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October 9, 2023

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Program Management, 12th Floor
625 Broadway
Albany, New York 12233-7012

Attention: Justin Starr

Subject: **RI FAP Addendum 2 for the Irvington Rugs and Cleaners Site**
Site (Site 360175)
Work Assignment # D009809-28
MACTEC Engineering and Geology, P.C., Project # 3616216144

Dear Mr. Starr,

MACTEC Engineering and Geology, P.C. (MACTEC) is submitting this Field Activities Plan (FAP) Addendum 2 for the Irvington Rugs and Cleaners Site (Site) (WA Issuance D009809-28). The original Remedial Investigation/Feasibility Study (RI/FS) FAP was issued in March 2022 (MACTEC, 2022).

Per-and polyfluoroalkyl substances (PFAS) have been detected in groundwater at and downgradient of the Irvington Rugs and Cleaners Site, in Irvington, NY (New York State Department of Environmental Conservation [NYSDEC] Site Number 360175) at concentrations above groundwater standards. The highest concentrations of PFAS were detected in groundwater below the site, with lesser concentrations downgradient. In addition, surface and shallow sub-surface soil sampling in the vicinity of the rear of the Site building (i.e., vicinity of the loading door) indicated PFAS in soil at concentrations above New York State guidance values; however, this contamination has not been delineated vertically or horizontally. As a result, soil sampling is being conducted to better delineate the vertical (i.e., above water table, anticipated to be six to eight feet below ground surface (bgs) and aerial extent of PFAS near the site at concentrations above New York State guidance values.

The field activities plan (FAP)/scope of work for soil sampling to be conducted at Irvington Rugs and Cleaners is described in the paragraphs below. Additional information, including the Site Specific Health and Safety Plan is included in the original Site FAP (MACTEC, 2022).

Soil samples will be collected for analysis of PFAS from nine locations, SB-1A to SB-4A, and SB-5 to SB-9, using direct push drilling methods at seven locations and hand tooling at two surface soil locations. Eight of the locations are within the driveway on the north side of 49 and 53 Main Street and in the fenced in back yard of 49 Main Street. The ninth location is a background location on North Ecker Street. Locations SB-1A o SB-4A will be in close proximity to SB-1 to SB-4 that were drilled in September 2022. The proposed locations on and adjacent to the Site are shown on Figure 1; the proposed sample and analytical program is included in Table 1. Samples will be collected following the Standard Operating Procedure (SOP) S6 - PFAS protocols, SOP S13 - Soil Sampling and SOP S17 - Direct Push Sampling from the MACTEC Program Quality Assurance Plan and Program Field Activities Plan (MACTEC, 2020), and included in Attachment 1. Soil samples collected from each boring will be described on the soil boring field data record included in SOP S6.

At each direct push boring location, soil will be collected using an acetate tube (locations in the fenced in yard will be completed with a handcart probe). At the hand tooling locations soil will be collected using a combination of stainless-steel spoon, hand auger, and/or slide hammer. Samples at the surface will be collected below the grass or organic surface matter. Soil samples will be collected at each boring from the following depths:

a) Five direct push borings: SB-1A to SB-4A, and SB-5 with samples from:
    i. 0-1 feet (ft)
    ii. 2-3 ft
    iii. 5-6 ft

b) Two direct push borings: SB-6 and SB-8 with samples from:
    i. 0-0.2 ft
    ii. 0.2-1 ft
    iii. 1-2 ft
    iv. 2-3 ft
    v. 5-6 ft

c) Surface soil samples at background location and additional backyard location: SB-7 and SB-9 with samples from:
    i. 0-0.2 ft
    ii. 1-2 ft

At locations designated in Table 1, the homogenized soil will be split into separate containers for quality control samples, including duplicate, laboratory matrix spike and matrix spike duplicate.

Once sampling has been completed, remaining soil will be placed back in the borings in the approximate order from which it was retrieved. Remaining space will be filled with sand and toped with in kind material (i.e., topsoil that was removed prior to sampling for backyard locations and cold patch for asphalt locations).

Sampling tools will be decontaminated with deionized water and Alconox and dried after each sample is collected. Decontamination fluids will be released to the ground surface in the vicinity of the soil borings.

Sample bottles will be labeled with the sample ID, date, and type of analysis. Sample IDs will consist of the NYSDEC Site Number, following by the boring ID, followed by the top sample depth in feet. Example 360175-SB005-0. Quality control samples will have the following at the end of the sample ID: “D” for duplicate; “MS” for Matrix Spike, and “MD” for matrix spike duplicate (see Table 1 for sample IDs).

Samples will be shipped by overnight FedEx to Eurofins Laboratory in Lancaster, PA under chain of custody for analysis of PFAS using methodologies based on United States Environmental Protection Agency Method 1633 with the analyte list as specified in the NYSDEC April 2023 “Sampling, Analysis, and Assessment of PFAS” guidance. The “MS” and “MD” samples will also be noted in the “comment” section of the laboratory chain of custody. Laboratory deliverables will include Category B deliverables.

