Division of Water Resources Survey of Per- and Polyfluoroalkyl Substances in Biosolids

NORTH CAROLINA
Department of Environmental Quality

Table of Contents

Survey of PFAS in Biosolids Overview 1

General Overview of PFAS Sampling Preparation 2

PFAS Sampling Supplies 5

Standard Operating Procedures: Wastewater Treatment Facilities 6

Standard Operating Procedures: Land Application Fields 9

Standard Operating Procedures: Sample Submission to GEL Laboratories LLC 13

Useful Resources 15

Survey of PFAS in Biosolids Overview

Recently there has been much discussion and media coverage about Per- and Polyfluoroalkyl substances (PFAS) in our environment. Per- and polyfluoroalkyl substances (PFAS) are a large and diverse group of man-made chemicals, which have been used globally for decades in a wide range of consumer and industrial products. Typical materials or processes that use or contain PFAS include firefighting foam, metal plating, pharmaceutical ingredients, cookware coatings, waterproofing on clothing and carpet, and even some food wrappers.

One of the goals identified in North Carolina Department of Environmental Quality's (NC DEQ) 2022-2024 Strategic Plan is protecting North Carolinians from exposures to PFAS using a transparent and science-based decision-making process. To accomplish this, NC DEQ is actively working to quantify and understand where PFAS are present, and who may be at risk for exposure. DEQ encourages permittees to monitor and voluntarily disclose PFAS information in their products and processes.

The intent of this letter is to provide a brief update on what is being done to measure and assess PFAS in biosolids, so that we can understand what risk, if any, may be associated with their disposal. PFAS are often referred to as "forever chemicals" because they do not break down easily and can accumulate and persist in the environment for a long time. Some PFAS, including perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) have been phased out of production in the United States and are no longer approved for use. Even though they have not been used for years, their presence remains. Both PFOA and PFOS have been found in biosolids along with many other types of PFAS.

Currently, the EPA is conducting a risk-based evaluation of PFAS in biosolids. This assessment is underway but will not be completed until the end of 2024. In the meantime, without federal regulation or guidance for PFAS-contaminated biosolids, it is currently up to individual states to determine best practices for managing wastewater residuals that may contain PFAS.

NC DEQ's Division of Water Resources Division has developed a strategy to work with Wastewater Treatment Plants (WWTPs) to identify PFAS concentrations in their waste streams and biosolids. As common sludge treatment processes do not reduce PFAS in sludge, these compounds may be present in both WWTP effluent flows and in biosolids. WWTPs do not generate PFAS chemicals, although they may receive discharges from certain industrial or commercial sources who have used PFAS.

This study will measure the PFAS passing through WWTPs and that remain in their biosolids. Land applied biosolids have the potential to impact the soil, water, and crops. NC DEQ is conducting this survey of WWTPs and land application fields for informational and research purposes only. The results of this survey do not have any regulatory bearings on the permits associated with these facilities, and no changes or limitations are being enforced at this time. All results of the sampling will be made available at the conclusion of the study.

More information about the work being done on PFAS in North Carolina is available on NC DEQ's Emerging Compounds website: https://deq.nc.gov/news/key-issues/emerging-compounds and is described in the North Carolina DEQ Action Strategy for PFAS, which can be accessed at: https://deq.nc.gov/genx/nc-deq-action-strategy-pfas/open.

General Overview of PFAS Sampling Preparation

This document serves as a general overview of how facilities and fields were selected, and how sample locations were determined.

Facility Selection:

The list of facilities was reviewed to determine if any facilities should be removed, or if facilities should added. This review should be based on the last 5 years of activity. Facilities were selected to provide the most valuable and representative data. Things to consider:

