



May 27, 2020

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Subject: Immediate Actions Required to Address Foam Accumulation on Waterways in Marinette and Peshtigo
JCI/Tyco Fire Technology Center and Stanton St. Campus
BRRTS #: 02-38-580694 and 02-38-581955

Dear Mr. Danko & Mr. Wahl:

The Wisconsin Department of Natural Resources (DNR) is directing Johnson Controls, Inc. and Tyco Fire Products, LP (JCI/Tyco) to take immediate actions to address foam on waterways in the City of Marinette (Marinette) and the Town of Peshtigo (Peshtigo) as part of open site investigations regarding discharges of per- and polyfluoroalkyl substances (PFAS) at the JCI/Tyco Stanton Street Campus (BRRTS# 02-38-581955) and the JCI/Tyco Fire Technology Center (BRRTS #02-38-580694).

In accordance with ch. NR 708 Wisconsin Administrative Code, immediate actions are required of responsible parties where directed by the DNR in order to minimize the harmful effects of discharge of hazardous substances or environmental pollution to air, lands, or waters of the state, and to establish documentation requirements associated with response actions. This letter details requirements that JCI/Tyco must conduct, including: foam monitoring; foam collection and analysis; and other response actions to be completed where foam accumulates on waterways in Marinette and Peshtigo.

These requirements include a continuation of activities directed by DNR on April 23rd, 2020; as well as initiation of additional activities to be carried out from the date of this letter through July 3rd, 2020. The completion of immediate action activities must be documented in a report due to the DNR by July 10, 2020.

The DNR has received numerous reports of foam accumulation on and adjacent to surface water drainage features located in Marinette and Peshtigo. These drainage areas have been sampled for PFAS by JCI/Tyco as part of the above-referenced open site investigations and labeled as Ditches A thru E (see attached figure). In addition, the DNR has also received reports of foam accumulation on the Little River and within the ditch at the southwest corner Leaf Rd and Kraus Rd in Peshtigo.

The DNR contacted JCI/Tyco regarding foam sightings on April 23, 2020 and requested action to mitigate foam accumulation in Ditches B and C by conducting daily inspections; deploying booms; and collecting, storing and testing foam for PFAS where significant accumulation occurs. On April 27, 2020, JCI/Tyco agreed to temporarily conduct the activities in a return email; no end date was indicated noting the duration of these temporary

measures. This letter is a continuation and expansion of the written direction provided by DNR on April 23, 2020 to fully address the surface waters impacted by PFAS contamination from the FTC and Stanton St. Campus. These activities shall be conducted by JCI/Tyco as part of the ongoing, open site investigations and immediate response actions under chs. NR 716 and NR 708.

Site investigation activities conducted by JCI/Tyco to date have included surface water sampling for PFAS compounds in each of the Ditches A through E. PFAS were detected in each of the ditches (A, B, C, D, and E) in varying concentrations. JCI/Tyco has not yet sampled the Little River for PFAS contamination as a part of these investigations; however, sampling has demonstrated that Ditch A is contaminated with PFAS and discharges into the Little River. The DNR conducted foam sampling at the ditch at Leaf Rd and Kraus Rd in September 2019; PFAS were detected in the foam collected at this location.

To determine if the foam accumulation in waterways and drainage areas in Marinette and Peshtigo contain PFAS, the DNR is directing JCI/Tyco to conduct the following activities in accordance with Wis. Admin. Code § NR 708.05(4):

- 1) Conduct Daily Inspections in Ditches A – E, the Little River, and the ditch at the southwest corner of Leaf Rd and Kraus Rd:
 - i. Continue to conduct daily inspections of Ditches B and C through July 3, 2020.
 - ii. From the date of this letter, begin to conduct daily inspections of Ditches A, D, E; the Little River; and the ditch at the southwest corner of Leaf and Kraus Rds in the Town of Peshtigo. Inspections shall be conducted through July 3, 2020 to determine if foam is accumulating on waterways and drainage areas.
 - iii. Maintain a daily log of observations and activities. The daily log shall include:
 - a. Document observations of foam including location, approximate size of the foam mass, characteristics of the foam (e.g. fluffy, flat, brown, white, etc.), if the foam is collecting in specific areas, photographs of the foam, and any other relevant conditions that may exist surrounding the foam event (e.g. windy conditions, heavy rains, surface water treatment bypass, etc.).
 - iv. Submit observations recorded as part of the report due to DNR as detailed in item number 5 below.
- 2) Implement a Foam Response Plan for Responding to Significant Foam Accumulations on Ditches A, B, C, D, and E; the Little River; and the ditch at the southwest corner of Leaf and Kraus Rds. The response plan should include, at minimum, the following:
 - i. Install booms to capture the foam and prevent downstream migration of foam. Booms must be used as necessary to control foam migration through July 3rd, 2020, or as long as foam is present on the waterways. Be aware that additional regulations regarding the deployment of boom anchoring points may apply, depending on the duration of time in the water. Additional information on booming strategies is available from US EPA, US Coast Guard, and NOAA.
 - ii. Maintain a daily log of observations and activities to prevent downstream migration of foam including inspection of the integrity and boom anchoring points daily. Secure and change out boom when it begins to degrade. If any boom becomes unsecured, reasonable efforts must be made to recover the boom.

- iii. Remove foam accumulations from the water; contain, and store foam until such time that a PFAS analysis has been completed and can inform the appropriate disposal options for foam/water mixture.
- iv. **Note that foam and water sampling conducted to meet the requirements of item number 3 below must be conducted before foam is removed from the waterway for waste characterization.**
- v. If you are uncertain which foam events are considered ‘significant accumulations,’ or need additional information related to permitting requirements for booms you may contact DNR Project Manager Dave Neste for additional direction.
- vi. Document actions taken to install and maintain booms to be included as part of the report requirements detailed in item number 5 below. Include a disposal plan for boom in the report.
- vii. Document actions taken to remove foam including location of collection point, volume of foam collected, and method of storage. These records must be included as part of the report requirements detailed in item number 5 below.