The SOPs listed previously can be found in the MACTEC Quality Assurance Program Plan (MACTEC, 2020). Other field work protocols, including handling investigation derived waste and health and safety can be found in the original FAP (MACTEC, 2022).

Results of the soil sampling will be incorporated into the RI report.

Please let us know if you have any questions or need any additional information.

Sincerely,
MACTEC Engineering and Geology, P.C.

Charles Staples, P.G.
Project Manager

Amberlee Clark
Technical Reviewer

Enclosures:
Figure 1 – PFAS Proposed Sample Locations
Table 1: Proposed Sampling and Analytical Program
Attachment 1: Standard Operating Procedures

References:

MACTEC Engineering and Geology, PC, 2022. Field Activities Plan, Remedial Investigation/Feasibility Study, Irvington Rugs and Cleaners. March 2022.

MACTEC, 2020. *Quality Assurance Program Plan and Program Field Activities Plan*. Prepared for the New York State Department of Environmental Conservation, Albany, New York. April 2020.

TABLES

Table 1: Proposed Sampling and Analytical Program

Site Type	Media	Property Location	Sample Location Description	Location ID	Sampling Interval (feet BGS)	Sample ID	PFAS Method 1633
Exterior Soil Sampling							
GeoProbe	Soil	53 Main	Driveway	SB-1A	0-1	360175-SB-1A-0	1
GeoProbe	Soil	53 Main	Driveway	SB-1A	2-3	360175-SB-1A-2	1
GeoProbe	Soil	53 Main	Driveway	SB-1A	5-6	360175-SB-1A-5	1
GeoProbe	Soil	49 Main	Driveway	SB-2A	0-1	360175-SB-2A-0	1
GeoProbe	Soil	49 Main	Driveway	SB-2A	2-3	360175-SB-2A-2	1
GeoProbe	Soil	49 Main	Backyard	SB-2A	5-6	360175-SB-2A-5	1
GeoProbe	Soil	53 Main	Backyard	SB-3A	0-1	360175-SB-3A-0	1
						360175-SB-3A-0-D	1
GeoProbe	Soil	53 Main	Backyard	SB-3A	2-3	360175-SB-3A-2	1
GeoProbe	Soil	53 Main	Backyard	SB-3A	5-6	360175-SB-3A-5	1
GeoProbe	Soil	49 Main	Backyard	SB-4A	0-1	360175-SB-4A-0	1
GeoProbe	Soil	49 Main	Backyard	SB-4A	2-3	360175-SB-4A-2	1
GeoProbe	Soil	49 Main	Backyard	SB-4A	5-6	360175-SB-4A-5	1
GeoProbe	Soil	49 Main	Driveway	SB-5	0-1	360175-SB-5-0	1
						360175-SB-5-0-D	1
						360175-SB-5-0-MS	1
						360175-SB-5-0-MD	1
GeoProbe	Soil	49 Main	Driveway	SB-5	2-3	360175-SB-5-2	1
GeoProbe	Soil	49 Main	Driveway	SB-5	5-6	360175-SB-5-5	1
GeoProbe	Soil	49 Main	Backyard	SB-6	0-0.2	360175-SB-6-0	1
GeoProbe	Soil	49 Main	Backyard	SB-6	0.2-1	360175-SB-6-0.2	1
GeoProbe	Soil	49 Main	Backyard	SB-6	1-2	360175-SB-6-1	1
GeoProbe	Soil	49 Main	Backyard	SB-6	2-3	360175-SB-6-2	1
GeoProbe	Soil	49 Main	Backyard	SB-6	5-6	360175-SB-6-5	1
GeoProbe	Soil	49 Main	Backyard	SB-7	0-0.2	360175-SB-7-0	1
						360175-SB-7-0-MS	1
						360175-SB-7-0-MD	1
GeoProbe	Soil	49 Main	Backyard	SB-7	1-2	360175-SB-7-1	1
GeoProbe	Soil	49 Main	Backyard	SB-8	0-0.2	360175-SB-8-0	1
GeoProbe	Soil	49 Main	Backyard	SB-8	0.2-1	360175-SB-8-0.2	1
GeoProbe	Soil	49 Main	Backyard	SB-8	1-2	360175-SB-8-1	1
GeoProbe	Soil	49 Main	Backyard	SB-8	2-3	360175-SB-8-2	1
GeoProbe	Soil	49 Main	Backyard	SB-8	5-6	360175-SB-8-5	1
Hand Auger	Soil	71 Main	Grass Shoulder	SB-9	0-0.2	360175-SB-9-0	1
Hand Auger	Soil	71 Main	Grass Shoulder	SB-9	1-2	360175-SB-9-2	1
TOTAL SAMPLES							35