- Is the facility still in operation?
  One facility in WSRO was no longer in use and it had not land applied in 10+ yrs. The facility was still permitted because it had not been decommissioned yet.
- Is the facility still land applying?
  Several facilities in WSRO and FRO were dewatering and landfilling or composting biosolids. If this is the case, the biosolids could still be sampled. Depending on the length of time this has been occurring, the fields could be removed.
- What was the most recent activity?
  Was a facility added as a new source for a permit? Do they no longer use their own permit? Have land application practices changed? Will this impact potential sampling? Has the facility decreased influent flow volume?
- Is the facility part of a larger statewide permit?
  The fields associated with a statewide permit likely have multiple sources applied to a single field. Sampling fields associated with this permit would not provide valuable information about an individual facility, just cumulative loading of a field. But this is permit specific as there may be local fields where only a single facility is land applied.
- Is the facility a source for multiple permits?
  This could spread the biosolids across multiple permits and multiple fields. Land application would not be consistent, and fields could have multiple sources applied. But this will be facility/region specific and best professional judgement should be used.
- Is there a comingling of waste streams?
  Does one municipal WWTP send biosolids or influent to another plant? Are both WWTPs on the list? In WSRO, one WWTP sent their biosolids to the other WWTP to for final biosolids treatment.
- What is the flow and land application frequency?
  Facilities with low flows were removed as they may not have land application events frequently. In FRO, a small facility treating wastewater from a country club was removed as they had low flows and were a source for a larger statewide permit. This is facility/region specific and best professional judgement should be used.
- Water treatment plants were removed from the sampling list.
  Most WTPs clean out once every 5-10 years depending on activity. WTPs would not provide as much information as wastewater treatment plants, who land apply every year. But WTP activities are facility/region specific and best professional judgement should be used.

Field Selection:

Item I.13 in the Land Owner Agreements allows for access up to a year after a field is removed from a permit, and Permit Condition V.3 allows for access to the land application sites and WWTFs. Land Owner Agreements can be found in the most recent permit renewal. Ideally, the field that has been permitted the longest and received the most applications should be selected. Things to consider:

- How long has the field been permitted?
  When looking at fields, the first permit issued and the most recent Attachment B were compared. Fields permitted less than 10 years were removed. If no original fields are still in the permit, later Attachment B's were reviewed.
- How often was the field applied on?
  Annual Reports for the past 10 years were reviewed for application activities. Land applicators or facilities could also be consulted if they maintain cumulative loading records. Fields that were applied on every year were preferred.
- Have multiple sources been applied to a field?
  When looking at application records, keep in mind what sources are being applied. Some permits for municipalities will have multiple sources (multiple WWTPs or WTPs). Is there a field where only one source is applied? Are multiple sources applied at an even rate? Was WTP material applied? Fields that received WTP material were removed.
- When was the last application?
  Fields that have been applied on in the last two years, and frequently in the last 10 years, were preferred. If a field had consistent applications up to five years ago, it was removed from the list if there was a more ideal field.
- What is the soil type?
  Ideally, each field in a region should have a different, but representative, soil series if multiple fields are being sampled. Soil series can be found in the most recent Attachment B. FRO and WSRO selected fields with representative soil types for the region, and individual fields had different soil series.
- Defer to the land applicator for interacting with landowners. By signing the Land Owner Agreement, the State has authorization to enter the property and collect soil samples during the term of the LOA (based on the most recent permit or Attachment B) and twelve months after the termination of the Agreement:

> I.13: The landowner or his representative hereby authorizes the Permittee, local officials, and State officials or their representatives to; enter and inspect any property, premises, or place on or related to the land application site(s) at any reasonable time for the purpose of determining compliance with the permit; establish monitoring facilities on or near the land application site(s) as required by the permit; copy any records that must be kept under the terms and conditions of the permit; take necessary leachate, surface water, groundwater, or soil samples during the term of, and 12 months after termination of, this Agreement.

The land applicators interact with the landowners on a regular basis and can relay the information to the landowners in a way that is not alarming. A copy of the project summary and objectives (Survey of PFAS in Biosolids Overview) is provided on page 1. It may be helpful to print copies of this Overview to provide to owners, operators, and/or land applicators.

Sample Location Selection:

A reconnaissance visit was made to each facility to discuss sample locations. Influent and effluent locations were discussed, and the final biosolids product was observed. These visits also allow staff to determine what type of sample equipment is needed (dipper, extendable dipper, trowel, buckets). Staff can also discuss waste streams to determine where additional samples may be needed. For example, WSRO had a facility that makes dried pellets from biosolids from both WWTPs. At this facility, liquid biosolids will be collected from both WWTPs and the dried pellet.

Treatment Facilities:
Sample locations were selected based on where the facility collects samples for DMRs.