3) Sample and Analyze for 36 PFAS Compounds Using BMPs:

- i. Sample foam collected from each waterway, utilizing best management practices (BMPs) for foam sampling. BMPs include gathering a foam sample and a surface water microlayer during each foam event before the foam is removed from the water. DNR provides Michigan’s foam sampling guidance as a reference for analogous foam sampling BMPs acceptable to DNR. [Michigan Foam Sampling Guidance](#)
- ii. **Note that the foam and water sampling described here must be conducted prior to removal of foam from waterways and drainage areas for disposal purposes described in item number 2 above.**
- iii. Submit foam and surface water microlayer samples for lab analysis for the 36 PFAS compounds defined by DNR’s laboratory certification program. Report results to the DNR within 10-days of receipt of lab results.

4) Additional Surface Water Sampling Due to Foam:

- i. In order to determine the potential for PFAS discharge to the environment and the potential for PFAS foam formation, surface water sampling must be completed in Ditch A immediately downstream of the treatment system, in Ditch B immediately downstream of the treatment system, and in the Little River immediately downstream of where Ditch A discharges into the waterway. A map with approximate locations has been provided for your reference. Complete these sampling events by June 5, 2020 and submit analytical reports in the report noted in number 5 below.

5) Submit an Immediate Actions Report by July 10, 2020.

- i. Submit a report by July 10, 2020 documenting to the DNR the results of the immediate actions completed for Ditches A, B, C, D, and E and the Little River, inclusive of the items described in this letter, as well as the elements described in Wis. Admin. Code § NR 708.05(6).

- ii. In the report, in accordance with Wis. Admin. Code § NR 708.07, determine whether additional immediate actions are needed, an interim action or additional site investigation activities or implementation of a preventative measures plan is necessary to minimize or prevent any further hazardous substance discharges, or if no further response actions are needed under Wis. Admin. Code § NR 708.09.

The DNR appreciates your efforts to restore the environment at this site. If you have any questions regarding this letter, please contact me at (920) 362-2072, or at david.neste@wisconsin.gov.

Sincerely,



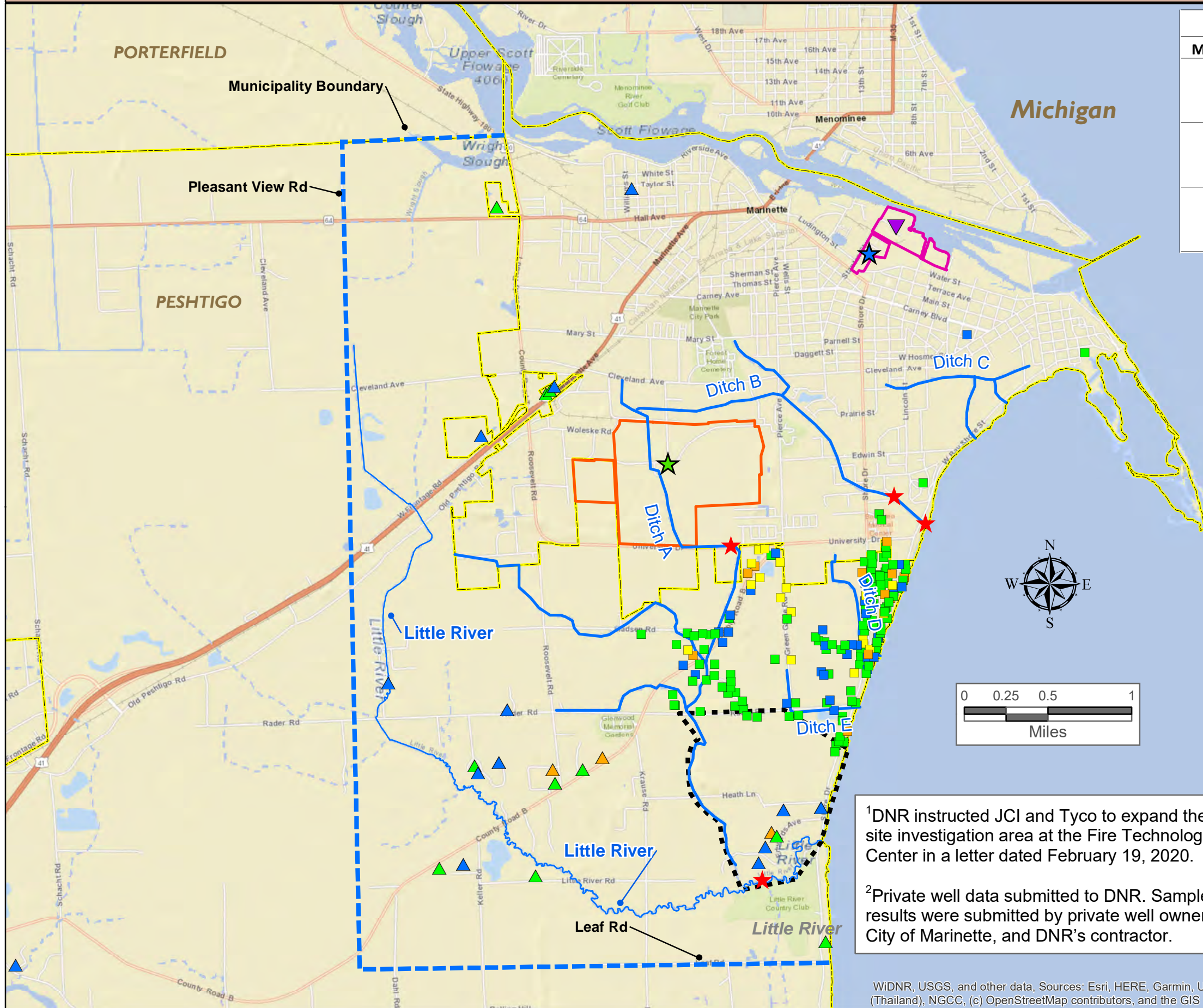
Dave Neste
Hydrogeologist, Northeast Region
Remediation & Redevelopment Program