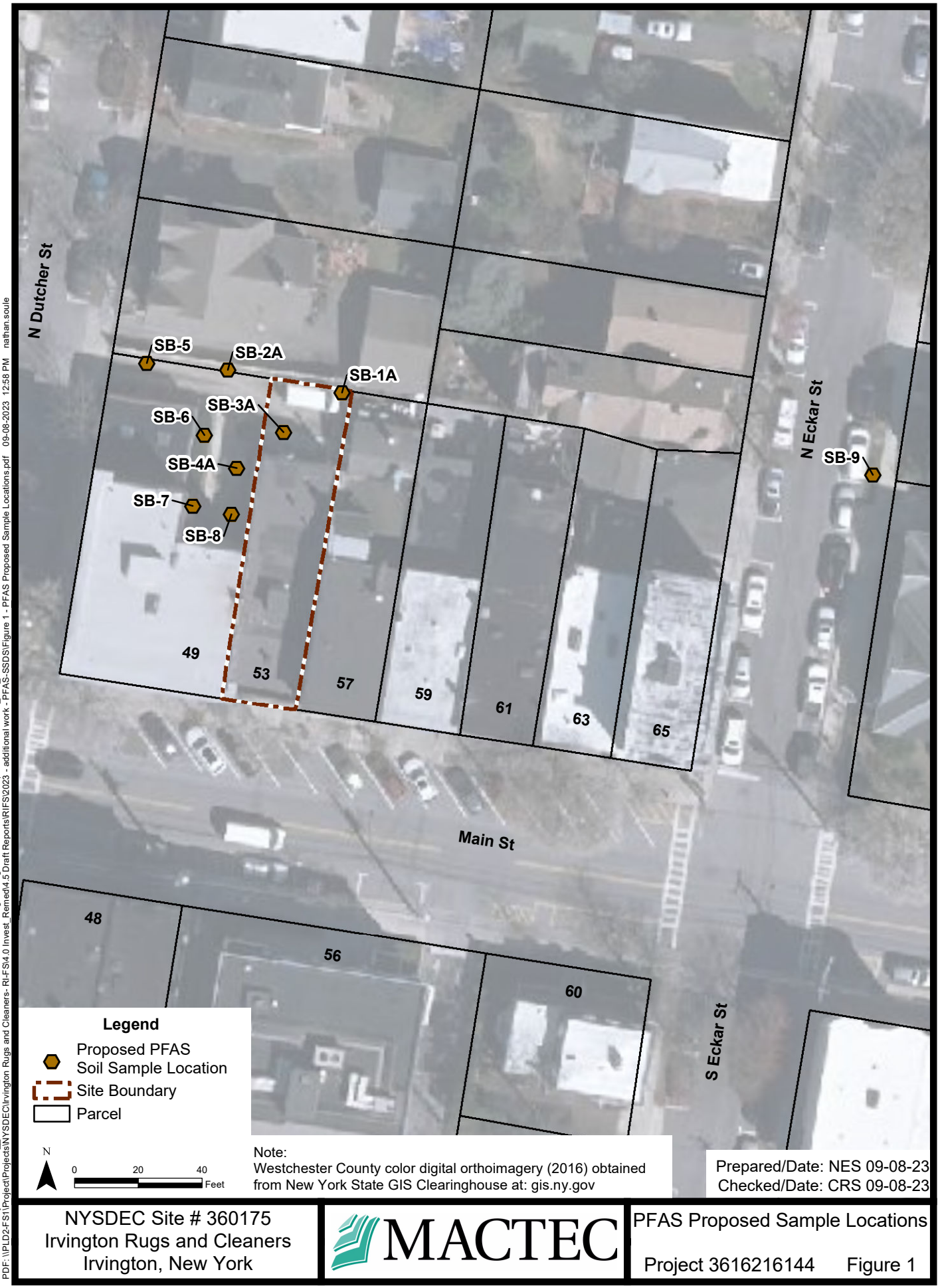
NOTES:

BGS = below ground surface

Sample ID: 360175 = NYSDEC Site No.; followed by location ID and sample depth (top of interval).

Field Quality Control samples (duplicates, matrix spike, matrix spiked duplicates) will be collected at a frequency of 5% (1:20 samples) and are indicated by a letter at the end of the sample ID (D, MS, MD)

FIGURES



Note:
Westchester County color digital orthoimagery (2016) obtained from New York State GIS Clearinghouse at: gis.ny.gov

Prepared/Date: NES 09-08-23
Checked/Date: CRS 09-08-23

NYSDEC Site # 360175
Irvington Rugs and Cleaners
Irvington, New York

MACTEC

PFAS Proposed Sample Locations

Project 3616216144 Figure 1

Document: P:\Projects\NYSDEC\... General NYSDEC Information D009809\Database\GIS\Irvington Rugs and Cleaners GIS\MapDocuments\PFAS_Soil_8.5x11P.mxd
PDF: \\PLD2-FS1\Project\Projects\NYSDEC\Irvington Rugs and Cleaners- RI-FS\4.0 Invest_Remed\4.5 Draft Reports\RIFS\2023 - additional work - PFAS-SSDS\Figure 1 - PFAS Proposed Sample Locations.pdf 09-08-2023 12:58 PM nathan.soule