- Influent location could be from a composite sampler, pre- or -post screening, or after back wash enters the influent stream. This will be facility specific.
    - SAMPLE NAME: NC00XXXXX – INF – YYYYMMDD
- Effluent location could be from a composite sampler, pre- or post-dechlorination, or at the outfall. This will be facility specific.
    - SAMPLE NAME: NC00XXXXX – EFF – YYYYMMDD
- Biosolids samples will be collected as the final product before field application, distribution, or landfilling.
    - SAMPLE NAME: NC00XXXXX- BIOS -YYYYMMDD

Fields:
Sample location was selected based on the history of the field, management practices, and off-loading areas. Things to consider:

- Where is the original application area?
  Original application maps were pulled from old permits and compared to the most recent application map. As the area surrounding a field changes (new houses or other buildings) buffers may change. The original application area will have received the most applications.
- The lowest elevation in the application area should be selected.
  Previous studies collected soil samples at the lowest spot in a field because of the potential movement of PFAS with rainwater.
- Where are the staging or off-loading areas?
  Liquid biosolids will be off-loaded from tankers to spreaders, and cake biosolids will be stock piled and loaded onto spreaders. These areas may have higher concentrations of PFAS than the actual application fields, as a result they would not be representative of application fields. These areas will also be compacted, making soil sampling difficult. These areas should be avoided.
- SAMPLE NAME: NC00XXXXX – FIELD NUMBER – YYYYMMDD

PFAS Sampling Supplies

- Liquinox: https://www.grainger.com/product/ALCONOX-Detergent-1-qt-Size-42X015
  (1 qt should be enough, a little concentrated soap goes a long way)
- Sludge nabber: https://www.forestry-suppliers.com/p/53932/32280/sludge-nabber-sampler
- Brushes: https://www.amazon.com/Holikme-Cleaning-Set%EF%BC%8CLong-cup%EF%BC%8CPipes-cover%EF%BC%8CWhite/dp/B086D7SX8K/ref=sr_1_6?crid=3UDCLNT0GJBTP&keywords=polyethylene%2Bgong%2Bbrush&qid=1674593320&s=home-garden&sprefix=polyethylene%2Bgong%2Bbrush%2Cgarden%2C94&sr=1-6&th=1
  (these brushes or other known PFAS free brushes)
- Soil probe: https://www.forestry-suppliers.com/p/77654/31191/ams-soil-probes
- Stainless steel bucket: https://www.grainger.com/product/CONBAR-Pail-2-25-gal-3LDY3
  OR Stainless steel bowl: https://www.forestry-suppliers.com/p/78314/31391/stainless-steel-pan-bowls-spoon
- Stainless steel dipper (x2): https://www.forestry-suppliers.com/p/53895/47940/conbar-stainless-steel-dipper
- Stainless steel trowel: https://www.forestry-suppliers.com/p/77563/31361/ams-stainless-steel-scoops
- Fine or Ultra Fine sharpies (known PFAS free)
- 10 gallon Ziploc bags to cover large equipment (like soil probe and bucket/bowl)
- Gallon Ziploc bags to cover dippers and trowel
- Quart Ziploc bags for bottles
- Powderless nitrile gloves
- 10mL glass vials for PFAS liquid screening
  (these can be requested from GEL or glass VOC vials with no preservative can be used)
- 2 HDPE bottles to make hand wash soap and equipment wash soap

Standard Operating Procedures: Wastewater Treatment Facilities

General PFAS Sampling Notes:

PFAS analysis is very sensitive and can measure in the parts per trillion (ppt). Care should be taken when sampling to avoid cross contamination. PFAS can be found in common sampling equipment (tubing, plastic bottles, gloves). Only supplies provided by the WSS laboratory, a contract lab (*e.g.* GEL Laboratories) or demonstrated to be PFAS free should come into direct contact with samples.

Personal items can also contain PFAS including clothing with waterproof, Scotch Guard, or UV protective qualities. Personal care products like make-up, dental floss, and lotions may also contain PFAS. During sampling, staff should avoid wearing items which may contain PFAS products to reduce the risk of sample contamination.

NOTE: 5ml samples only need to be collected during the first round of sampling to establish baseline PFAS levels at locations within a given sampling site. Wastewater samples were collected near where WWTP staff collect samples for reporting on DMRs. Biosolid samples were collected as finished product to be land applied or distributed.

Sampling Materials:

1. Sampling apparati may vary between regions. Some common sampling devices include:
    a. Rigid cup dippers
    b. Dippers with bottle attachments
    c. Handheld scoops
    d. Extendable dippers
    e. Bridge Sampler
2. Portions of sampling equipment that come into contact with sample media (water, biosolids, *etc.*) must be decontaminated prior to daily sampling. Decontaminated dippers and scoops can be covered with Ziploc bags after decontamination.
3. It is recommended to sample in this order if dedicated equipment for each location is not available: effluent, influent, biosolids.

