PFAS concentrations that necessitate specific disposal or discharge methods for soil, dewatered groundwater, and other materials in accordance with all applicable laws and regulations—as they may be adopted and amended—regarding handling, disposal, and transport, if PFAS is detected. As appropriate, sampling plans will be updated in response to new data, information, and regulatory requirements.

c. Sanitation Districts' Pacific Ocean Outfall Pipeline

California has implemented water discharge permits that include PFAS monitoring limits. The California State Water Resources Control Board has issued orders requiring monitoring for PFAS in various water systems. The Sanitation Districts' NPDES permit expires on June 30, 2028. As a condition of the updated NPDES permit, PFAS testing may be required. Quantifiable PFAS have been measured in the current Districts' effluent.

IV. Potential Environmental Effects of Pure Water

Pure Water would not involve any new land uses or processes that would result in the creation or use of PFAS compounds. Instead, Pure Water is designed to purify, distribute via a pipeline, and beneficially reuse water that is captured from a treated wastewater stream that is currently being discharged to the Pacific Ocean via the Sanitation Districts' Warren Facility ocean outfall.

Pure Water does not generate or introduce any new sources of PFAS, potential environmental impacts (if any) associated with Pure Water primarily would be temporary, indirect effects arising from ground disturbance during construction, the handling and disposal of potential PFAS-containing materials, and the ongoing release of the existing waste discharge stream (albeit at a lesser volume) through the Sanitation Districts' existing outfall facility. None of these activities are expected to have a potentially significant impact on the environment above the existing baseline conditions, and all applicable regulations will be adhered to. Nonetheless, the following analysis addresses each of Pure Water's primary components and discusses the potential for PFAS-related impacts from Pure Water construction and operation.

A. Construction of the AWP Facility and the Workforce Training Center

As of the writing of this technical memorandum, there are no "set" federal or state regulations that establish discrete requirements regarding PFAS for sampling and handling of soils and construction dewatering water. Rather, as to dewatering water, it is likely that sampling, testing, and management would fall under any applicable SWRCB or local RWQCB NPDES General Permits, which do not at this time contain terms pertaining to PFAS.

Additionally, there are no current industry best practices for soil sampling as the science around PFAS is still evolving, and contaminated sites may have significantly varying properties. Given the likely historic use of PFAS on the former Fletcher Oil and Refining Company site, PFAS sampling will be conducted to assess the locations and quantities of contamination in soil.

During construction of the AWP Facility and workforce training center, no additional PFAS will be introduced into the environment, and construction would have minimal impact on PFAS discharges. Construction will comply with all applicable laws and regulations that are in place. This includes adhering to NPDES requirements and obtaining any necessary permits regulating PFAS from the SWRCB, and local RWQCBs, overseeing compliance and ensuring construction activities do not contribute to PFAS contamination in water sources.

B. Excavation, Tunneling, and Dewatering During Construction of the Backbone Conveyance Pipeline

As of the writing of this technical memorandum, there are no “set” federal or state regulations that establish discrete requirements regarding PFAS for sampling and handling of soils and construction dewatering water. Rather, as to dewatering water, it is likely that sampling, testing, and management would fall under any applicable SWRCB or local RWQCB NPDES General Permits, which do not at this time contain terms pertaining to PFAS. Additionally, there are no current industry best practices for soil sampling as the science around PFAS is still evolving, and contaminated sites may have significantly varying properties.

As discussed above, several sites near or adjacent to the backbone pipeline have been identified as containing or at risk of containing PFAS contaminants. Specific areas of backbone construction near these sites are more likely to encounter elevated concentrations of PFAS. Site-specific soil and groundwater sampling plans will account for known and suspected sites of PFAS contamination, construction methods and needs, applicable laws and regulations, and other factors. Data obtained from sampling will be used to inform decisions on proper management, transport, and disposal of impacted materials, which will be conducted in accordance with all applicable laws and regulations, as they may be amended.

During construction of the backbone conveyance, no additional PFAS will be introduced into the environment, and construction of the backbone conveyance will have minimal impact on PFAS discharges.

c. Operation of the AWP Facility

Reverse osmosis (RO) membranes are high-pressure filtration processes that force water through semi-permeable membranes. Membrane filtration selectively removes compounds/contaminants based on their size and charge (Figure 5-1).

