

Focus on: PFAS Cleanup Levels

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Purpose and background

This focus sheet provides the Washington State Department of Ecology’s (Ecology’s) recommended soil and groundwater cleanup levels for part of a group of harmful compounds known as per- and polyfluoroalkyl substances, or PFAS. These compounds include:

1. PFOA, or perfluorooctanoic acid,
2. PFOS, or perfluorooctane sulfonic acid,
3. PFNSA, or perfluorononanoic acid,
4. PFHxS, or perfluorohexane sulfonic acid,
5. PFBS, or perfluorobutane sulfonic acid, and
6. HFPO-DA (GenX), or hexafluoropropylene oxide dimer acid.

The Washington State Department of Health (DOH) issued a final rule that included groundwater State Action Levels (SALs) for the first five PFAS compounds listed above, which became effective on January 1, 2022. The Department of Health calculated the SALs using peer-reviewed non-cancer reference doses (RfDs) that represent the best available science. They used RfDs to establish the SALs because there are limited data available to support a quantitative assessment of cancer risk for PFAS compounds.

At a future date, we will release our recommended cleanup levels for terrestrial ecological, surface water, sediments, and air quality.

Recommended groundwater cleanup levels

For PFAS with SALs, Ecology recommends using the SALs as the appropriate groundwater cleanup levels. For chemicals without SALs, Ecology recommends using RfDs developed by EPA to calculate the appropriate cleanup level. The recommended groundwater cleanup levels for the first five compounds in Table 1 are the DOH SALs.

We calculated the recommended groundwater cleanup level for HFPO-DA using Model Toxics Control Act (MTCA) [Equation 720-1](#)¹ and EPA reference doses (RfDs).

For comparison purposes, we’ve also included the Environmental Protection Agency’s (EPA) Health Advisory Levels for PFOA, PFOS, PFBS, and HFPO-DA. EPA is still evaluating the RfDs they used to develop the interim Health Advisory Levels for PFOA and PFOS, and it’s possible these levels could be revised in the future. EPA is also developing RfDs for several other PFAS compounds, which may lead to additional groundwater health advisories.

Table 1: Recommended groundwater cleanup levels

PFAS Compound	Recommended Groundwater Cleanup Level	EPA Health Advisory Level
PFOA	10 ng/L	0.004 ng/L
PFOS	15 ng/L	0.02 ng/L
PFNA	9 ng/L	None
PFHxS	65 ng/L	None
PFBS	345 ng/L	2,000 ng/L
HFPO-DA (GenX)	24 ng/L	10 ng/L

Note: On June 15, 2022, EPA issued “interim” Health Advisories for PFOS and PFOA, and final Health Advisories for PFBS and HFPO-DA. Ecology is not using the EPA Health Advisory Levels as recommended cleanup levels because: 1) the levels for PFOA and PFOS are interim and subject to change, 2) the PFBS level exceeds the DOH SAL, and 3) the approach used to determine the level for HFPO-DA is not consistent with the process set out in MTCA.

Recommended soil cleanup levels protective of groundwater

Table 2 provides recommended soil concentrations for both the vadose zone and the saturated zone that are protective of groundwater. We calculated these levels using MTCA Equation [747-1](#),² the groundwater cleanup levels in Table 1, and the default soil characteristics listed in the MTCA Cleanup Rule. We used organic carbon-water partitioning coefficients (Koc) and Henry's Law constants (Hcc) from the [Oak Ridge National Labs database](#).³ We calculated soil water distribution coefficient (Kd) values from Koc values using MTCA Equation 747-2.

Table 2: Recommended soil cleanup levels protective of groundwater

PFAS Compounds	Vadose Zone	Saturated Zone
PFOA	6.3E-05 mg/kg	4.0E-06 mg/kg
PFOS	1.7E-04 mg/kg	9.9E-06 mg/kg
PFNA	8.0E-05 mg/kg	4.8E-06 mg/kg
PFHxS	4.1E-04 mg/kg	2.6E-05 mg/kg
PFBS	1.8E-03 mg/kg	1.2E-04 mg/kg
HFPO-DA (GenX)	1.0E-04 mg/kg	7.2E-06 mg/kg

Soil direct contact cleanup levels

The soil direct contact levels in Table 3 are protective of human health based on exposure through incidental soil ingestion. We calculated recommended cleanup levels using Equation [740-1](#)⁴ (Method B—unrestricted use) and Equation [745-1](#)⁵ (Method C—sites meeting the definition of an industrial property under the MTCA Cleanup Rule). We used the RfDs that were adopted by the Department of Health for establishing the State Action Levels, along with the associated default exposure assumptions provided in the MTCA Cleanup Rule. For HFPO-DA, we used the RfD developed by EPA.

Table 3: Recommended soil direct contact cleanup levels

PFAS Compounds	Method B	Method C
PFOA	0.24 mg/kg	11 mg/kg
PFOS	0.24 mg/kg	11 mg/kg
PFNA	0.2 mg/kg	8.8 mg/kg
PFHxS	0.78 mg/kg	34 mg/kg
PFBS	24 mg/kg	1,100 mg/kg
HFPO-DA (GenX)	0.24 mg/kg	11 mg/kg

Compliance with state and federal laws

Cleanup levels must comply with applicable local, state, and federal laws, along with requirements Ecology has determined to be relevant and appropriate in the MTCA Cleanup Rule (WAC [173-340-710\(4\)](#)).⁶ Together these requirements are referred to as ARARs. As of June 2022, there are no legally applicable state or federal laws, such as Maximum Contaminant Levels, to apply when developing PFAS cleanup levels. However, each cleanup site can be reviewed to determine if there are relevant and appropriate requirements that, while not legally required, should be applied depending on circumstances at the site. To make this determination, Ecology needs to evaluate criteria in WAC 173-340-710(4) to establish that the recommended levels are relevant and appropriate.

Until Ecology makes a site-specific determination, you can consider the soil and groundwater cleanup levels set forth in this focus sheet to be preliminary cleanup levels. This will provide a common understanding of the potential severity of the PFAS contamination found as part of a site investigation.

Related information

- [PFAS and cleanups](#)⁷
- [Learn more about PFAS and health](#)⁸
- [MTCA Cleanup Rule \(Chapter 173-340 WAC\)](#)⁹



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¹ <https://apps.leg.wa.gov/WAC/default.aspx?cite=173-340-720>

² <https://apps.leg.wa.gov/WAC/default.aspx?cite=173-340-747>

³ <https://rais.ornl.gov/>

⁴ <https://apps.leg.wa.gov/wac/default.aspx?cite=173-340-740>

⁵ <https://apps.leg.wa.gov/wac/default.aspx?cite=173-340-745>

⁶ <https://app.leg.wa.gov/wac/default.aspx?cite=173-340-710>

⁷ <https://ecology.wa.gov/PFAScleanup>

⁸ <https://ecology.wa.gov/PFAS>

⁹ <https://apps.leg.wa.gov/WAC/default.aspx?cite=173-340>