Prior to Sampling:

1. Decontaminate and collect an equipment blank for sampling equipment (see QAQC samples).
2. Prepare field sheets, COCs, and labels.
   Label guide: Use NPDES permit number to denote location with qualifiers as needed:
    - Trip Blank: NC00xxxx-TB
    - Field Blank: NC00xxxx-FRB
    - Influent: NC00xxxx-Inf
    - Effluent: NC00xxxx-Eff
    - Biosolids: NC00xxxx-Bios (will vary, see approved sampling plan)
3. Prepare sample bottles.
4. Pack cooler with wet ice.
5. Prepare trip blank before leaving office (see QAQC samples).

Wastewater Treatment Facility Sampling:

1. Collect a trip blank before leaving the office. *See QAQC Sample section.
2. Upon arrival at influent sample location wash hands and put on powderless nitrile gloves.
3. Collect Field Reagent Blank with bottles shipped from GEL. *See QAQC Sample section.
4. Change gloves.
5. Rinse first dipper/ dipper with bottle holder attachment 3 times in influent (pre-screening if possible).
6. Use dipper to collect 2x250mL and 1x5mL samples in GEL provided HPDE bottles and vial.
    a. Complete label before sampling.
    b. Do not set bottle lids on the ground.
    c. Place all bottles in one Ziploc bag.
7. Change gloves.
8. Rinse new dipper 3 times in effluent
9. Use dipper to collect 2x250mL and 1x5mL samples in GEL provided HPDE bottles and vial.
    a. Complete label before sampling.
    b. Do not set bottle lids on the ground.
    c. Place all bottles in one Ziploc bag.
10. Change gloves.
11. Use a metal scoop (hand-held or telescopic), dipper, or dipper with bottle holder attachment to collect 2x250mL samples of biosolids in GEL provided HPDE bottles.
    a. Complete label before sampling.
    b. Do not set bottle lids on the ground.
    c. Place all bottles in one Ziploc bag.
12. Place all Ziploc bags into a cooler lined with GEL provided bag and wet ice to travel back to the office.
13. Place completed COC in a Ziploc bag and place on top of samples or inside the lid of the cooler.
14. Use postage-paid address label (provided by GEL) to ship coolers via FedEx to GEL.

QAQC Samples

Equipment Blanks

Equipment blanks are required for all equipment that comes into contact with sample media (dippers, trowels, buckets).

1. Put on a pair of new nitrile gloves.
2. Use PFAS-free water to rinse all equipment that will be in direct contact with water and biosolids.
3. Rinse each piece of equipment separately into a stainless steel or known PFAS-free container.
4. Transfer rinsate into a labeled empty HDPE bottle before rinsing the next piece of equipment.
5. Place each bottle in an individual Ziploc bag.
6. Refrigerate samples until ready to ship.
7. Include Ziploc bags in a cooler with other GEL samples.

Trip Blanks

Trip blanks are required for each sampling trip. The trip blank is carried in the same cooler as the samples. The trip blank is prepared at the office before starting the day's field work.

1. Put on a pair of new nitrile gloves.
2. Pour PFAS free blank water from filled bottle into empty HDPE bottle and immediately cap. *NOTE: Hold or place empty HDPE bottle cap upside-down in Ziploc bag while pouring.*
3. Record time, date, and sampler name on trip blank label.
4. Place the trip blank in a Ziploc bag.
5. Place trip blank in cooler.
6. Store and ship trip blank with samples.
7. Maintain Chain of Custody.

Field Blanks

One field blank should be collected during *each* location on a given sampling trip. The field blank should be collected on site either prior to or after sample collection.

1. Put on a pair of new nitrile gloves.
2. Pour PFAS free blank water from filled bottle into empty HDPE bottle and immediately cap. *NOTE: Hold or place empty HDPE bottle cap upside-down in Ziploc bag while pouring.*
3. Record time, date, and sampler name on field blank label.
4. Place the field blank in a Ziploc bag.
5. Place field blank in cooler
6. Store and ship field blank with samples.
7. Maintain Chain of Custody.

Standard Operating Procedures: Land Application Fields

General PFAS Sampling Notes:

PFAS analysis is very sensitive and can measure in the parts per trillion (ppt). Care should be taken when sampling to avoid cross contamination. PFAS can be found in common sampling equipment (tubing, plastic bottles, gloves). Only supplies provided by the WSS laboratory, a contract lab (*e.g.* GEL Laboratories) or demonstrated to be PFAS free should come into direct contact with samples.

Personal items can also contain PFAS including clothing with waterproof, Scotch Guard, or UV protective qualities. Personal care products like make-up, dental floss, and lotions may also contain PFAS. During sampling, staff should avoid wearing items which may contain PFAS products to reduce the risk of sample contamination.