ATTACHMENT 1

STANDARD OPERATING PROCEDURES

SOP # S6

MACTEC STANDARD OPERATING PROCEDURE #S6

PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) FIELD SAMPLING PROTOCOLS

April 20, 2020

New York State Department of Environmental Conservation

Program QAPP – D009809

Revision 0

APPROVED:

Charles R Staples

April 27,2020

Charles Staples, PG, Program Technical Lead — Date

Reviewed — Date

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PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) FIELD SAMPLING PROTOCOLS

1.0 PURPOSE

The purpose of this SOP is to describe the procedures/considerations when collecting soil, sediment, surface water, and groundwater samples for per- and polyfluoroalkyl substances (PFAS) characterization at a site. This SOP also describes a tiered approach that should be used to assist with field decisions. Sampling specific SOPs should also be reviewed prior to conducting field sampling activities for PFAS characterization.

This procedure applies to all MACTEC personnel and subcontractors who collect or otherwise handle samples of soil, sediment, surface water, and groundwater for analysis of PFAS. This SOP should be reviewed by all on-site personnel prior to implementation of field activities.

This procedure is not intended to obviate the need for professional judgment to accommodate unforeseen circumstances. Deviation from this procedure must be approved by the project manager and documented in the field log book and field forms.

Procedures and protocols in this SOP and the Program QAPP have been designed to comply with NYSDEC PFAS Sampling Guidelines (NYSDEC, 2020) (**Attached**).

2.0 REFERENCES

NYSDEC, 2020. Guidelines for Sampling and Analysis of PFAS Under NYSDEC's Part 375 Remedial Programs. January 2020.

3.0 PROCEDURES

Given the low detection limits associated with laboratory PFAS analysis, and the many potential sources of trace levels of PFAS, field personnel are advised to act on the side of caution by strictly following the subject protocols, frequently replacing nitrile gloves, and rinsing field equipment to help mitigate the potential for false detections of PFAS.

This section contains both the responsibilities and procedures involved with field sampling for analysis of PFAS.

3.1 Responsibilities

Project Manager

The project manager (PM) shall provide the Quality Assurance Program Plan (QAPP) and site-specific field activities plan (FAP) to project personnel, which shall include the sampling requirements for each investigation. The PM will detail deviations to the procedure provided in this SOP in the site-specific FAP.

Field Operations Lead

The field operations lead (FOL) shall ensure that samples are collected using procedures that are in accordance with the QAPP, site-specific FAPs, and applicable SOPs. The FOL shall also be required to make rational and justifiable decisions when deviations from these procedures are necessary because of field conditions or unforeseen issues and report the deviations to the PM.

Field Personnel

Field personnel assigned to sampling activities are responsible for completing their tasks according to specifications outlined in the QAPP, site-specific FAPs, applicable SOPs, and other appropriate procedures. Field personnel are responsible for reporting deviations from procedures to the FOL and PM and documented in the field logbook and field data record.

3.2 Field Procedures/Considerations

The following are procedures/considerations to be made during field activities for PFAS sampling. A summary of the prohibited and acceptable items for PFAS investigation areas is included in Table 1. A checklist (**Attached)** shall be used daily prior to the commencement of fieldwork to ensure the field team is in compliance with this protocol.

Field Equipment

- **Do not use Teflon®-containing materials** (e.g., Teflon® tubing, bailers, tape, plumbing paste, or other Teflon® materials) since Teflon® contains fluorinated compounds.
- Sample containers and collected samples will be stored and shipped using dedicated coolers provided by the laboratory.
- Stainless steel, high-density polyethylene (HDPE), polypropylene, and silicone materials are acceptable for sampling. Samples should not be collected with tubing or stored in containers made of low-density polyethylene (LDPE) materials (fluorinated compounds are known to adsorb to LDPE). All sampling equipment components and sample containers should not come in contact with aluminum foil, LDPE, glass or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer.
- MACTEC will use peristaltic pumps for groundwater sample collection at depths shallower than 25 feet. MACTEC will use ProActive SS Pumps with polyvinyl chloride (PVC) leads or Geotech SS Geosub pumps for groundwater sample collection at depths greater than 25 feet. These pumps are constructed with stainless steel and will minimize introductions of PFAS. PFAS-free bladder pumps may also be used for sampling. PVC (e.g. Whale®) pumps can be used for well development, if needed, but should not be used for sampling, or left in the wells.
- When using liners to collect soil samples during direct-push technology or during conventional drilling and sampling methodologies, acetate liners are to be used.
- Field reports will be documented on loose paper secured on masonite or aluminum clipboards (i.e. plastic clipboards, binders, or spiral hard cover notebooks are not acceptable) using a pen or pencil.
- **Post-It Notes are not allowed** on project sites.