Enclosures:

- 1) *Surface Water Sampling Locations Map*
- 2) *BMPs Foam Sampling – MI Foam Sampling Guidance*

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JCI/TYCO FIRE TECHNOLOGY CENTER (BRRTS #: 02-38-580694) - SURFACE WATER SAMPLING LOCATIONS



LEGEND		
Map Symbol	Facility/Site Name - Address	BRRTS Case
★	JCI/Tyco 1 Stanton St Marinette, WI	JCI/Tyco Stanton (PFAS) Case No. 02-38-581955
★	JCI/Tyco Fire Training Center 2700 Indsutiral Parkway Marinette, WI	JCI/Tyco FTC (PFAS) Case No. 02-38-580694
▼	ChemDesign 2 Stanton St Marinette, WI	ChemDesign (PFAS) Case No. 02-38-583852

- ★ Approximate Surface Water Sampling Locations
 - Expanded Site Investigation Area¹
 - Approximate Extent of Southern Area
 - Ditches
 - JCI/Tyco FTC Property Boundary
 - JCI/Tyco Stanton St Property Boundary
 - Municipality Boundary
- JCI/TYCO PRIVATE WELL SAMPLING DATA**
- ND - 2 ppt PFOS/PFOA
 - 2 - 20 ppt PFOS/PFOA
 - 20 - 70 ppt PFOS/PFOA
 - > 70 ppt PFOS/PFOA
- DNR/PRIVATE WELL OWNER SAMPLING DATA²**
- ▲ ND PFOS/PFOA
 - ▲ 0 - 20 ppt PFOS/PFOA
 - ▲ 20 - 70 ppt PFOS/PFOA

¹DNR instructed JCI and Tyco to expand the site investigation area at the Fire Technology Center in a letter dated February 19, 2020.

²Private well data submitted to DNR. Sample results were submitted by private well owners, City of Marinette, and DNR's contractor.



WiDNR, USGS, and other data. Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

SURFACE WATER FOAM PFAS SAMPLING

Guidance

Introduction

This sampling guidance discusses the processes and acceptable materials that must be used by Michigan Department of Environment, Great Lakes, and Energy (EGLE) staff and contractors conducting surface water foam sampling for per- and polyfluoroalkyl substances (PFAS). This guidance will be used to support the sampling objectives and procedures based on the Quality Assurance Project Plan (QAPP) developed before starting field activities. This Surface Water Foam PFAS Sampling Guidance (Foam Guidance) assumes staff has basic familiarity with and/or understanding of basic surface water foam sampling procedures.

NOTE: Review the **General PFAS Sampling Guidance** document prior to reviewing this guidance document.

EGLE intends to update the information contained within this Foam Guidance as new information becomes available. The user of this Foam Guidance is encouraged to visit the Michigan PFAS Action Response Team (MPART) Web page (www.Michigan.gov/PFASResponse) to access the most current version of this document.

PFAS has been detected in surface water foam in Michigan at concentrations over 296,000 parts per trillion (ppt). Surface water foam volume, density, and PFAS concentration in Michigan may vary by location, composition, foaming mechanism, and age of the foam. Because PFAS compounds can be analyzed at concentrations in the ppt range, precautions must be taken to prevent cross-contamination. Therefore, there is a high possibility of false positives if decontamination procedures are not followed diligently. While EGLE has been sampling surface water foam for PFAS since 2017, as of the date of this publication staff are not aware of surface water foam sampling that has occurred in other states.

This Foam Guidance discusses the collection of surface water foam and the potential for cross-contamination that can occur from:

- Field clothing and personal protective equipment (PPE)
- Sampling equipment
- Sample collection and handling
- Sample shipment

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NOTE: Additional information about PFAS testing can be found on the Michigan PFAS Action Response Team (MPART) website:

www.michigan.gov/PFASresponse

Additional information about PFAS foam can be found at:

www.michigan.gov/PFASfoam

1. Potential Sources for PFAS Cross-Contamination

Potential sources for PFAS cross-contamination are materials used within the sampling environment, such as sampling equipment, field clothing, PPE, sun and biological protection products, personal hygiene and personal care products (PCP), and food packaging. A detailed discussion about potential sources for PFAS cross-contamination are discussed in the **General PFAS Sampling Guidance**, which should be reviewed prior to reading this Foam Guidance. However, a high-level summary will be discussed in this Foam Guidance.

All of the materials or items discussed in each of EGLE's PFAS Sampling Guidance documents will be divided into three major groups:

- Prohibited (●) identifies items and materials that should not be used when sampling. It is well documented that they contain PFAS or that PFAS are used in their manufacture.
- Allowable (■) identifies items and materials that have been proven not to be sources of PFAS cross contamination and are considered acceptable for sampling.
- Needs Screening (▲) identifies items and materials that have the potential for PFAS cross-contamination due to a lack of scientific data or statements from manufacturers to prove otherwise. These items and materials are further sub-divided into two categories:
 - **Category 1:** Items and materials that will come in direct contact with the sample. These should not be used when sampling unless they are known to be PFAS-free, by collecting an equipment blank sample prior to use.
 - **Category 2:** Items and materials that will not come in direct contact with the sample. These should be avoided, if possible, unless they are known to be PFAS-free by collecting an equipment blank sample prior to use.

