

Per- and Polyfluoroalkyl Substances (PFAS) Sampling Guidelines

CALIFORNIA STATE WATER QUALITY CONTROL BOARD
DIVISION OF WATER QUALITY



TABLE OF CONTENTS

1.0	Introduction	2
2.0	General Sampling Guidelines	3
2.1	Personal Protective Equipment and Field Clothing	3
2.2	Sun and Biological Protection	4
2.3	Food Packaging	5
3.0	Sampling Procedures	6
3.1	Sampling Equipment	6
3.2	Sampling Collection and Storage	6
3.3	Decontamination	7
4.0	Field Quality Control Samples	8
5.0	References	9



1.0 INTRODUCTION

Per- and polyfluoroalkyl substances (PFAS) are a class of manufactured compounds that are extensively used to make everyday items more resistant to stains, grease, and water. These chemicals have been used in a variety of industrial, commercial, and consumer products. Some of these products could be present and/or used during a routine sampling event, such as plastic bags and bottles, waterproof clothing, detergents, and waterproof pens and paper. The use of these products could possibly contaminate the samples during sample collection (including preparing the sampling site, actual sample collection, decontamination, and shipment).

The probability of false positives is relatively high during PFAS sample collection due to the potential for many sources of cross-contamination, combined with low laboratory detection limits (nanograms per liter, ng/L; or parts per trillion, ppt), and as such, care must be taken in the design and implementation of a PFAS sampling program. This guidance will provide steps to take to help you avoid potential sample contamination.

2.0 GENERAL SAMPLING GUIDELINES

Before conducting any PFAS sampling, it is recommended that a project-specific Quality Assurance Project Plan (QAPP) be developed. The QAPP should include the 24 elements identified by EPA guidance that describe the project's goals, data needs and assessment, responsible individuals, quality assurance plan, quality control measures, and reporting deadlines. The QAPP elements (e.g., analyte list, method of analysis, environmental matrices, and reporting limits) are based on the project objectives.

The QAPP should clearly identify potential cross-contamination sources. These can include water used during drilling or decontamination, materials used within the sampling environment, sampling equipment, field clothing and personal protective equipment (PPE), sun and biological protection products, food packaging, and the environment itself.

Additional guidelines for the preparation of a QAPP can be found in the Water Boards QAPP Development Resources website (https://www.waterboards.ca.gov/water_issues/programs/quality_assurance/qapp.html) and U.S. Environmental Protection Agency's (EPA) *Guidance for Quality Assurance Project Plans*, EPA QA/G-5 (dated December 2002) and also located here: <https://www.epa.gov/quality/guidance-quality-assurance-project-plans-epa-qag-5>.

Sampling materials and field supplies for the purposes of sampling for PFAS are divided into three groups:

1. Allowable materials: These materials are proven not to be sources of PFAS cross contamination and can be used during all sampling stages in the immediate sampling environment.
2. Staging area-only materials: These materials may contain PFAS and should not come into direct contact with the sample but can be used in the staging area away from sample bottles and equipment. Care should be taken to thoroughly wash hands and don new gloves after handling any of these materials.
3. Prohibited materials: These include items that are well-documented to contain PFAS and may present a threat to the integrity of the sample.

2.1 PERSONAL PROTECTIVE EQUIPMENT AND FIELD CLOTHING

Any field planning and mobilization effort should address the physical, chemical, and biological hazards associated with each PFAS site. The mitigation of potential risks should be documented in a site-specific health and safety plan (HASP). The HASP should identify personal protective equipment (PPE) that is free of PFAS materials to avoid cross-contamination.

PFAS are used to coat various clothing and leather products to repel water, oil, and dirt. While preparing for sampling, attention should be paid on clothing that is advertised as having waterproof, water-repellant, or dirt and/or stain resistant characteristics. These types of clothing are most likely to have had PFAS used in their manufacturing.