Background:

Biosolids are often land applied to agricultural fields at agronomic rates as soil amendments or fertilizers. Land application can include surface application, incorporation, or injection. Preliminary research shows that perfluorochemicals accumulate in surface horizons but have been found in deeper horizons. Additional research needs to be completed to understand how perfluorochemicals interact with soil texture, organic matter, moisture content, landscape position, and other soil properties.

Field Selection:

Field selection is based on a combination of length of time in a land application program and frequency of land application activities. Fields with a long history of land application from an individual facility and minimal interference from other residual sources (e.g., WTPs or field transfers) are preferred. Select a single field for each biosolids generating facility being sampled. If possible, select fields with differing soil series in each region. Soil series designation for each field is based on the predominant soil series in that field and can be found in the most recent Attachment B for each land application permit. Land applicators should be consulted to determine areas of a field to avoid, for example loading/staging areas, newly buffered areas, newly cleared areas, or where buildings were previously located. Original application maps can also be consulted, if available. Drone mapping or topographic maps can be used to determine the lowest elevation of each field. A rough acre (200ftx200ft) can be measured using Field Maps, a range finder, or measuring tape and each corner marked. Field Maps, Google Maps, or Google Earth can be used to confirm visually that the acre is in the application area.

Sampling Overview:

Use preferred method to flag the corners of an acre (200ftx200ft). Collect soil cores from 0-6” in a zig zag pattern (see attachment A) across the acre using a decontaminated soil probe. Clear the grounds surface with a gloved hand before sampling. Collect approximately 10-15 cores, or enough cores to fill two 250mL bottles. Mix the soil cores in a stainless steel bucket. During this process remove rocks, crop stubble, and other organic matter.

Sampling Materials:

1. Sampling equipment includes, but is not limited to:
    a. Stainless steel sampling probe
    b. Stainless steel trowel
    c. Stainless steel bucket or bowl
    d. Fine Tip or Ultra Fine Tip Sharpie.
    e. Powderless Nitrile Gloves
    f. Ziploc Bags
2. Portions of sampling equipment that comes into contact with soil samples must be decontaminated prior to daily sampling.

Prior to Sampling:

1. Decontaminate and collect equipment blank for sampling equipment (see QAQC Sample Section). Ziploc bags can be used to cover decontaminated sample equipment.
2. Prepare fields sheets, COCs, and labels.
    a. Label Guide: Use NPDES permit number to denote location with qualifiers as needed:
        i. Trip Blank: NC00XXXXX – TB – YYYYMMDD
        ii. Field Blank: NC00XXXXX – FRB – YYYYMMDD
        iii. Soil Sample: NC00XXXXX – FIELD NAME – YYYYMMDD

    *Note: The FIELD NAME should match the WQ00XXXXX permit
3. Prepare sample bottles.
4. Pack cooler with wet ice.
5. Prepare trip blank before leaving office (see QAQC Sample Section).

Soil Sampling:

1. Collect a trip blank before leaving the office (see QAQC Sample Section).
2. Upon arrival at field wash hands and put on powderless nitrile gloves.
3. Collect Field Reagent Blank with bottles shipped from GEL (see QAQC Sample Section).
4. Change gloves.
5. Use decontaminated soil probe to collect 10-15, or more, 0-6” cores in selected area of field.
    a. An Ultra Fine Tip or Fine Tip Sharpie can be used to mark 0-6” on the soil probe, or a deeper soil core can be pulled and only 0-6” can be collected.
    b. A zig-zag method can be used to cross the acre and collect cores.
    c. Empty probe into stainless steel bucket after each core.
    d. Avoid areas that appear to have obvious disturbances (e.g. stormwater deposition from upslope or fill material) or appear to be a different soil series (e.g. different vegetation or surface colors if visible)
    e. Thoroughly mix soil cores with a gloved hand or stainless steel trowel.
    f. If sampling in a grassed field, be sure to remove vegetation from the composite sample. If sampling in a row crop field, be sure to remove any crop stubble. Remove any large rocks.
6. Fill 2x250mL GEL provided HPDE bottles.
    a. Complete label before sampling.

   b. Do not set bottle lids on the ground.
   c. Place both bottles in one Ziploc bag.
7. Place Ziploc bag into a cooler lined with a GEL provided bag and wet ice to travel back to the office.
8. Place completed COC in a Ziploc bag and place on top of samples or inside the lid of the cooler.
9. Use postage-paid address label (provided by GEL) to ship cooler via FedEx to GEL.