Unlike granular activated carbon and ion exchange resin which are alternative PFAS treatment technologies, high-pressure membranes are a liquid phase separation process, meaning that they generate a permeate stream of treated water and a liquid residual concentrate stream. The RO concentrate will have higher concentrations of PFAS in addition to other constituents rejected by the membrane. RO membranes have been shown to remove >99% of target PFAS compounds and are therefore an effective treatment process to remove PFAS.

Commercially available membranes sized for PFAS removal span in ranges of selectivity from loose nanofiltration (NF) to tight NF and loose RO to tight RO. The RO membranes at the AWP will be between loose and tight RO sizes. During the RO treatment process, PFAS are not retained on the RO membranes. Therefore, their replacement rate is based on maintenance needs and contaminant rejection ability. Additionally, pretreatment (e.g., pH adjustment) and routine cleaning-in-place procedures are usually required to minimize RO membrane fouling. When the RO membranes reach the end of their service life, approximately every 5 years, they will be disposed of per current regulations.

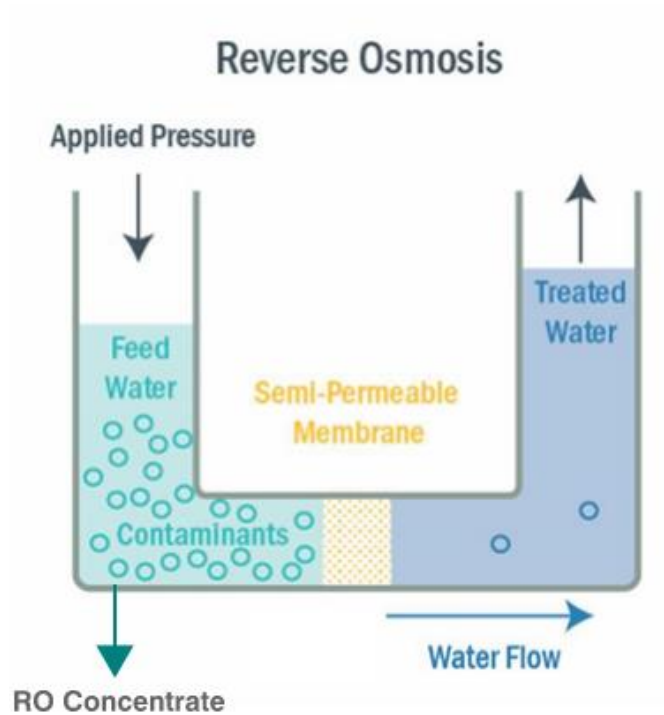


Figure 5-1. RO membranes are a separation process that retain contaminants like PFAS and allow water to permeate through the membrane

The operation of the AWPf system will not add additional PFAS mass and should not result in an increase of total PFAS discharged to the Sanitation Districts' ocean outfall. The RO concentrate that will be discharged to the ocean outfall as part of the AWPf operation will result in a reduced water discharge volume than what is currently discharged to the ocean outfall.

However, there will be an increase in PFAS concentration in the RO concentrate due to the concentrated nature of contaminants removed through the RO process. The anticipated increase in concentration in PFAS is still several orders of magnitude lower than the saltwater aquatic life benchmarks listed in Table 2-3 and based on the current science and understanding of aquatic toxicity, is unlikely to pose a significant impact to the environment. Compliance with regular NPDES permit renewals for the Sanitation Districts' ocean discharge will continue to be adhered to throughout the duration of this program.

It is anticipated that the condition of permit approval to operate the AWPf will be routine compliance monitoring for PFAS to verify system performance.

V. Conclusions

Construction and operation of the AWP Facility, workforce training center, ancillary facilities, and the backbone conveyance pipeline will not add or contribute to additional PFAS in the environment. It is likely that work associated with these activities will encounter existing PFAS contamination. Soils and water encountered during construction will be tested, handled, and managed in accordance with all applicable laws and regulations pertaining to PFAS. Likewise, the AWP Facility will be operated in compliance with all applicable laws and regulations pertaining to PFAS.