Sampling staff should take practical and appropriate precautions to avoid items that are likely to contain PFAS at the sampling site and during the sampling event. Staff should follow the **EGLE PFAS Sampling Quick Reference Field Guide** table for approved and prohibited items.

1.1 Field Clothing and Personal Protective Equipment

Field clothing and PPE screening should be performed during the QAPP development or the planning phase of sampling programs. The screening should be performed on all items and materials that are expected to come into contact with the samples and are defined as **Category 1**. Due to the extensive use of PFAS in many industries and products, PPE may contain PFAS. During a PFAS investigation, PPE-containing PFAS should be avoided to prevent cross-contamination.

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

Depending on the project objectives and sampling plan, the collection of surface water foam samples could be as simple as a grab sample from the surface water shoreline or as complex as a sample collected from a boat. Generally, for surface water foam sampling, approved field clothing, and Level D protection (such as steel toed boots, protective eyewear, hard hat, gloves, and fluorescent vests) are required.

During surface water foam sampling, staff may need to wear life jackets and/or waders. Life jackets made of PFAS-free materials should be used. The coatings used on waders are of particular concern: ensure the waders are made from PFAS-free materials before use.

- Do not use latex gloves.
- Do not use waders made of Gore-Tex[®] or other known PFAS containing materials.
- Use powderless nitrile gloves (which can be found at some hardware stores and major retail outlets).
- Life jackets made of polyethylene foam and nylon shell fabric can be used.
- Waders made of Neoprene[®] or other PFAS-free materials can be used.

NOTE: Protective coatings that could contain PFAS might still be used in the manufacturing of life jackets.

Any field clothing and/or PPE items that might be required for surface water foam sampling and not discussed in this Foam Guidance should be evaluated as described in **Sections 4.2.1** and **4.2.2** of the **General PFAS Sampling Guidance**.

1.2 Personal Care Products

A number of sampling guidance documents recommend that personal hygiene and PCPs (e.g., cosmetics, shampoo, sunscreens, dental floss, etc.) not be used prior to and on the day(s) of sampling because the presence of PFAS in these products has been documented (OECD, 2002; Fujii, 2013; Borg and Ivarsson, 2017). However, if EGGLE's sampling standard operating procedures are followed, these items should not come into contact with the sampling equipment or the sample being collected. As of the date of this Foam Guidance, cross-contamination of samples due to the use of PCPs has not been documented during the collection of thousands of samples. However, field staff should be aware of the potential of cross-contamination if the sampling equipment or actual samples would come into contact with these products. The following precautions should be taken when dealing with personal hygiene or PCPs before sampling:

- Do not apply PCPs in the sampling area.
- Do not apply PCPs while wearing PPE that will be present during sampling.
- Move to the staging area and remove PPE if applying PCPs becomes necessary.
- Wash hands thoroughly after application of PCPs, and when finished, put on a fresh pair of powderless nitrile gloves.

1.3 Food Packaging

PFAS has been used by the paper industry as a special protective coating against grease, oil, and water for paper and paperboards, including food packaging since the late 1950s (Trier et al., 2018). PFAS application for food packaging includes paper products that come into

contact with food, such as paper plates, food containers, bags, and wraps (OECD, 2002). Prewrapped food or snacks (such as candy bars, microwave popcorn, etc.) must not be on-site during sampling. When staff need a break to eat or drink, they should remove their gloves and coveralls, 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.

- Do not handle, consume, or otherwise interact with prewrapped food or snacks, carry-out food, fast food, or other food items while on site during sampling.

2. Surface Water Foam Sampling Equipment

Surface water foam sampling equipment is categorized into **Category 1** and **Category 2**:

NOTE: As a precautionary action, an equipment rinsate blank should be collected even if the sampling materials are made of materials that are not expected to contain PFAS.

Category 1: Any item that will directly contact the foam, including bags, bottles, cheesecloth, and other equipment. This equipment has a high likelihood of cross-contamination if the proper decontamination procedures are not followed.

These items should be known to be PFAS-free.

Category 2: Any item that will not directly contact the foam, including GPS receivers, notebooks, and other equipment that is used on boats. The surface of these pieces of field equipment or the storage boxes in which they are kept might contain PFAS.

Although these items will not directly contact foam samples, cross-contamination may still occur. Every effort should be made to ensure these items are PFAS-free. Be aware, surfaces of the field equipment or the containers in which they are kept may contain PFAS. Care should be taken to prevent cross-contamination.

Surface water foam has been successfully sampled in Michigan using various high density polyethylene (HDPE) bottles and polyethylene plastic bags (e.g., Ziploc®). Polyethylene plastic bags (e.g., Ziploc®) are preferred for sampling collection because they have wide openings to facilitate the placement of surface water foam. HDPE bottles may be used if bags are unavailable. HDPE bottles are used to hold the foam after it has condensed in the polyethylene plastic bag.

Do not use any materials or equipment that contains any known fluoropolymers or that potentially have been cross-contaminated with PFAS such as, but not limited to, the following:

- Do not use polytetrafluoroethylene (PTFE) that includes the trademark Teflon® and Hostaflon®, which can be found in many items, including but not limited to the lining of some hoses and tubing, some wiring, certain kinds of gears, lubricant, and some objects that require the sliding action of parts.
- Do not use Polyvinylidene fluoride (PVDF) that includes 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.
- Do not use Polychlorotrifluoroethylene (PCTFE) that includes the trademark Neoflon®, which can be found in many items, including but not limited to valves, seals, gaskets, and food packaging.

