

Oklahoma Department of Environmental Quality
Protocols for PFAS Sampling
Standard Operating Procedures

Groundwater Sampling SOP

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Table:

DEQ PFAS Sampling Quick Reference Field Guide

1.0 General

The objective of this protocol is to give general guidelines for the collection of groundwater samples for PFAS analysis. Multiple groundwater samples may need to be collected from the sampling site to determine the extent of any plume which might be present. This guidance is based on the DEQ's research, USEPA Method 537.1, and USEPA Draft Method 1633. The PFAS General Sampling Guidance should be referred to for what to include in a QAPP for PFAS sampling, information on cross-contamination, additional information on field clothing, and many other details.

2.0 Field Clothing and PPE

Field clothing and other personal protective equipment (PPE) may consist of PFAS-containing materials, especially those advertised as water-resistant, water repellent, or stain-resistant. Refer to Tables 1-4 and Table 8 in the Quick Reference Field Guide for general guidance regarding field clothing and PPE.

Sunscreen and biological protection also require screening, and recommendations are provided in Tables 5 and 7 in the Quick Reference Field Guide.

For guidance on specific brands and product names, refer to Table 6 in the Quick Reference Field Guide.

While PFAS-containing apparel and PPE should be avoided, the safety of samplers should never be compromised. Any deviation from the DEQ's guidance should be recorded in the field notes.

3.0 Equipment

All equipment and materials (e.g. tubing) used during sample collection should be assessed for the presence of PFAS to eliminate or reduce the probability of cross-contamination. Refer to Table 10 in the Quick Reference Guide at the end of this document for details on sampling containers that are and are not allowed. For groundwater sampling, complex equipment with multiple components may be used. Equipment specifications can be found in each respective USEPA laboratory method document referenced (Draft Method 1633 and 846-SW Method 8327). For groundwater sampling, stainless steel, high-density polyethylene (HDPE), polypropylene, and/or silicone materials are recommended for collection. Refer to Table 11 in the Quick Reference Guide at the end of this document for a list of common materials that may be present in groundwater sampling equipment, such as bailers and pumps. Food packaging can contain PFAS, so food packaging and products should be kept in a designated eating area as noted in Table 9 of the Quick Reference Guide at the end of this document.

Additional information to consider when selecting sampling equipment is as follows:

- Keep sampling equipment in its original packing material.
- Use PFAS-free nylon lines or cotton strings for raising and lowering equipment.
- Avoid glass equipment for aqueous samples.
- Internal pump components that do not come into contact with the sample have a low potential for cross-contamination.

4.0 Sampling Techniques and Collection Methods

The following section provides guidance for groundwater sample collection for PFAS analysis. DEQ approves multiple groundwater sampling techniques. The selected sampling technique may vary depending on what is most suitable for the sampling entity, selected laboratory, site characterization, and release type. The well depth and volume will also determine the appropriate sampling technique and equipment. USEPA 846-SW Method 8327 and USEPA Draft Method 1633 are the acceptable laboratory analysis methods for groundwater, and the differences in sampling methods are highlighted below. While Draft Method 1633 guidance is not promulgated as regulation, it is highly recommended by the USEPA for individual permits. Sample preparations should be outlined in a site-specific sampling plan, such as a Sampling Analysis Plan (SAP).

Method 1633 Sampling Equipment: Use 500-mL HDPE (or polypropylene) sampling containers with HDPE (or polypropylene) screw caps.

846-SW Method 8327 Sampling Equipment: Use polypropylene (or HDPE) sampling containers with polypropylene (or HDPE) screw caps. Laboratory protocol will indicate which size sample containers to use; always avoiding over-sizing to eliminate the need for subsampling.

4.1 General Groundwater Sampling Guidelines

- Before sampling, decontaminate the sampling equipment per recommended guidance in the Decontamination section.
- If multiple wells are being sampled, start purging and sampling the least contaminated wells and end with the most contaminated wells based on previous screening results.
- Samplers must take appropriate water quality parameter measurements before purging, as shown in Table 1.
- Purging will be conducted in full accordance with EPA's SOP 2007 Groundwater Well Sampling and DEQ Land Protection SOP-7 Monitoring Well Sampling with a Low-Flow Peristaltic Pump.

