DEPARTMENT OF ECOLOGY
State of Washington

Best Management Practices for Deep Cleaning Fire Equipment Contaminated with PFAS-Containing Firefighting Foam in Washington State

Introduction

Per- and polyfluoroalkyl substances (PFAS) are found in Aqueous film-forming foam (AFFF), which is used for firefighting. PFAS are a large group of manufactured "forever chemicals" — they never disappear from the environment. PFAS-containing firefighting foams are highly effective at extinguishing liquid fuel-based fires. However, due to the impact of PFAS on the environment and public health, many fire departments are switching from AFFF to fluorine free foam (F3). To effectively switch to safer alternatives without cross contaminating the new foam, thorough cleaning of fire engines, firefighting apparatuses, and other equipment is required.

There are several techniques to decontaminate firefighting equipment systems of PFAS before switching to F3. However, no cleaning method has been proven effective at fully eliminating residual PFAS from firefighting systems. The Washington State Department of Ecology (Ecology) recommends that organizations carefully consider the feasibility of replacing PFAS-contaminated firefighting equipment, or specific parts of the contaminated equipment, instead of relying on cleaning and reuse.

It's important for those switching to F3 to consider creating a full foam transition plan. A transition plan includes:

1. A thorough assessment and cost-benefit analysis of replacement and decontamination options for all contaminated equipment.
2. A rigorous decontamination approach.
3. A plan for adequate safety, environmental protection, and waste management during the cleaning process.

This interim guidance provides firefighters in Washington State with best management practices (BMP) for cleaning equipment contaminated by PFAS-containing firefighting foam.

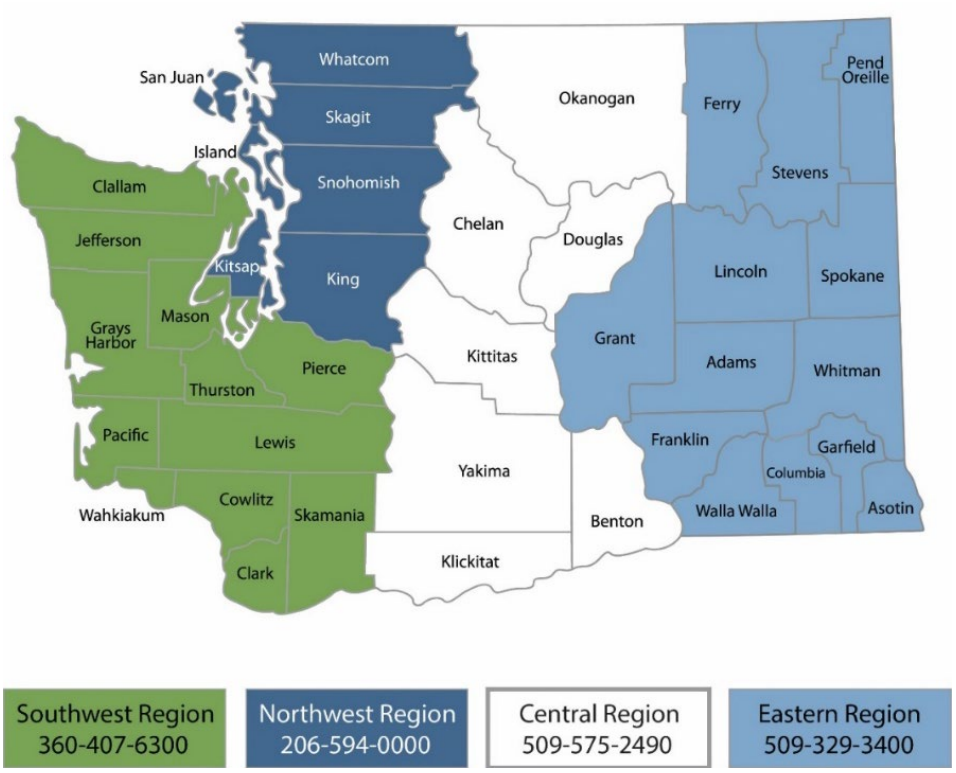
The threshold for acceptable residual PFAS after cleaning is not yet established. Additional information on PFAS discharge limits awaits Environmental Protection Agency (EPA) action.

This guidance will change as more information becomes available.

Please contact your regional hazardous waste compliance specialist with any questions.