- Do not use Ethylene-tetrafluoro-ethylene (ETFE) that includes 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.
- Do not use Fluorinated ethylene propylene (FEP) that includes 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.
- Do not use low density polyethylene (LDPE) 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.
 - ▲ **However**, LDPE may be used if an equipment blank has confirmed it to be PFAS-free. LDPE does not contain PFAS in the raw material but may contain PFAS cross-contamination from the manufacturing process.
 - LDPE bags (e.g., Ziploc®) that **do not** come into direct contact with the sample media and do not introduce cross-contamination with samples may be used. Materials that are either made of HDPE, polypropylene, silicone, or acetate.

NOTE: Manufacturers can change the chemical composition of any product. As a result, all materials that will come into contact with the sample matrices (defined as Category 1) should be tested to confirm they are “PFAS-free”, i.e. will not contaminate samples at detectable levels. **There is no guarantee that materials in the ‘Acceptable’ category will always be PFAS-free.**

3. Equipment Decontamination Before Sampling

Disposable **Category 1** sampling equipment should be used, especially for sample bags, sample bottles, cheesecloth, and other materials that are used where the foam sample may be in contact with the sampling equipment for an extended period of time. Field sampling equipment used at multiple sites or sampling locations can become highly contaminated with PFAS. Decontamination procedures must be implemented to prevent cross-contamination, especially between individual sample locations.

For nondedicated **Category 1** 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 poly vinyl 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 certified to be PFAS-free.
- ▲ Municipal drinking water may be used for decontamination purposes if it is known to be PFAS-free.

4. Sample Collection and Handling

Cross-contamination could be introduced during the sample collection and handling. Careful planning prevents cross-contamination.

4.1 Sample Handling Considerations

Samples from streams, rivers, lakes, and other surface waters can be collected from the shore or from boats. The following considerations should be taken during sample collection to prevent contamination:

- Do not let dust or fibers fall into the sample container.
- Surface water or other nonaqueous matrices (e.g., plants, insects, etc.) should not be collected along with the surface water foam. Use a gloved hand to pick out extraneous materials.
- If using a bottle, never set the cap down, touch any part of the cap that contacts the bottle, or let anything touch the rim of the bottle or inside the cap.
- Do not use markers other than fine or ultra-fine point markers that have been proven to be PFAS-free, such as Sharpies®.
- Do not rinse the sampling container. Decon water and/or the surface water will dilute the surface water foam sample, which will return an inaccurate result.
- Do not allow any part of the ungloved hand to come into contact with the surface of the water when scooping by hand to collect surface water foam.
- Do not collect any surface water with the surface water foam—even the smallest amount of water can affect the accuracy of the foam results.
- Use a polyethylene plastic bag (e.g., Ziploc®) for the initial foam sample collection. If Ziploc® bags are not used, you must do an equipment blank.
- Bottles or sample containers should only be opened immediately prior to sampling.
- During the initial surface water foam sample collection, labeling should be done on the Ziploc® bags used to collect and condense the surface water foam. Preprinted labels, or blank labels from the laboratory, may also be used.
- Use only fine and ultra-fine point Sharpie® markers or ballpoint pens when labeling sample containers.
- After foam has condensed into a liquid, use HDPE or polypropylene sample bottles with Teflon-free caps provided by the laboratory.
- Use PFAS-free markers to label the empty sample bottle prior to or immediately after the sample collection. Make sure the cap is on the sample bottle and gloves are changed after sample bottle labeling. Allow the ink to dry completely before proceeding.
- Samples should be double bagged using resealable bags (e.g., Ziploc®).
- A surface water sample should be taken after the foam sample is taken. Be sure to review the surface water sampling guidance document and bring appropriate supplies.
- In the absence of formal United States Environmental Protection Agency (USEPA) guidance for PFAS sample storage, the documentation in Method 537 should be used as a guide for thermal preservation (holding temperature) and holding times for soil or other samples. Samples must be chilled during storage and shipment, and must not exceed 50°F (10°C) during the first 48 hours after collection. Samples stored in the laboratory must be held at or below 43°F (6°C) until extraction, but should not be frozen (USEPA Method 537 Rev. 1.1).

● - Prohibited ■ - Allowable ▲ - Needs Screening

If site-specific information is available, sampling should be conducted from the least to the most contaminated location. Additional guidance on the sampling sequence can be found in **Section 4.3.3** of the **General PFAS Sampling Guidance**.

Powderless nitrile gloves must be changed any time there is an opportunity for cross-contamination during sampling, including, but not limited to:

- Immediately prior to sample collection
- Each time sampling equipment is in contact with and removed from foam
- Placing sampling equipment into foam
- Handling of any sample, including quality assurance/quality control (QA/QC) samples
- After the handling of any nondedicated sampling equipment
- After contact with nondecontaminated surfaces
- After decontamination of sampling equipment
- When judged necessary by field personnel

NOTE: USEPA Method 537 was developed for the analysis of finished drinking water samples only. It was not designed to deal with sediments or other contaminants that could cause significant interferences to the method. Other analytical methods such as liquid chromatography with quadrupole mass spectrometry (LC/MS/MS) using the isotope dilution technique (also known as the “modified” 537 method), or ASTM D7968-14 (or D7968-17a) may be better at resolving interferences in samples. These methods are similar to USEPA Method 537 but can handle other matrices such as soil and sediments.

4.2 Sample Collection Methods

Samplers should collect enough surface water foam so that there is sufficient volume for PFAS analysis after the foam condenses over time into an aqueous phase. A volume between 20 to 50 milliliters (mL) of the liquid phase of the surface water foam sample is generally sufficient for PFAS analyses; however, this quantity should be confirmed with the selected laboratory.