- **Supply Well Collection:** If collecting from a supply well, run water from the spigot for at least 15 minutes, or approximately the volume of the well casing, to collect a representative sample.
- **Monitoring Well Collection:** If collecting from a monitoring well, purge using either low-flow methods, bailers, or submersible pumps. DEQ’s preferred method for purging is the low-flow method. If this is not possible, bailers, submersible pumps, or other purging equipment may be used as long as the components that come into contact with the sample are PFAS-free. Low-flow purging is preferred since other methods may increase turbidity and an influx of particulate matter in the representative water sample. Since PFAS tends to adsorb to material, this could contaminate the sample and bias the analytical results low. Use the following parameters in Table 1 to ensure adequate purging has occurred if using low-flow methods:

Table 1: Suggested Well Purge Stabilization Criteria for Water-Quality-Indicator Parameters		
Parameter	Stabilization Criteria	Reference
Temperature	\pm 3% of reading (minimum of \pm 0.2° C)	SAM 2002
pH	\pm 0.1	Puls and Barcelona 1996; USGS 2006
Specific electrical conductance (SEC)	\pm 0.3%	Puls and Barcelona, 1996

- After groundwater has stabilized, take the appropriate water quality parameter measurements prior to sampling.

If further information regarding each sampling technique is desired before sampling, please reference the respective USEPA method documents mentioned.

5.0 Decontamination

Refer to Table 13 in the Quick Reference Field Guide at the end of this document for guidance on decontamination methods and materials which are allowed or prohibited while sampling. The following general decontamination principles for PFAS sampling should be followed:

- Sampling equipment must be decontaminated after sampling at each location and at the end of the workday.
- Wash hands with PFAS-free water and put on new nitrile gloves before decontamination.
- Decontaminate equipment with a triple rinse of verified PFAS-free water and remove particulates with a polyethylene or PVC brush.
- PFAS-free detergents such as Alconox®, Liquinox®, or Citranox® may be used.
- Dry equipment with a cotton cloth, untreated paper towels, or place decontaminated equipment on a PFAS-free surface to air-dry.

6.0 Quality Assurance / Quality Control

The DEQ recommends following the Quality Assurance/Quality Control (QA/QC) Guidelines outlined in section 5.0 of the General PFAS Sampling document to ensure project-specific Quality Assurance Project Plan (QAPP), Standard Operating Procedures (SOP), and Sampling Analysis Plan (SAP) consistency between sampling events. Additionally, the following guidelines should be followed for ground water-specific sampling events.

- Collect a rinsate/equipment blank at the rate of 1 per day per sampling team to ensure the sampling has not introduced PFAS cross-contamination to the sampling results. This process should be conducted on each piece of equipment. (Required)
- Laboratory sources of water used for equipment decontamination and blank sample collection should be certified PFAS-free or addressed for background concentrations of PFAS. (Required)
- Collect field quality control samples such as duplicates collected at the rate of 1 per 10 samples, trip blanks collected at the rate of 1 per cooler, and field blanks collected at the rate of 1 per day per sampling team to assist in evaluating groundwater sampling and handling activities at the investigation site. (Required)
- If possible, a control sample (background sample) should be collected from an area not affected by the possible contaminants of concern and submitted with the other samples. The background sample should be collected from the same aquifer or water source (Required)

7.0 Documentation

Keep a sampling log during the sampling event. In the sample log, record the following:

- Well location
- Sample point location
- Owner's Contact Information (if applicable)
- Sampling equipment

- Duration of purge
- Duplicate sample(s)
- Visual description of samples
- Use of any unapproved PPE
- Other sampling specific (applicable) observations

Ensure documentation materials are PFAS-free; refer to Table 12 in the Quick Reference Field Guide. Pre-printed labels for sample containers are preferred.

8.0 Shipment

The following is recommended for sample shipment. Information is also provided in the Quick Reference Field Guide Table 14.

- Use regular ice, double-bagged, in place of chemical (blue) ice and maintain temperature between +4°C and - 2 °C in a cooler.
- Check the cooler periodically to ensure samples are well iced and at the proper temperature.
- The cooler should be taped closed with a custody seal.
- Double bag Chain of Custody and other applicable forms and tape to the inside of the cooler lid. Include the appropriate Monitoring Well and Groundwater Data documents.
- Ship within 48 hours or per the holding time determined by the laboratory or the selected laboratory analysis method.