- Use ballpoint pens. Pens will be used when documenting field activities in the field log and on field forms as well as labeling sample containers and preparing the Chain of Custody.
- **Do not use chemical (blue) ice packs** during the sampling program. This includes the use of ice packs for the storage of food and/or samples.

Field Clothing and Personal Protective Equipment

- **Do not wear water resistant, waterproof, or stain-treated clothing** during the field program. Field clothing made of synthetic and natural fibers (preferably cotton) are acceptable. Field clothing should be laundered without the use of fabric softener. Preferably, field gear should be cotton construction and well laundered (i.e., washed a minimum of three times prior to use after purchase). New clothing may contain PFAS related treatments. **Do not use new clothing** while sampling or sample handling.
- **Do not wear clothing or boots containing Gore-Tex™** during the sampling program as it contains a PFAS membrane.
- Safety footwear will consist of steel-toed boots made with polyurethane and PVC, untreated leather boots, or well-worn leather boots. Newer leather boots may be worn if they are covered with polypropylene, polyethane, or PVC boot covers.
- Disposable nitrile gloves must be worn at all times. Further, a new pair of nitrile gloves shall be donned prior to the following activities at each sample location:
  - Decontamination of re-usable sampling equipment.
  - Handling sample bottles or water containers.
  - Insertion of anything into the well (e.g., HDPE tubing, HydraSleeve™, bailer, etc.).
  - Insertion of silicone tubing into the peristaltic pump.
  - Sample Collection after completion of monitor well purging; and,
  - Handling of any quality assurance/quality control samples including field blanks and equipment blanks.

  In addition, gloves should be changed after the handling of any non-dedicated sampling equipment, contact with non-decontaminated surfaces, or when judged necessary by field personnel.

Sample Containers

- Different laboratories may supply sample collection containers of varying sizes dependent on the type of media to be sampled (e.g., soil, groundwater, etc.). All samples should be collected in polypropylene or HDPE bottles. The screw cap will be made of polypropylene or HDPE and may be lined or unlined. However, if lined, the liner may not be made of Teflon® or other material containing PFAS.
- Container labels will be completed using pen after the caps have been placed back on each bottle.
- Glass sample containers are not to be used due to potential loss of analyte through adsorption.

Wet Weather

- Field sampling occurring during wet weather (e.g., rainfall and snowfall) should be conducted while wearing appropriate clothing that will not pose a risk for cross-contamination. Teams will

avoid synthetic gear that has been treated with water-repellant finishes containing PFAS. Use rain gear made from polyurethane, vinyl, and wax or rubber-coated materials.

- Teams should consider the use of a gazebo tent, which can be erected overtop of the sample location and provide shelter from the rain. It should be noted that the canopy material is likely a treated surface and should be handled as such; therefore, gloves should be worn when setting up and moving the tent, changed immediately afterwards and further contact with the tent should be avoided until all sampling activities have been finished and the team is ready to move on to the next sample location.

Equipment Decontamination

- Field sampling equipment used at each sample location, will require cleaning between uses. Alconox® and Liquinox® soap is acceptable for use since the Safety Data Sheets do not list fluoro-surfactants as an ingredient (do not use Liquinox® soap if also sampling for 1,4-dioxane). However, Decon 90 will not be used during decontamination activities. Water used for the final rinse during decontamination of sampling equipment will be laboratory certified "PFAS-free" water.
- For larger equipment (e.g., drill rig and large downhole drilling and sampling equipment), decontamination will be conducted with potable water using a high-pressure washer and then rinsed using potable water.

Groundwater Sampling

- At sites with dedicated sampling equipment installed in the wells that contains Teflon (e.g., tubing, pumps), this equipment should be removed from the wells and replaced with HDPE tubing and non-Teflon containing equipment, if possible. These wells will be re-developed by removing three well volumes of water, if possible, and letting the wells recover for at least 48 hours prior to sampling.
- At sites with dedicated sampling equipment installed in the wells that contain LDPE tubing, this tubing should be removed from the wells and replaced with HDPE tubing. These wells can be sampled immediately following replacement of tubing; however, attempts should be made to remove one well volume prior to sampling. For larger wells, with higher volumes of water, it may be preferable to redevelop the wells and remove one well volume with a higher volume pump. In such cases the wells should be allowed to recover for at least 48 hours prior to sampling.