Allowable materials	Staging area materials	Prohibited materials
<ul style="list-style-type: none"> • Well-laundered synthetic or 100% cotton clothing (with most recent launderings not using fabric softeners) • Powderless nitrile gloves • Waterproof clothing made of or with polyurethane, PVC, wax-coated fabrics, rubber, neoprene • Boots made of polyurethane and/or PVC 	<ul style="list-style-type: none"> • If the HASP requires a specific type of boot (such as steel-toed), and PFAS-free cannot be purchased, PFAS-free over-boots may be worn. The over-boots must be put on, and hands washed after donning the over-boots before the beginning of sampling activities. Over-boots may only be removed in the staging area and after the sampling activities are completed. • Application of approved sunscreens and insect repellants (see below). 	<ul style="list-style-type: none"> • Water/stain/dirt-resistant treated clothes (including but not limited to Gore-Tex™, Scotchgard™, RUCO®, etc.) • New unwashed clothing • Clothes recently washed with fabric softeners • Clothes chemically treated for insect resistance and ultraviolet protection • Coated Tyvek® • Latex gloves

There are many often-used and industry standard PPE items that may be required to be used during sampling events that have not been completely evaluated, including hard hats, safety glasses, and Tyvek®. If use of these items is required, they should be screened by reviewing the safety data sheets (if available) and/or collecting an equipment blank prior to use.

2.2 SUN AND BIOLOGICAL PROTECTION

Because biological hazards (sunburn, mosquitos, ticks, etc.) may be encountered during sampling, the elimination of specific clothing materials or PPE (sunscreens and insect repellants) could pose a health and safety hazard to staff.

The safety of staff should not be compromised by fear of PFAS-containing materials without any scientific basis. Personal safety is paramount. Any deviation from this guidance, including those necessary to ensure the health and safety of field staff, should be recorded in field notes and discussed in the final report.

Prolonged sun exposure will require sunscreens, which may include PFAS in their manufacture. Protection against insects may require the use of insect repellent. The words “natural” and/or “organic” in a product name or used to describe it does not mean that it is PFAS-free. Below is a detailed list of sunscreens and insect repellants that have been analyzed and found to be PFAS-free. Note that this is not a comprehensive list of allowable insect repellants or sunscreens; other products may meet the



requirements for use. Listing or omission of any product does not imply endorsement or disapproval. Also, there is no guarantee that these products will always remain PFAS free.

- Allowable Insect Repellants:
 - OFF Deep Woods
 - Sawyer Permethrin
 - Jason Natural Quit Bugging Me
 - Repel Lemon Eucalyptus Insect repellent
 - Herbal Armor
 - California Baby Natural Bug Spray
- Allowable Sunscreens:
 - Banana Boat Sport Performance Sunscreen Lotion Broad Spectrum SPF 30.
 - Meijer Sunscreen Lotion Broad Spectrum SPF 30.
 - Neutrogena Ultra-Sheer Dry-Touch Sunscreen Broad Spectrum SPF 30.
 - Banana Boat for Men Triple Defense Continuous Spray Sunscreen SPF 30
 - Banana Boat Sport Performance Coolzone Broad Spectrum SPF 30
 - Banana Boat Sport Performance Sunscreen Lotion Broad Spectrum SPF 30
 - Banana Boat Sport Performance Sunscreen Stick SPF 50
 - Coppertone Sunscreen Lotion Ultra Guard Broad Spectrum SPF 50
 - Coppertone Sport High-Performance AccuSpray Sunscreen SPF 30
 - Coppertone Sunscreen Stick Kids SPF 55 • L'Oréal Silky Sheer Face Lotion 50+
 - Meijer Clear Zinc Sunscreen Lotion Broad Spectrum SPF 15, 30 and 50
 - Meijer Wet Skin Kids Sunscreen Continuous Spray Broad Spectrum SPF 70
 - Neutrogena Beach Defense Water + Sun Barrier Lotion SPF 70
 - Neutrogena Beach Defense Water + Sun Barrier Spray Broad Spectrum SPF 30
 - Neutrogena Pure & Free Baby Sunscreen Broad Spectrum SPF 60+

If none of the above sunscreens or insect repellents are available, an equipment blank sample must be collected to verify that it is PFAS-free.

2.3 FOOD PACKAGING

PFAS are known to be prevalent in food packaging, including paper plates, food containers, bags, and wraps. Although long-chain PFAS have been banned for use in the manufacturing of contact food materials in the United States, short-chain PFAS have not been banned.