DEQ PFAS Sampling Quick Reference Field Guide

Table 1: Clothing ¹		
Allowed	Not Allowed	Needs Additional Research
<ul style="list-style-type: none"> • Well laundered clothing (recommended six times prior to sampling) • 100% cotton (preferred) • Synthetic fabrics • Polyvinyl Chloride (PVC) • Polyurethane • Uncoated Tyvek® clothing • Wax-coated fabrics. • Rubber/Neoprene 	<ul style="list-style-type: none"> • New/unwashed clothing • Clothing applied/washed with fabric softeners, fabric protectors including ultraviolet (UV) protection, water, dirt or stain-resistant chemicals, or insect-resistant chemicals • Clothing containing Tyvek® • Flame resistant (FR) clothing • Clothing made of Gore-Tex or other known PFAS containing materials. 	<ul style="list-style-type: none"> • Tyvek® suits, clothing that contains Tyvek®, or coated Tyvek®

¹Clothing should be kept dust and fiber free.

Table 2: Boots		
Allowed	Not Allowed	Needs Additional Research
<ul style="list-style-type: none"> • Polyurethane boots • PVC boots • PFAS-free boot covers 	<ul style="list-style-type: none"> • Gore-Tex® boots • Boots made from water-resistant synthetics 	

Table 3: Gloves		
Allowed	Not Allowed	Needs Additional Research
<ul style="list-style-type: none"> • Powderless nitrile gloves* 	<ul style="list-style-type: none"> • Gore-Tex gloves • Any glove made with PFAS-containing materials. 	<ul style="list-style-type: none"> • Latex gloves • Water and dirt-resistant leather gloves • Any special gloves required by a Health and Safety Plan (HASP).

*Samplers must wash their hands with PFAS-free water before putting on any gloves.

Table 4: PPE ¹		
Allowed	Not Allowed	Needs Additional Research
<ul style="list-style-type: none"> • Hard hats made of HDPE • Hard hat covers/liners (i.e. Head Gaiters) made of cotton or other natural fabric • Safety glasses made of HDPE • Life jackets made of polyethylene foam and nylon shell fabric • Waders made of Neoprene or other PFAS-free material 	<ul style="list-style-type: none"> • Waders made of Gore-Tex or other known PFAS containing materials 	<ul style="list-style-type: none"> • Hard hats or safety glasses not made of HDPE

¹PPE should be kept dust and fiber free.

Table 5: Sun Protection		
Allowed	Not Allowed	Needs Additional Research
<ul style="list-style-type: none"> • Approved Sunscreens (See Table 6) 	<ul style="list-style-type: none"> • No unauthorized sunscreen 	

Table 6: Allowed/Approved Sunscreens ¹
• 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 50
• Meijer® Sunscreen Continuous Spray Broad Spectrum SPF 30
• 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+
• Neutrogena® UltraSheer Dry-Touch Sunscreen Broad Spectrum SPF 30

¹Baby sunscreens that are "free" or "natural" are not guaranteed PFAS-free and need additional research.

Table 7: Insect Protection ¹		
Allowed	Not Allowed	Needs Additional Research
<ul style="list-style-type: none"> • OFF® Deep Woods • Sawyer® Permethrin 	<ul style="list-style-type: none"> • No unauthorized insect protection 	

¹Approved sunscreens and insect repellents should not be applied near the sample collection area. Hands should be well washed after application or handling of these products, and afterwards; an uncontaminated clean/new pair of powderless nitrile gloves should be worn.

Table 8: Prohibited Water Repellant Field Clothing and PPE Brand and Product Names	
• Ultra Release Teflon®	• Release Teflon®
• Repel Teflon® Fabric Protector	• High-Performance Release Teflon®
• High-Performance Repel Teflon® Fabric Protector	• Advanced Dual Action Teflon® Fabric Protector
• NK Guard® S Series	• GreenShield®
• Tri-Effects Teflon® Fabric Protector	• Lurotex Protector RL ECO®
• Oleophobol CP®	• Repellan KFC®
• Rucostar® EEE6	• Unidyne™
• Bionic Finish®	• RUCO-GUARD®
• RUCOSTAR®	• RUCO-COAT®
• RUCO-PROTECT®	• RUCOTEC®
• RUCO®	• Resist Spills™
• Resists Spills and Releases Stains™	• Scotchgard™ Fabric Protector
• GoreTex®	