Personnel Hygiene

- Field personnel will not use cosmetics, moisturizers, hand cream, or other related products as part of their personal cleaning/showering routine on the morning of a sampling event, unless the products are applied to a part of the body that will be coved by clothing. These products may contain surfactants and represent a potential source of PFAS.
- All clothing worn by sampling personnel must have been laundered multiple times.
- Many manufactured sunblock and insect repellants contain PFAS and should not be brought or used on-site. Sunblock and insect repellants that are used on-site should consist of 100% natural

ingredients, unless previously vetted by the project chemist. A list of acceptable sunscreens and insect repellents is provided in Table 1.

- For washroom breaks, field personnel will leave the exclusion zone and then remove gloves and overalls. Field personnel should wash as normal with extra time for rinsing with water after soap use. When finished washing, the use of a mechanical dryer is preferred and the use of paper towel for drying is to be avoided (if possible).

Food Considerations

- No food or drink shall be brought on-site, with the exception of bottled water and hydration drinks (e.g., Gatorade® and Powerade®), which will only be allowed to be brought and consumed within the staging area.

Visitors

- Visitors to the investigation area are asked to remain outside of the exclusion zone during sampling activities.

4.0 TIERED APPROACH TO ASSIST WITH FIELD DECISIONS

In evaluating whether products contain PFAS and are suitable for use in the field, the tiered approach presented in Table 2 will be used to assist with field decisions. Any member of the field team should contact the project manager with questions.

Table 1. Summary of Prohibited and Acceptable Items for PFAS Sampling

Prohibited Items	Acceptable Items
Field Equipment	
Teflon® containing materials	High-density polyethylene (HDPE) materials
Storage of samples in containers made of LDPE materials	Acetate liners, HDPE bottles
Teflon® tubing	HDPE or silicone tubing
Waterproof field books not manufactured by Rite in the Rain	Rite in the Rain products or Loose paper (non-waterproof)
Plastic clipboards, binders, or spiral hard cover notebooks	Aluminum field clipboards or with Masonite
Sharpies®, if possible	Ballpoint pens
Post-It Notes	
Chemical (blue) ice packs	Regular ice
Excel Purity Paste TFW Multipurpose Thread Sealant Vibra-Tite Thread Sealant	Gasoils NT Non-PTFE Thread Sealant Bentonite
Equipment with Viton Components (need to be evaluated on a case by case basis, Viton contains PTFE, but may be acceptable if used in gaskets or O-rings that are sealed away and will not come into contact with sample or sampling equipment.)	

Field Clothing and PPE	
New clothing or water resistant, waterproof, or stain-treated clothing, clothing containing Gore-Tex™	Well-laundered clothing, defined as clothing that has been washed three or more times after purchase, made of synthetic or natural fibers (preferable cotton)
Clothing laundered using fabric softener	
Boots containing Gore-Tex™	Boots made with polyurethane and PVC, well-worn or untreated leather boots, leather boots with boot covers
	Reflective safety vests, Tyvek®, Cotton Clothing, synthetic under clothing, body braces
No cosmetics, moisturizers, hand cream, or other related products as part of personal cleaning/showering routine on the morning of sampling, unless the products are applied to body parts that will be covered by clothing.	**Sunscreens** - Alba Organics Natural Sunscreen, Yes to Cucumbers, Aubrey Organics, Jason Natural Sun Block, Kiss my face, Baby sunscreens that are "free" or "natural" **Insect Repellents** - Jason Natural Quit Bugging Me, Repel Lemon Eucalyptus Insect repellant, Herbal Armor, California Baby Natural Bug Spray, BabyGanics, Deep Woods Off **Sunscreen and insect repellant -** Avon Skin So Soft Bug Guard Plus – SPF 30 Lotion
Sample Containers	
LDPE or glass containers	HDPE or polypropylene
Teflon®-lined caps	Lined or unlined HDPE or polypropylene caps
Rain Events	
Waterproof or resistant rain gear	Polyurethane, vinyl, wax or rubber-coated rain gear. Gazebo tent that is only touched or moved prior to and following sampling activities
Equipment Decontamination	
Decon 90	Alconox® and/or Liquinox® (Do not use Liquinox® if also sampling for 1,4-dioxane).
Water from an on-site well	Potable water from municipal drinking water supply
Food Considerations	
All food and drink, with exceptions noted on the right	Bottled water and hydration drinks (i.e. Gatorade® and Powerade®) to be brought and consumed only in the staging area

Table 2. Tiered Approach

Tier and Description	Action
Tier 1: Products that *will come into direct contact* with field samples include, but are not limited to, drilling grease, sampling equipment, sample containers, and well construction materials	These products will undergo the greatest scrutiny and requires chemist's input to help evaluate the materials as a possible source of contamination[A] and as possible sampling and/or storage materials
Tier 2: Products that *will not come into direct contact* with samples, but could be *reasonably expected to contain PFAS*, such as waterproof or nonstick products	Project team/affected person can review the Safety Data Sheet (SDS)[B] and if it shows PFAS, product should not be used. If product SDS does not indicate PFAS, confirm with chemist before use

Tier 3: Products that *will not come into direct contact* with samples and are *not expected to contain PFAS*, such as ballpoint pens, zipper bags, and body braces	Project team/affected person can review SDS and if no PFAS, then appropriate to use

[A] Tier 1 products will undergo the closest scrutiny. It may be necessary to have Tier 1 products analyzed for PFAS to confirm that a specific batch or lot number does not contain PFAS. Alternate products will need to be evaluated/used if PFAS are identified in the product.