QAQC Samples

Equipment Blanks
Equipment blanks are required for all equipment that comes into contact with sample media (soil probe, trowel, or bucket).

1. Put on a new pair of nitrile gloves.
2. Use PFAS-free water to rinse all equipment that will be in direct contact with soil.
3. Rinse each piece of equipment separately into a stainless steel or known PFAS-free container.
4. Transfer rinsate into a labeled empty HDPE bottle before rinsing the next piece of equipment.
5. Place each bottle in an individual Ziploc bag.
6. Refrigerate samples until ready to ship.
7. Include Ziploc bags in a cooler with other GEL samples.
8. Maintain Chain of Custody.

Trip Blanks
Trip blanks are required for each sampling trip. The trip blank is carried in the same cooler as the samples. The trip blank is prepared at the office before starting the day's field work.

1. Put on a new pair of nitrile gloves.
2. Pour PFAS-free blank water from filled bottle into empty HDPE bottle and immediately cap. *NOTE: Hold or place empty HDPE bottle cap upside-down in Ziploc bag while pouring.*
3. Record time, date, and sampler name on trip blank label.
4. Place the trip blank in a Ziploc bag.
5. Place trip blank in cooler.
6. Store and ship trip blank with samples.
7. Maintain Chain of Custody.

Field Blanks
One field blank should be collected at *each* location on a given sampling trip. The field blank should be collected on site either prior to or after sample collection.

1. Put on a pair of new nitrile gloves.
2. Pour PFAS free blank water from filled bottle into empty HDPE bottle and immediately cap. *NOTE: Hold or place empty HDPE bottle cap upside-down in Ziploc bag while pouring.*
3. Record time, date, and sampler name on field blank label.
4. Place the field blank in a Ziploc bag.
5. Place field blank in cooler
6. Store and ship field blank with samples.
7. Maintain Chain of Custody.

Attachment A:

Traditional sampling strategy

When a 5- to 15-acre field of similar soil type will be managed uniformly, collect a soil sample of 15 to 20 cores using a zigzag pattern (Figure 2A). This approach will help ensure that overall field conditions and variability are taken into account. It is best to divide fields greater than 15 acres into smaller units (about 5 acres) until variability is known.

In any sampling, avoid small areas that differ markedly from the rest of the field—wet spots, severely eroded areas, old building sites, fence rows, spoil banks, burn row areas, old woodpile or fire sites and fertilizer application bands. Cores from such nonrepresentative areas can bias evaluations of a field's nutrient-supplying capacity.

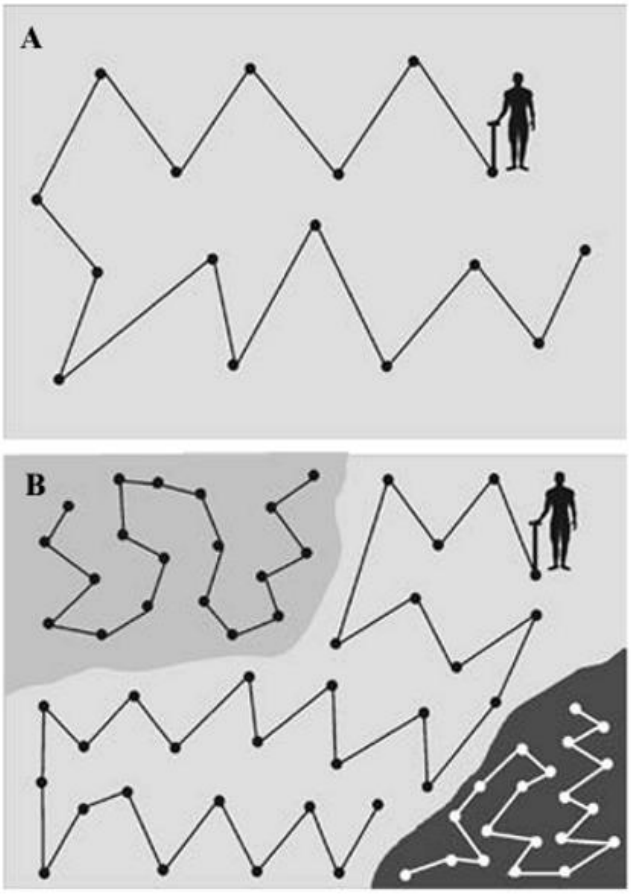

Figure 2. Sampling strategies. **A)** Use a zigzag pattern to collect cores randomly from a field with uniform soil. **B)** Subdivide fields that have distinct zones (soil type, cropping history, etc.) if it is feasible to lime and fertilize each area separately.