Table 9: Food Containers		
Allowed	Not Allowed	Needs Additional Research
• Food packaging and products in a designated eating area set up for food and beverage consumption	• Food packaging and products in the staging or sampling areas	• Bringing foods rewrapped in PFAS-free materials

Table 10: Sampling Containers		
Allowed	Not Allowed	Needs Additional Research
<ul style="list-style-type: none"> • HDPE also known as polyethylene high-density (PEHD) • Polypropylene • Stainless Steel • Unlined bottle caps • LDPE resealable bags (Ziplock) that will not come in contact with the sample media • 	<ul style="list-style-type: none"> • Polytetrafluoroethylene (PTFE) lined bottles or caps (i.e. Teflon® and Hostaflon®) • LDPE containers that will contact the sample media • Aluminum foil is not to be used due to the possibility of it being coated with PFAS. Utilize an alternative sample preparation and storage material 	<ul style="list-style-type: none"> • Glass bottles and containers¹

¹Glass bottles or containers may be used if they are known to be PFAS-free; however, PFAS have been found to adsorb to glass, especially when the sample is in contact with the glass for an extended period of time (e.g., stored in a glass container). If the sample comes into direct contact with the glass for a short period of time (e.g., using a glass container to collect the sample, then transferring the sample to a non-glass sample bottle), the adsorption is minimal. Generally, glass bottles or containers should not be used for PFAS samples.

Table 11: Sampling Equipment		
Allowed	Not Allowed	Needs Additional Research
<ul style="list-style-type: none"> • HDPE (also PEHD) • Polypropylene • Stainless Steel • Acetate • Silicone 	<ul style="list-style-type: none"> • Polytetrafluoroethylene (PTFE) • Polyvinylidene fluoride (PVDF) • Polychlorotrifluoroethylene (PCTFE) • Ethylene-tetrafluoroethylene (ETFE) • Low-density polyethylene (LDPE) which will contact the sample media 	<ul style="list-style-type: none"> • Glass equipment

Table 12: Field Materials		
Allowed	Not Allowed	Needs Additional Research
<ul style="list-style-type: none"> • Aluminum, polypropylene, or Masonite field clipboards • Rite in the Rain® notebooks • Loose paper (non-waterproof, non-recycled) • Ballpoint pens and pencils 	<ul style="list-style-type: none"> • Clipboards coated with PFAS-containing materials • Notebooks made with PFAS treated paper • PFAS treated loose paper • Post-It® Notes or other adhesive paper products • Sharpie® markers • Coated materials, including paper towels • Aluminum foil is not to be used due to the possibility of it being coated with PFAS. Utilize an alternative sample preparation and storage material 	<ul style="list-style-type: none"> • Plastic clipboards, binders, or spiral hardcover notebooks • Waterproof field books • All markers not listed as allowable

Table 13: Decontamination Procedures		
Allowed	Not Allowed	Needs Additional Research
<ul style="list-style-type: none"> • Alconox®, Liquinox®, or Citranox® • Triple rinse with PFAS-free water • Cotton cloth or untreated paper towels • Polyethylene or PVC brush to remove particulates 	<ul style="list-style-type: none"> • Decon 90® • PFAS treated paper towels • Reusing non-dedicated equipment without decontaminating 	<ul style="list-style-type: none"> • Municipal water¹ • Recycled or treated paper towels

¹Decontamination procedures should include a triple rinsing with PFAS-free water for equipment such as dippers, balers, spades, etc. Laboratory supplied PFAS-free deionized water is preferred for cleaning and decontamination. However, commercially available deionized water may be used for cleaning and decontamination if the water is verified to be PFAS-free. Municipal drinking water may be used for cleaning or decontamination if the water is known to be PFAS-free.

Table 14: Sample Shipment		
Allowed/Required	Not Allowed	Needs Additional Research
<ul style="list-style-type: none"> • Coolers filled with regular ice • Maintaining sample temperature between +4°C and -2°C • Double-bagging of samples and ice using bag materials made of HDPE (preferred) or LDPE (if sample does not come in contact) • Chain of Custody and other forms should be single bagged in LDPE (e.g. Ziploc®) storage bags and taped to the inside of the cooler lid. 	<ul style="list-style-type: none"> • Aluminum foil is not to be used due to the possibility of it being coated with PFAS. Utilize an alternative sample preparation and storage material • Chemical (blue) ice packs 	<ul style="list-style-type: none"> • Chemical (blue) ice packs that are verified PFAS free