[B] SDS Check: To evaluate product SDS and/or manufacturing specs, check if the product contains anything with "fluoro" in the name or the acronyms TPE, FEP, ETFE, and/or PFA. If fluorinated compounds are not listed in the manufacturing specs and/or on the SDSs, product can be used.

5.0 ATTACHMENTS

Daily PFAS Protocol Checklist Record

NYSDEC Guidelines for Sampling and Analysis of PFAS

DAILY PFAS PROTOCOL CHECKLIST RECORD

MACTEC

511 Congress Street
Suite 200
Portland, Maine 04101

PROJECT NAME	**DATE**
PROJECT NUMBER	**START TIME**
INSTALLATION	**WEATHER**

Field Clothing and PPE (as applicable):

- ☐ Field crew in compliance with Tables 1 and 2, SOP S6
- ☐ Field crew has not used fabric softener on clothing
- ☐ Field crew has not used cosmetics, moisturizers, hand cream, or other related products on exposed body parts this morning
- ☐ Field crew has not applied unacceptable sunscreen or insect repellant

Field Clothing and PPE (as applicable):

- ☐ No Teflon® containing materials on-site
- ☐ All sample materials made from stainless steel, HDPE, acetate, silicon, or polypropylene
- ☐ No waterproof field books on-site other than Rite-in-the-Rain® Products
- ☐ No plastic clipboards, binders, or spiral hard cover notebooks on-site
- ☐ No adhesives (Post-it® Notes) on-site
- ☐ Coolers filled with regular ice only. No chemical (blue) ice packs in possession

Sample Containers:

- ☐ All sample containers made of HDPE or polypropylene. Samples are not stored in containers made of LDPE
- ☐ Caps are lined or unlined and made of HDPE or polypropylene

Wet Weather (as applicable):

- ☐ For personnel in direct contact with samples and/or sampling equipment, wet weather gear made of Vinyl, polyurethane, PVC, latex or rubber-coated materials only

Equipment Decontamination:

- ☐ "PFAS-free" water on-site for decontamination of sample equipment
- ☐ Alconox and Liquinox to be used as decontamination materials

Food and Drink

- ☐ No food or drink on-site with exception of bottled water and/or hydration drinks (i.e., Gatorade and Powerade) that is available for consumption only in the staging area

If any applicable boxes cannot be checked, the Field Lead shall describe the noncompliance issues below and work with field personnel to address noncompliance issues prior to commencement of that day's work. Corrective action shall include removal of noncompliance items from the investigation area or removal of worker offsite until in compliance. Repeated failure to comply with PFC sample protocols will result in the permanent removal of worker(s) from the investigation area.

Describe the noncompliance issues (include personnel not in compliance) and action/outcome of noncompliance:

Sampler Signature: Print Name:

Checked By: Date:

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

GUIDELINES FOR SAMPLING AND ANALYSIS OF PFAS

Under NYSDEC's Part 375 Remedial Programs

January 2020

www.dec.ny.gov

Contents

ERRATA SHEET for

Guidelines for Sampling and Analysis of PFAS Under NYSDEC's Part 375 Program
Issued January 17, 2020

Citation and Page Number	Current Text	Corrected Text	Date

January 2020

Guidelines for Sampling and Analysis of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs

Objective

New York State Department of Environmental Conservation's Division of Environmental Remediation (DER) performs or oversees sampling of environmental media and subsequent analysis of PFAS as part of remedial programs implemented under 6 NYCRR Part 375. To ensure consistency in sampling, analysis and reporting of PFAS, DER has developed this document to summarize procedures and update previous DER technical guidance pertaining to PFAS.

Applicability

Sampling for PFAS has already been initiated at numerous sites under DER-approved work plans, in accordance with specified procedures. All future work plans should include PFAS sampling and analysis procedures that conform to the guidelines provided herein.

As part of a site investigation or remedial action compliance program, whenever samples of potentially affected media are collected and analyzed for the standard Target Analyte List/Target Compound List (TAL/TCL), PFAS analysis should also be performed. Potentially affected media can include soil, groundwater, surface water, and sediment. Based upon the potential for biota to be affected, biota sampling and analysis for PFAS may also be warranted as determined pursuant to a Fish and Wildlife Impact Analysis. Soil vapor sampling for PFAS is not required.