Department of Ecology's Regional Offices

Map of Counties Served



Region	Counties served	Mailing Address	Phone
Southwest	Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Mason, Lewis, Pacific, Pierce, Skamania, Thurston, Wahkiakum	P.O. Box 47775 Olympia, WA 98504	360-407-6300
Northwest	Island, King, Kitsap, San Juan, Skagit, Snohomish, Whatcom	P.O. Box 330316 Shoreline, WA 98133	206-594-0000
Central	Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima	1250 West Alder Street Union Gap, WA 98903	509-575-2490
Eastern	Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman	4601 North Monroe Spokane, WA 99205	509-329-3400
Headquarters	Statewide	P.O. Box 46700 Olympia, WA 98504	360-407-6000

Cleaning Guidance

To safely and effectively cleanse your vehicles, nozzles, and other equipment, Ecology recommends following these steps in order:

1. Understand PFAS Contamination

- Educate personnel about PFAS and its potential hazards. Emphasize the importance of proper decontamination procedures to safeguard the environment and firefighter health. Information about the environmental and public health impacts of are available here[1] and here.[2]
- Stay updated on the latest research and regulations concerning PFAS to ensure compliance with any future changes. This information can be found here.[3]

2. Review Important Information Before Deep Cleaning

a. Cleaning Level

i. There are no requirements for how clean firefighting equipment must be of PFAS.

ii. Test methods to measure the residual PFAS in equipment are in development but not yet approved by regulatory agencies. A swab sample of the equipment's inner wall, tested by measuring the total fluorine level, may indicate the residual levels of PFAS left within. There are no established limits on the acceptable total fluorine level of residual PFAS in Aircraft Rescue and Fire Fighting (ARFF) vehicles.

b. AFFF and Rinsate Disposal

i. All AFFF concentrate and rinsate that designates as a dangerous waste should be put into containers and labeled for future disposal. **DO NOT dispose of the AFFF concentrate or PFAS rinse water in a sanitary sewer; an on-site septic system, drywell, a storm drain, a catch basin; or on the ground surface.** Doing so is a reportable release of such material pursuant to WAC 173-303-145, Dangerous Waste Regulations[4] and could cause soil, groundwater, and surface water contamination. This can impact drinking water wells, streams, or fisheries and require environmental remediation at your expense.[5]

ii. Safety data sheets (SDS) that identify the type of AFFF concentrate removed from systems are needed to identify the material. SDS should be kept with the rinsate containers for proper waste disposal.

iii. In compliance with Washington's Dangerous Waste Regulations, contact your hazardous waste hauler and schedule pick up and disposal of the waste AFFF and

[1] https://ecology.wa.gov/Waste-Toxics/Reducing-toxic-chemicals/Addressing-priority-toxic-chemicals/PFAS/AFFF
[2] https://doh.wa.gov/community-and-environment/contaminants/pfas
[3] https://pfas-1.itrcweb.org/
[4] https://app.leg.wa.gov/WAC/default.aspx?cite=173-303-145
[5] Fire Departments may elect to hire a vendor to deep clean their vehicles and equipment. This guidance should be shared with the vendor to ensure their compliance with Washington State's dangerous waste rules.

rinsate. Fire departments are responsible for the costs associated with waste AFFF and rinsate disposal.

c. Using Replacement Fluorine-Free Foam (F3) Concentrate

i. Ecology has not reviewed F3 foams for their environmental impact or fire suppression effectiveness. However:

- Clean Production Action certified several foams as environmentally safer through its GreenScreen™ tool. See GreenScreen Certified™[6] for a list of certified products.
- The United States Department of Defense (DoD) certified F3 foams as meeting the military's performance specifications. More information is available at the DoD Qualified Products Database.[7]

ii. Before replacing drained AFFF with F3, ensure the entire system is dry.

iii. F3 foams CANNOT be mixed with other foams.

iv. Consult manufacturer guidance and appropriate regulations for proportioning concentrations and proportioning tests.

v. Most F3 SDS recommend containment and appropriate treatment of F3 concentrate/water mix used in any setting. This is good practice since any equipment used for PFAS foams is likely to discharge low levels of PFAS even after the cleaning process. Discharged firewater should be sampled and tested to monitor any levels of PFAS or total fluorine. The waste management vendor you use or the wastewater treatment authority you contact about discharge of captured firewater should be provided with the level of PFAS present.

vi. You should collect a sample of the replacement F3 at least 20 days after it is installed. Even after deep cleaning, residual PFAS may contaminate new F3.

d. Documentation

i. Keep detailed records of the steps taken to empty and clean vehicles and equipment. This documentation is important to demonstrate compliance with regulations in case of inspection.

ii. Keep detailed records of all decontamination activities, including:

- Dates
- Times
- Methods used
- Quantities of PFAS-containing waste generated

[6] https://www.greenscreenchemicals.org/certified/products/category/firefighting
[7] https://qpldocs.dla.mil/search/parts.aspx?qpl=4513&param=MIL-PRF-32725&type=26144

3. Follow Ecology Cleaning Protocols

a. Empty the Vehicle[8]

i. Fully empty the vehicle of its contents. Drain, suction, or remove the AFFF as much as possible.