Food packaging must not be in the sampling and staging areas during sampling due to the potential for PFAS cross-contamination. When staff requires a break to eat or drink, they should remove their gloves, coveralls, and any other appropriate PPE, if worn, in the staging area and move to the designated area for food and beverage consumption. When finished, staff should wash their hands and put on a fresh pair of powderless nitrile gloves at the staging area, before returning to the sampling area.

3.0 SAMPLING PROCEDURES

Conventional sampling procedures can generally be used to collect samples for PFAS analysis. Exceptions requiring alternative actions include the following considerations.

3.1 SAMPLING EQUIPMENT

The actual list of PFAS-containing materials potentially encountered onsite will change based on the specific sampled media and site-specific sampling conditions. Allowable materials include high-density polyethylene (HDPE), polypropylene, silicone, stainless steel, nylon, PVC, acetate, and cotton. Do not use any equipment that contains any known fluoropolymers including, but not limited to:

- Polytetrafluoroethylene (PTFE), including the trademark Teflon® and Hostaflon®, which can be found in many items, including but not limited to ball check-valves on certain bailers, the lining of some hoses and tubing, some wiring, certain kinds of gears, lubricant, and some objects that require the sliding action of parts.
- Polyvinylidene fluoride (PVDF), including the trademark Kynar®, which can be found in many items, including but not limited to tubing, films/coatings on aluminum, galvanized or aluminized steel, wire insulators, and lithium-ion batteries.
- Polychlorotrifluoroethylene (PCTFE), including the trademark Neoflon®, which can be found in many items, including but not limited to valves, seals, gaskets, and food packaging.
- Ethylene-tetrafluoro-ethylene (ETFE), including the trademark Tefzel®, which can be found in many items, including but not limited to wire and cable insulation and covers, films for roofing and siding, liners in pipes, and some cable tie wraps.
- Fluorinated ethylene propylene (FEP), including the trademarks Teflon® FEP and Hostaflon® FEP, and may also include Neoflon®, which can be found in many items, including but not limited to wire and cable insulation and covers, pipe linings, and some labware.
- Low density polyethylene (LDPE) should not be used for any items that will come into direct contact with the sample media. LDPE can be found in many items, including but not limited to containers and bottles, plastic bags, and tubing.

Equipment that contains PFAS materials such as Teflon coated parts can be used if the PFAS is internal to the equipment and does not contact the external environment. If in doubt about a product, collect and analyze an equipment blank sample.

3.2 SAMPLING COLLECTION AND STORAGE

All bottles used for PFAS sampling should come from the laboratory that will also be performing the PFAS analysis. For all environmental media, hands should be well washed before sampling. Clean powderless nitrile gloves must be put on before collecting samples, handling sample containers, and handling sampling equipment. The sample container must be kept sealed and only open during the

sample collection. The sampling container cap or lid should never be placed the ground, or on any other surface unless it is PFAS-free.

The following additional considerations should be taken during sample collection to prevent contamination:

- Regular/thick size markers (Sharpie® or otherwise) are to be avoided; as they may contain PFAS.
- Do not use sticky notes (e.g. Post-it Notes®), plastic clipboards, or waterproof paper and notebooks in the sampling area.
- Fine and Ultra-Fine point Sharpie® markers are acceptable to label the empty sample bottle while in the staging area provided the lid is on the sample bottle and gloves are changed following sample bottle labeling.
- Ballpoint pens may be used when labeling sample containers. If ballpoint pens do not write on the sample container labels, preprinted labels from the laboratory may be used.
- Rite in the Rain® notebooks are acceptable to use in the staging area provided gloves are changed after note taking.
- Use HDPE or polypropylene sample bottles with Teflon®-free caps, provided by the laboratory.
- Chemical or blue ice should not be used.
- Samples and ice should be double-bagged using LDPE bags (e.g. Ziploc®). Care should be taken to ensure that they are kept in the staging area, do not come into direct contact with the sample media, and gloves are changed after handling.

Samples must be chilled during storage and shipment and must not exceed 50°F (10°C) during the first 48 hours after collection.