Excerpts from North Carolina Department of Agricultre and Consumer Services. (2014). Soil Sampling Large Areas: Agricultral Crops, Pastures, Parks or Athletic Turf [Brochure].

Standard Operating Procedures: Sample Submission to GEL Laboratories LLC

GEL Contact: Delaney Stonesmith, Project Manager
843-852-5814, Delaney.Stone@gel.com

Shipping Address:
Delaney Stone
2040 Savage Road
Charleston, SC 29407

Hold times for PFAS Samples: 14 days from collection to extraction

Find more sample packing guidance and digital Chain of Custody (COC) forms here:
https://www.gel.com/laboratories/resources

1. Supply requests to GEL should occur at least 1 week before supplies are needed.
   NOTE: Request FedEx return shipping labels from GEL if they are not present in your supply delivery.
2. Ensure COC (see attached example) is completed properly including:
   a. Correct sample IDs
   b. Collector
   c. Analyses requested (match attached COC or write "Expanded PFAS Analyses")
   d. Number of bottles per sample
   e. Project name
   f. Relinquish samples
   g. If using Trizma, place asterisk in sample analysis column and "* = Trizma" in code description box
3. Review sample labels on bottles for accuracy.
4. Line cooler with plastic trash bag before filling cooler with ice.
5. Load samples in cooler.
   a. All PFAS samples should be bagged
   b. Wrap glass vials in bubble wrap
6. Scan COC form before placing in a resealable bag. Place COC bag on top of samples or affix to underside of cooler lid.
8. Close cooler lid, tape securely, and affix shipping label.
9. Drop off coolers at at FedEx location or schedule pick-up by calling FedEx at 1.800.463.3339.
   NOTE: You do not need a FedEx account, just the tracking number on the return label.
10. Invoices will arrive by email from Stephanie Zorio (Stephanie.Zorio@ncdenr.gov) or GEL.
11. Review invoices for accuracy and froward to your supervisor, Julie Grzyb (julie.grzyb@ncdenr.gov), Poonam Giri (Poonam.Giri@ncdenr.gov), Kathy Bullock (Katherine.Bullock@ncdenr.gov) and Teresa Revis (Teresa.Revis@ncdenr.gov)

Page: _____ of _____
Project # _____
GEL Quote #: _____
COC Number (1): _____
PO Number:

Chain of Custody and Analytical Request

GEL Work Order Number: ***GEL Project Manager:***

GEL Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: NC Dept of Environmental Quality — Phone # 910-433-3300
Project/Site Name: PFAS Analysis — Fax # 910-485-7467
Address: 225 Green St. Suite 714 Fayetteville NC 28301
Collected By: STEPHANIE ZORIO — Send Results To: ON FILE

Sample Analysis Requested (5) (Fill in the number of containers for each test)

Sample ID ** For composites - indicate start and stop date/time*	*Date Collected (mm-dd-yy)	*Time Collected (Military) (hhmm)	QC Code (2)	Field Filtered (3)	Sample Matrix (4)	Should this sample be considered: Radioactive (If yes, please supply isotopic info.)	Should this sample be considered: (7) Known or possible Hazards	Total number of containers	EPA 537 mod PFC by LCMS, Table 3	<-- Preservative Type (6)	Comments Note: extra sample is required for sample specific QC
NC0023957-TB-20230329	3/29/2023	9:33	TB	N	W			1	1		
NC0023957-FRB-20230329	3/29/2023	10:08	TB	N	W			1	1		
NC0023957-INF-20230329	3/29/2023	10:32	G	N	WW			3	3		Vial inc for screeny
NC0023957-EFF-20230329	3/29/2023	10:22	G	N	WW			3	3		Vial inc for screeny
NC0023957-BIOS-20230329	3/29/2023	10:45	G	N	SL			2	2		
NC0023957-CU501M-20230329	3/29/2023	13:02	G	N	SO			2	2		
NC0050105-FRB-20230329	3/29/2023	11:18	TB	N	W			1	1		
NC0050105-INF-20230329	3/29/2023	11:32	G	N	WW			3	3		Vial inc for screeny
NC0050105-EFF-20230329	3/29/2023	11:21	G	N	WW			3	3		Vial inc for screeny
NC0050105-BIOS-20230329	3/29/2023	11:45	G	N	SL			2	2		

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1	3/29/23	14:30	1		
2			2		
3			3		

TAT Requested: Normal: x Rush: _____ Specify: _____ (Subject to Surcharge)

Fax Results: [ ] Yes [x] No

Select Deliverable: [x] C of A [ ] QC Summary [ ] level 1 [ ] Level 2 [ ] Level 3 [ ] Level 4

Additional Remarks:

For Lab Receiving Use Only: *Custody Seal Intact?* [ ] *Yes* [ ] *No* ***Cooler Temp:*** _____ °C

> For sample shipping and delivery details, see Sample Receipt & Review form (SRR.)