1. Avoid using additional equipment, like pumps or hoses, during the emptying process. This eliminates the need to clean or rinse this equipment. Instead of cleaning, consider replacing contaminated equipment.
2. Drain AFFF concentrate into dedicated containers, such as a 55-gallon drum (steel or plastic).

ii. Determine if the drained foam is a waste or dangerous waste. If it is dangerous waste, it must be designated following Washington State dangerous waste rules.[9] Dangerous waste must be counted towards your generator regulatory status. If you are a medium or large quantity generator, label the containers as dangerous waste and segregate them for future disposal.

iii. Label containers with the following:

- "Drained Fluorinated Foam Concentrate" or "Drained AFFF Concentrate".
- If the drained material will be disposed of and it designates as dangerous waste, the label must also include:
  a. "Dangerous Waste".
  b. "Toxicity and Persistent" (the risk of the waste).
  c. The date the waste was first put into the container.

iv. Until they're picked up for disposal, store any containers of drained AFFF concentrate:

- In an indoor area (if possible).
- Protected from the elements.
- Away from floor drains and catch basins.
- Within secondary containment.

v. If drained foam is determined to still be a product,[10] fire departments should follow Ecology's AFFF Guidance on how to safely store AFFF. See Aqueous Film Forming Foam Guidance for Firefighting Organizations.[11]

[8] For this guidance the term "vehicle" includes all parts of a fire truck, engine, tender, etc. that can be used to transport and deploy PFAS containing foam.
[9] https://ecology.wa.gov/regulations-permits/guidance-technical-assistance/dangerous-waste-guidance
[10] A product is a good that can and will continue to be used for its intended purpose. AFFF, even when it is drained from a vehicle or tank, could still be used to fight fires.
[11] https://apps.ecology.wa.gov/publications/SummaryPages/2104031.html

b. Rinse the Vehicle's Class B Tank Systems

After emptying AFFF concentrate from the Class B tank systems:

i. Perform a hot water rinse (between 110° to 160° Fahrenheit) of the tank system, including the plumbing. We recommend adding glycol-based cleaning detergents to the hot water rinse to help remove residual concentrate. For example, a 20 percent butyl CARBITOL™ solution, FluoroFighter™, or PerfluorAd™.

ii. Power wash the interior tank surfaces to remove residual PFAS (if possible).

iii. Allow the cleaning solution to stay in the Class B tank system for at least 30 minutes. Carefully agitate or circulate the contents[12] (if possible). Then, drain it though the plumbing system into a dedicated container (55-gallon drum or 275-gallon tank). Label this container with:

- "PFAS foam rinsate".
- The date the waste was first put into the container.

iv. After draining, perform a second hot water cleaning rinse. Repeat the agitation and circulation. Let rinsate stand or circulate for at least 30 minutes before draining through the plumbing system. Add this liquid to the PFAS foam rinsate container.

v. If desired, perform a third hot cleaning rinse with repeated agitation and circulation. Let rinsate stand or circulate for at least 30 minutes before draining through the plumbing system. Add this liquid to the PFAS foam rinsate container.

vi. Sample the collected rinsate and designate it.

1. If the rinsate contains less than 0.01 percent (100 parts per million) halogenated organic compounds (HOC) it is not considered a dangerous waste. [13] Contact your publicly owned treatment works (POTW) to confirm their approval prior to discharge.[14]

2. If the rinsate contains more than 0.01 percent halogenated organic compounds (HOC) it must be disposed of in accordance with Washington's dangerous waste rules.

vii. If you are unsure about what to test for, contact an Ecology hazardous waste compliance officer for your region. Regional contact information is on page 2.

viii. Store labeled waste containers in a designated and protected area with secondary containment for future disposal. You should store the labeled PFAS foam rinsate waste containers in a covered location.

[12] You can agitate the rinsate by driving the vehicle while regularly turning the steering wheel back and forth.
[13] Ecology's Chemical Test Methods Section 3.8 details the HOC analysis requirements. URL: https://apps.ecology.wa.gov/publications/summarypages/97407.html
[14] Your POTW may require treatment to Maximum Contamination Levels (MCLs) prior to discharge. You should contact your POTW before discharging.

Additional Resources

The citations below are for reference only and are not meant to be instructions on how to deep clean contaminated equipment or vehicles.

AECOM and TRS Group. 2022. AFFF Fire Truck and Foam Unit Decontamination Summary Report. Prepared for and published by Connecticut Department of Energy and Environmental Protection. https://portal.ct.gov/-/media/deep/site_clean_up/contaminants_of_emerging_concern/pfas_documents/firefightingrelated/aecom-afff-decon-summary_05-06-2022.pdf

Arcadis. 2022. Trailer Demonstration Project Summary Report. Prepared for and published by Connecticut Department of Energy and Environmental Protection. https://portal.ct.gov/-/media/deep/site_clean_up/contaminants_of_emerging_concern/pfas_documents/firefightingrelated/arcadis-final_summary-rpt_winsted-trailer-pfas-cleaning.pdf

More Information

For more information on this guidance or the AFFF disposal program, please contact:

Sean Smith
425-324-0328
Sean.Smith@ecy.wa.gov

ADA Accessibility

To request an ADA accommodation, contact us by phone at 360-407-6700 or email at hwtrpubs@ecy.wa.gov, or visit ecology.wa.gov/accessibility. For Relay Service or TTY, call 711 or 877-833-6341.