Surface water foam can vary vastly in density. Keep in mind that lighter foam will result in less liquid volume (condensed foam). In Michigan to date, even though the same volume of foam was initially collected, the volume of resulting condensed foam has varied widely. Based on limited samples collected in Michigan, a wide range of condensed foam produced from similar foam volumes has been observed. Overall, the collection of foam in 2 large gallon-size Ziploc® bags, 6 quart-size Ziploc® bags, or 8 250 mL HDPE bottles has been found to produce enough volume of condensed foam needed for analysis.

Since boats may be made of various parts that may contain PFAS (especially protective water repellent coating), surface water foam samples collected on rivers should always be collected on the upstream side of the boat.

As of July 2019, there were very few methods to collect foam. This Foam Guidance will be updated as new methods are proven effective at gathering surface water foam samples.

Direct Scooping Methods

A. Surface Skimmer (modified pool skimmer)

● - Prohibited ■ - Allowable ▲ - Needs Screening

This method uses a standard pool skimmer modified with cheesecloth instead of regular netting, following the instructions in Appendix A. Staff may stand on the shore or in a boat, whichever is best suited for that particular occasion, and reach the skimmer out to collect the foam.

B. Hand Collection – Surface

Surface water foam samples have been successfully collected by hand from the waterbody while wearing appropriate gloves. Put on a fresh pair of powderless nitrile gloves and gently skim the foam into the appropriate container. Ziploc® bags are the preferred container, but HDPE bottles may be used. Caution should be taken to avoid inclusion of the surface microlayer (which is approximately the top 2 millimeters [mm] of the water) and the surface water, both of which would affect the results if included.

C. Hand Collection – Shoreline

For surface water foam that has blown inland on the shoreline, put on a fresh pair of powderless nitrile gloves and use your hands or use a piece of rigid, PFAS-free plastic sheet, and gently scoop the foam into the appropriate container. Ziploc® bags are the preferred container, but HDPE bottles may be used. Caution should be taken to avoid inclusion of the underlying sediment, which would affect the results.

D. Hand Collection – Other Foam (such as aqueous film-forming foam)

For other foams that occur without surface water present, put on a fresh pair of powderless nitrile gloves and use your hands or use a piece of rigid, PFAS-free plastic sheet, and gently scoop the foam into the appropriate containers. Ziploc® bags are the preferred container, but HDPE bottles may be used. Make sure that no dirt, plant materials, or other debris get collected along with the sample.

For all methods listed above, the liquid foam will ultimately need to be collected in a container. Collect the surface water foam sample in Ziploc® bags, preferably, or HDPE bottles if plastic bags are unable to be used. In order to obtain enough foam for a sample for PFAS analysis, collect foam in one of the following amounts:

- Two (2) gallon-size Ziploc® bags
- Six (6) quart-size Ziploc® bags
- Eight (8) 250 mL HDPE bottles verified PFAS-free

4.3 Sample Collection

The current array of foam collection methods mentioned in **Section 4.2** all include gathering the foam and then allowing it to collapse into a liquid for analysis. Use a method described in **Section 4.2**, then follow the steps below:

1. Bags or sample bottles should be labeled before sample collection following guidance in **Section 4.1**.
2. Wash hands thoroughly and put on a fresh pair of powderless nitrile gloves.
3. Collect the surface water foam sample according to one of the previously listed methods in **Section 4.2**.
4. Double-bag each bag or bottle that contains part of the foam sample.
5. Place the double-bagged sample containers on wet ice in a cooler for a period of up to 12 hours or until the surface water foam has condensed to

a liquid. Gently decant the condensed liquid to a new 250 mL HDPE lab supplied bottle.

6. Record the volume of fresh foam and approximate volume of liquid formed after the foam condenses. This information should be recorded and kept for reference to better understand the relationship between fresh and condensed foam.
7. Keep the decanted liquid sample bottle on wet ice and ship to the laboratory as soon as possible so lab staff can perform the necessary steps within the 14-day holding time beginning the date of sample collection.

5. Surface Water Sample Collection

When collecting a surface water foam sample, a sample of the surface water at that location should also be taken. Take the sample as close as and as safely as possible to the location of the foam. Follow the **EGLE Surface Water PFAS Sampling Guidance** for instructions on how to collect this sample.

6. Sample Shipment

The following procedures should be used for sample shipment:

- Samples must be chilled **during shipment** and must not exceed 50°F (10°C) during the first 48 hours after collection.
- Use wet ice that is double bagged using resealable bags (e.g., Ziploc®).
- Chain-of-Custody should be single-bagged in resealable bags (e.g., Ziploc®) and taped to the inside of the cooler lid.
- The cooler should be taped closed with a custody seal.
- Surface water foam samples should be shipped or driven to the laboratory as soon as possible (e.g., overnight) so the lab may perform the necessary steps within the 14-day holding time beginning the date of sample collection.

7. Equipment Decontamination After Sampling

It is customary to decontaminate surface water foam sampling equipment at the end of the sampling event, whether it is a single sampling location or the conclusion of the workday. This is to ensure sampling equipment is decontaminated ahead of time for the next sampling event.

- Do not put equipment away without decontaminating it.
- Do decontaminate sampling equipment after sampling at each location, or at the end of the work day. Follow the decontamination guidelines in **Section 3** of this Foam Guidance.