3.3 DECONTAMINATION

For non-dedicated sampling equipment, the following materials and procedures must be used for decontamination:

- Do not use Decon 90®.
- Laboratory supplied PFAS-free deionized water is preferred for decontamination.
- Alconox®, Liquinox®, and Citranox® can be used for equipment decontamination.
- Sampling equipment can be scrubbed using a polyethylene or Polyvinyl chloride (PVC) brush to remove particulates.
- Decontamination procedures should include triple rinsing with PFAS-free water.
- Commercially available deionized water in an HDPE container may be used for decontamination if the water is verified to be PFAS-free.
- Municipal drinking water may be used for decontamination purposes if it is known to be PFAS-free.

4.0 FIELD QUALITY CONTROL SAMPLES

Due to the prevalence of PFAS in a wide range of materials, there may be a greater likelihood for cross-contamination during sampling, transport, and storage of samples. As such, it is recommended to collect field quality control samples to evaluate if cross-contamination has occurred. The type and frequency of samples should be identified in the site-specific QAPP.

- Equipment blank samples are collected by passing laboratory-verified PFAS-free water over or through decontaminated field sampling equipment before the collection of samples to assess the adequacy of the decontamination process and/or to evaluate potential contamination from the equipment used during sampling.
- Field blanks are prepared in the laboratory by placing an aliquot of PFAS-free water reagent water in a sample container and treating it as a sample in all respects, including shipment to the sampling site, exposure to sampling site conditions, storage, preservation, and all analytical procedures. The field blank sample is used to determine if method analytes or other interferences are present in the field environment.
- Trip blanks are a bottle of PFAS-free water that is prepared in the laboratory, travels from the laboratory to the site, and then get transported back to the laboratory without having been exposed to any sampling procedures. The trip blank sample is used to assess cross-contamination introduced from the laboratory and during shipping procedures.
- Field duplicates are replicate or split samples collected in the field and submitted to the laboratory as two different samples. Field duplicates measure both field and laboratory precision.

Each analytical method provides instructions on how many blanks and duplicate samples are required per sampling event. Analytical test methods approved for use by the US EPA are found at:

<https://www.epa.gov/measurements-modeling/collection-methods>.

5.0 REFERENCES

Bartlett, Samuel A. and Davis, Katherine L. "Evaluating PFAS cross contamination issues." *Remediation*. 2018; 28:53-57.

Department of Defense Environmental Data Quality Workgroup. "Bottle Selection and other Sampling Considerations When Sampling for Per and Poly-Fluoroalkyl Substances (PFAS)." 2017. <https://www.denix.osd.mil/edqw/home/what-s-new/unassigned/edqw-pfas-sampling-factsheet-rev-1-2-july-2017/>

Government of Western Australia, Department of Environment Regulation. "Interim Guideline on the Assessment and Management of Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS)." January 2017. https://www.der.wa.gov.au/images/documents/your-environment/contaminated-sites/guidelines/Guideline_on_Assessment_and_Management_of_PFAS_v2.1.pdf

Heads of EPAs Australia and New Zealand. "PFAS National Environmental Management Plan." January 2018. https://www.epa.vic.gov.au/your-environment/land-and-groundwater/pfas-in-victoria/~media/Files/Your%20environment/Land%20and%20groundwater/PFAS%20in%20Victoria/PFAS%20NEMP/FINAL_PFAS-NEMP-20180110.pdf

Interstate Regulatory Technology Council (ITRC). "Site Characterization Considerations, Sampling Precautions, and Laboratory Analytical Methods for Per- and Polyfluoroalkyl Substances (PFAS)." March 2018. https://pfas-1.itrcweb.org/wp-content/uploads/2018/03/pfas_fact_sheet_site_characterization_3_15_18.pdf

Michigan Department of Environmental Quality. "General PFAS Sampling Guidance." 16 October 2018. https://www.michigan.gov/documents/pfasresponse/General_PFAS_Sampling_Guidance_634597_7.pdf

Naval Facilities Engineering Command (NAVFAC). "Interim Per- and Polyfluoroalkyl Substances (PFAS) Site Guidance for NAVFAC Remedial Project Managers (RPMs)/September 2017 Update." September 2017. https://www.navfac.navy.mil/content/dam/navfac/Specialty%20Centers/Engineering%20and%20Expeditionary%20Warfare%20Center/Environmental/Restoration/er_pdfs/gpr/navfac-pfas-guidance-sept-2017.pdf