Sample Collection Time Zone: [ ] Eastern [ ] Pacific [ ] Central [ ] Mountain [ ] Other:

1.) Chain of Custody Number = Client Determined

2.) QC Codes: **N** = Normal Sample, **TB** = Trip Blank, **FD** = Field Duplicate, **EB** = Equipment Blank, **MS** = Matrix Spike Sample, **MSD** = Matrix Spike Duplicate Sample, **G** = Grab, **C** = Composite

3.) Field Filtered: For liquid matrices, indicate with a - **Y** - for yes the sample was field filtered or - **N** - for sample was not field filtered.

4.) Matrix Codes: **DW**=Drinking Water, **GW**=Groundwater, **SW**=Surface Water, **WW**=Waste Water, **W**=Water, **ML**=Misc Liquid, **SO**=Soil, **SD**=Sediment, **SL**=Sludge, **SS**=Solid Waste, **O**=Oil, **F**=Filter, **P**=Wipe, **U**=Urine, **F**=Fecal, **N**=Nasal

5.) Sample Analysis Requested: Analytical method requested (i.e. **8260B**, **6010B/7470A**) and number of containers provided for each (i.e. *8260B* - **3**, *6010B/7470A* - **1**).

6.) Preservative Type: **HA** = Hydrochloric Acid, **NI** = Nitric Acid, **SH** = Sodium Hydroxide, **SA** = Sulfuric Acid, **AA** = Ascorbic Acid, **HX** = Hexane, **ST** = Sodium Thiosulfate, If no preservative is added = leave field blank

7.) **KNOWN OR POSSIBLE HAZARDS**

RCRA Metals
As = Arsenic **Hg**= Mercury
Ba = Barium **Se**= Selenium
Cd = Cadmium **Ag**= Silver
Cr = Chromium **MR**= Misc. RCRA metals
Pb = Lead

Characteristic Hazards
FL = Flammable/Ignitable
CO = Corrosive
RE = Reactive

TSCA Regulated
PCB = Polychlorinated biphenyls

Listed Waste
LW= Listed Waste
(F,K,P and U-listed wastes.)
Waste code(s):

Other
OT= Other / Unknown
(i.e.: High/low pH, asbestos, beryllium, irritants, other misc. health hazards, etc.)
Description:

Please provide any additional details below regarding handling and/or disposal concerns. *(i.e.: Origin of sample(s), type of site collected from, odd matrices, etc.)*

AA

Useful Resources

Michigan Department of Environmental Quality (2018). *General PFAS Sampling Guidance*: https://www.michigan.gov/-/media/Project/Websites/pfasresponse/documents/Testing/Sampling-Guidance/General.pdf?rev=fb2d062295574101a931275c995fb75a

Michigan Department of Environmental Quality (2018). *Wastewater PFAS Sampling Guidance*: https://www.michigan.gov/pfasresponse/-/media/Project/Websites/PFAS-Response/Sampling-Guidance/Wastewater.pdf?rev=b117222a4819402f91645bbda257830a

Michigan Department of Environmental Quality (2022). Biosolids and Sludge PFAS Sampling Guidance: https://www.michigan.gov/pfasresponse/-/media/Project/Websites/PFAS-Response/Sampling-Guidance/Biosolids.pdf?rev=bcd20d5d65434b02b81123181aab4d6e

Michigan Department of Environmental Quality (2018). *Soil PFAS Sampling Guidance*: https://www.michigan.gov/pfasresponse/-/media/Project/Websites/PFAS-Response/Sampling-Guidance/Soil.pdf?rev=384fca222a814ae8aad696be36e7be3f

State of Michigan. (2023). PFAS Sampling Guidance. Michigan PFAS Action Response Team. https://www.michigan.gov/pfasresponse/investigations/sampling-guidance

New Hampshire Department of Environmental Services (2023) Biosolids. https://www.des.nh.gov/land/biosolids

History and Use of Per- and Polyfluoroalkyl Substances (PFAS). (2020). Interstate Technology Regulatory Council. https://pfas1.itrcweb.org/fact_sheets_page/PFAS_Fact_Sheet_History_and_Use_April2020.pdf