Appendix A: Visual Guide - Surface Water Foam Collection Using Cheesecloth

Equipment:

- Two personnel
- Modified pool skimmer
 - If one is not already made, you will need a standard pool skimmer and the following:
 - Drill
 - Four (4) wing nuts
 - Four (4) bolts
- Cheesecloth – 100% cotton, single use
 - You will need at least 4 yd² of cheesecloth for a single sampling event.
- Scissors or other cutting utensil for cutting the cheesecloth
- Nitrile gloves (multiple pairs)
- Collection containers. Use either:
 - Two (2) gallon-size Ziploc® bags
 - Six (6) quart-size Ziploc® bags
 - Eight (8) 250 mL HDPE bottles, verified PFAS-free
- One (1) HDPE bottle, verified PFAS-free, for collection of condensed foam
- You may also need waders, rubber boots, and/or a lifejacket or other personal flotation device



Procedures:

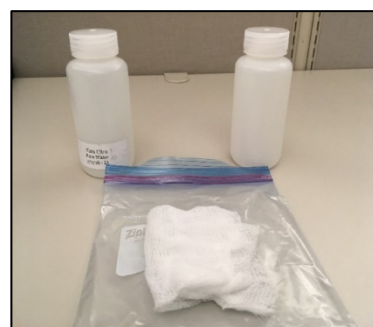
If you already have a modified pool skimmer, skip to the next section. To create a modified pool skimmer to collect surface water foam or other foam, follow these steps:

1. Take a standard pool skimmer and remove the regular netting.
2. Drill out four holes around the perimeter of the frame.
3. Replace the regular netting with cheesecloth wrapped three times around the head of the skimmer (front, back, front).
4. Place wing nuts and bolts in each hole. These will be used to secure the cheesecloth.



To collect a surface water foam sample, follow these recommended steps:

1. Before sample collection, thoroughly decontaminate all nondedicated equipment (i.e., the modified pool skimmer) with a mixture of PFAS-free water and Alconox® (or similar approved decontamination detergent) followed by a triple rinse with laboratory verified PFAS-free water.
2. Collect an equipment blank sample from the cheesecloth.
3. Take the modified pool skimmer and replace any current cheesecloth with fresh cheesecloth folded at least three times around the skimmer (front, back, front). Do this by pulling the cloth taut around the frame of the skimmer and securing it in place with the removable bolts.



4. Carefully collect a sample onto the surface of the pool skimmer. Staff may stand on the shore or in a boat, whichever is best suited for that particular occasion, and reach out to collect the surface water foam from:

- Locations where surface water foam has accumulated into piles on the shore, water surface, or in entrapment areas (fallen trees, rocks, etc.), slide the skimmer along the base of the foam and carefully lift the surface water foam from the underlying substrate.
- Locations where smaller quantities of surface water foam or slicks are present, partially submerge the skimmer under water to allow for the accumulation of foam onto the cheesecloth and carefully lift the skimmer and surface water foam from the underlying substrate.



5. With a fresh pair of powderless nitrile gloves, scoop the surface water foam from the skimmer and place into a new Ziploc® bag or 250 mL HDPE lab supplied bottle. The sample collection containers should be kept at a distance from the skimmer to avoid the possibility of inadvertently diluting the foam sample with surface water dripping from the cheesecloth and skimmer. Continue this process until the recommended volume of foam has been collected. Record the volume of fresh surface water foam upon collection.

NOTE: The cheesecloth should be changed before moving to the next sample location.

NOTE: When one Ziploc® bag or 250 mL HDPE lab supplied bottles is full, seal the bag or close the lid of the bottle and place it within a second Ziploc® bag.

Place all double-bagged surface water foam samples in a cooler on wet ice and allow it to condense in a liquid state (it could take up to 12 hours). Keep the samples chilled during this time. Once condensed, carefully pour the foam into new 250mL HDPE lab supplied bottles. You will only need one bottle for a single sample analysis. Record the approximate resulting volume of condensed surface water foam. If the sample appears to have solids or large organic debris, create a filter from a 4" x 8" section of new cheese cloth and fold it in half to form a 4" x 4" square, then filter the condensed surface water foam through.

NOTE: The filter will absorb some of your sample, so make sure you will still have enough for the needed sample.



6. Package and ship the samples following the **Foam Guidance** and **EGLE's PFAS General Sampling Guidance**.

EGLE PFAS SAMPLING QUICK REFERENCE FIELD GUIDE¹

All Items Used During Sampling Event

● Prohibited
<ul style="list-style-type: none"> ● Items or materials that contain fluoropolymers such as <ul style="list-style-type: none"> ○ Polytetrafluoroethylene (PTFE), that includes the trademarks Teflon® and Hostaflon® ○ Polyvinylidene fluoride (PVDF), that includes the trademark Kynar® ○ Polychlorotrifluoroethylene (PCTFE), that includes the trademark Neoflon® ○ Ethylene-tetrafluoro-ethylene (ETFE), that includes the trademark Tefzel® ○ Fluorinated ethylene propylene (FEP), that includes the trademarks Teflon® FEP and Hostaflon® FEP ● Items or materials that contain any other fluoropolymer

Pumps, Tubing, and Sampling Equipment

● Prohibited	■ Allowable	▲ Needs Screening ²
<ul style="list-style-type: none"> ● Items or materials containing any fluoropolymer (potential items include tubing, valves, or pipe thread seal tape) 	<ul style="list-style-type: none"> ● High-density polyethylene (HDPE) ● Low-density polyethylene (LDPE) tubing ● Polypropylene ● Silicone ● Stainless-steel ● Any items used to secure sampling bottles made from: <ul style="list-style-type: none"> ○ Natural rubber ○ Nylon (cable ties) ○ Uncoated metal springs ○ Polyethylene 	<ul style="list-style-type: none"> ● Any items or materials that will come into direct contact with the sample that have not been verified to be PFAS-free <ul style="list-style-type: none"> ○ Do not assume that any sampling items or materials are PFAS-free based on composition alone

Sample Storage and Preservation

● Prohibited	■ Allowable	▲ Needs Screening ²
<ul style="list-style-type: none"> ● Polytetrafluoroethylene (PTFE): Teflon® lined bottles or caps 	<ul style="list-style-type: none"> ● Glass jars⁴ ● Laboratory-provided PFAS-Free bottles: <ul style="list-style-type: none"> ○ HDPE or polypropylene ● Regular wet ice ● Thin HDPE sheeting ● LDPE resealable storage bags (i.e. Ziploc®) that will not contact the sample media⁶ 	<ul style="list-style-type: none"> ● Aluminium foil⁴ ● Chemical or blue ice⁵ ● Plastic storage bags other than those listed as ■ Allowable ● Low-density polyethylene (LDPE) bottles

Field Documentation

● Prohibited	■ Allowable	▲ Needs Screening ²
<ul style="list-style-type: none"> ● Clipboards coated with PFAS ● Notebooks made with PFAS treated paper ● PFAS treated loose paper ● PFAS treated adhesive paper products 	<ul style="list-style-type: none"> ● Loose paper (non-waterproof, non-recycled) ● Rite in the Rain® notebooks ● Aluminium, polypropylene, or Masonite field clipboards ● Ballpoint pens, pencils, and Fine or Ultra-Fine Point Sharpie® markers 	<ul style="list-style-type: none"> ● Plastic clipboards, binders, or spiral hard cover notebooks ● All markers not listed as ■ Allowable ● Post-It® Notes or other adhesive paper products ● Waterproof field books

Decontamination

● Prohibited	■ Allowable	▲ Needs Screening ²
<ul style="list-style-type: none"> ● Decon 90® ● PFAS treated paper towel 	<ul style="list-style-type: none"> ● Alconox®, Liquinox®, or Citranox® ● Triple rinse with PFAS-free deionized water ● Cotton cloth or untreated paper towel 	<ul style="list-style-type: none"> ● Municipal water ● Recycled paper towels or chemically treated paper towels

Clothing, Boots, Rain Gear, and PPE

● Prohibited	■ Allowable	▲ Needs Screening ²
<ul style="list-style-type: none"> • New or unwashed clothing • Anything made of or with: <ul style="list-style-type: none"> ○ Gore-Tex™ or other water-resistant synthetics • Anything applied with or recently washed with: <ul style="list-style-type: none"> ○ Fabric softeners ○ Fabric protectors, including UV protection ○ Insect resistant chemicals ○ Water, dirt, and/or stain resistant chemicals 	<ul style="list-style-type: none"> • Powderless nitrile gloves • Well-laundered synthetic or 100% cotton clothing, with most recent launderings not using fabric softeners • Made of or with: <ul style="list-style-type: none"> ○ Polyurethane ○ Polyvinyl chloride (PVC) ○ Wax coated fabrics ○ Rubber / Neoprene ○ Uncoated Tyvek® 	<ul style="list-style-type: none"> • Latex gloves • Water and/or dirt resistant leather gloves • Any special gloves required by a HASP • Tyvek® suits, clothing that contains Tyvek®, or coated Tyvek®

Food and Beverages

● Prohibited	■ Allowable
<ul style="list-style-type: none"> • No food should be consumed in the staging or sampling areas, including pre-packaged food or snacks. <ul style="list-style-type: none"> ■ If consuming food on-site becomes necessary, move to the staging area and remove PPE. After eating, wash hands thoroughly and put on new PPE. 	<ul style="list-style-type: none"> • Brought and consumed only outside the vicinity of the sampling area: <ul style="list-style-type: none"> ○ Bottled water ○ Hydration drinks (i.e. Gatorade®, Powerade®)

Personal Care Products (PCPs) - for day of sample collection⁶

● Prohibited	■ Allowable	▲ Needs Screening ²
<ul style="list-style-type: none"> • Any PCPs⁶, sunscreen, and insect repellent applied in the sampling area. 	<p>PCPs⁶, sunscreens, and insect repellents applied in the staging area, away from sampling bottles and equipment followed by thoroughly washing hands:</p> <p>PCPs⁶:</p> <ul style="list-style-type: none"> • Cosmetics, deodorants/antiperspirants, moisturizers, hand creams, and other PCPs⁶ <p>Sunscreens:</p> <ul style="list-style-type: none"> • 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 <p>Insect Repellents:</p> <ul style="list-style-type: none"> • OFF® Deep Woods • Sawyer® Permethrin 	<ul style="list-style-type: none"> • Products other than those listed as <ul style="list-style-type: none"> ■ Allowable

¹ This table is not considered to be a complete listing of prohibited or allowable materials. All materials should be evaluated prior to use during sampling. The manufacturers of various products should be contacted in order to determine if PFAS was used in the production of any particular product.

² Equipment blank samples should be taken to verify these products are PFAS-free prior to use during sampling.

³ **For surface water foam samples:** LDPE storage bags may be used in the sampling of foam on surface waters. In this instance, it is allowable for the LDPE bag to come into direct contact with the sample media.

⁴ **For fish and other wildlife samples:** Depending on the project objectives, glass jars and aluminum foil might be used for PFAS sampling. PFAS has been found to bind to glass and if the sample is stored in a glass jar, a rinse of the jar is required during the sample analysis. PFAS are sometimes used as a protective layer for some aluminum foils. An equipment blank sample should be collected prior to any aluminum foil use.

⁵ Regular ice is recommended as there are concerns that chemical and blue ice may not cool and maintain the sample at or below 42.8°F (6°C) (as determined by EPA 40 CFR 136 – NPDES) during collection and through transit to the laboratory.

⁶ Based on evidence, avoidance of PCPs is considered to be precautionary because none have been documented as having cross-contaminated samples due to their use. However, if used, application of PCPs must be done at the staging area and away from sampling bottles and equipment, and hands must be thoroughly washed after the use of any PCPs prior to sampling.