Field Sampling Procedures

DER-10 specifies technical guidance applicable to DER's remedial programs. Given the prevalence and use of PFAS, DER has developed "best management practices" specific to sampling for PFAS. As specified in DER-10 Chapter 2, quality assurance procedures are to be submitted with investigation work plans. Typically, these procedures are incorporated into a work plan, or submitted as a stand-alone document (e.g., a Quality Assurance Project Plan). Quality assurance guidelines for PFAS are listed in Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS.

Field sampling for PFAS performed under DER remedial programs should follow the appropriate procedures outlined for soils, sediments or other solids (Appendix B), non-potable groundwater (Appendix C), surface water (Appendix D), public or private water supply wells (Appendix E), and fish tissue (Appendix F).

QA/QC samples (e.g. duplicates, MS/MSD) should be collected as specified in DER-10, Section 2.3(c). For sampling equipment coming in contact with aqueous samples only, rinsate or equipment blanks should be collected. Equipment blanks should be collected at a minimum frequency of one per day or one per twenty samples, whichever is more frequent.

Data Assessment and Application to Site Cleanup

Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFAS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10.

Water Sample Results

PFAS should be further assessed and considered as a potential contaminant of concern in groundwater or surface water if PFOA or PFOS is detected in any water sample at or above 10 ng/L (ppt). In addition, further assessment of water may be warranted if either of the following screening levels are met:

a. any other individual PFAS (not PFOA or PFOS) is detected in water at or above 100 ng/L; or
b. total concentration of PFAS (including PFOA and PFOS) is detected in water at or above 500 ng/L

If PFAS are identified as a contaminant of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.

Soil Sample Results

The extent of soil contamination for purposes of delineation and remedy selection should be determined by having certain soil samples tested by Synthetic Precipitation Leaching Procedure (SPLP) and the leachate analyzed for PFAS. Soil exhibiting SPLP results above 70 ppt for either PFOA or PFOS (individually or combined) are to be evaluated during the cleanup phase.

Sites in the site management phase should evaluate for PFAS to determine if modification to any components of the SMP is necessary (e.g., monitoring for PFAS, upgrading treatment facilities, or performing an RSO).

Testing for Imported Soil

Soil imported to a site for use in a soil cap, soil cover, or as backfill is to be tested for PFAS in general conformance with DER-10, Section 5.4(e) for the *PFAS Analyte List* (Appendix F) using the analytical procedures discussed below and the criteria in DER-10 associated with SVOCs.

If PFOA or PFOS is detected in any sample at or above 1 µg/kg, then soil should be tested by SPLP and the leachate analyzed for PFAS. If the SPLP results exceed 10 ppt for either PFOA or PFOS (individually) then the source of backfill should be rejected, unless a site-specific exemption is provided by DER. SPLP leachate criteria is based on the Maximum Contaminant Levels proposed for drinking water by New York State's Department of Health, this value may be updated based on future Federal or State promulgated regulatory standards. Remedial parties have the option of analyzing samples concurrently for both PFAS in soil and in the SPLP leachate to minimize project delays. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.

Analysis and Reporting

As of January 2020, the United States Environmental Protection Agency (EPA) does not have a validated method for analysis of PFAS for media commonly analyzed under DER remedial programs (non-potable waters, solids). DER has developed the following guidelines to ensure consistency in analysis and reporting of PFAS.

The investigation work plan should describe analysis and reporting procedures, including laboratory analytical procedures for the methods discussed below. As specified in DER-10 Section 2.2, laboratories should provide a full Category B deliverable. In addition, a Data Usability Summary Report (DUSR) should be prepared by an independent, third party data validator. Electronic data submissions should meet the requirements provided at: https://www.dec.ny.gov/chemical/62440.html.

DER has developed a *PFAS Analyte List* (Appendix F) for remedial programs to understand the nature of contamination at sites. It is expected that reported results for PFAS will include, at a minimum, all the compounds listed. If lab and/or matrix specific issues are encountered for any analytes, the DER project manager, in consultation with the DER chemist, will make case-by-case decisions as to whether certain analytes may be temporarily or permanently discontinued from analysis at each site. As with other contaminants that are analyzed for at a site, the *PFAS Analyte List* may be refined for future sampling events based on investigative findings.

Routine Analysis

Currently, New York State Department of Health's Environmental Laboratory Approval Program (ELAP) does not offer certification for PFAS in matrices other than finished drinking water. However, laboratories analyzing environmental samples for PFAS (e.g., soil, sediments, and groundwater) under DER's Part 375 remedial programs need to hold ELAP certification for PFOA and PFOS in drinking water by EPA Method 537.1 or ISO 25101. Laboratories should adhere to the guidelines and criteria set forth in the DER's laboratory guidelines for PFAS in non-potable water and solids (Appendix H - Laboratory Guidelines for Analysis of PFAS in Non-Potable Water and Solids). Data review guidelines were developed by DER to ensure data comparability and usability (Appendix H - Data Review Guidelines for Analysis of PFAS in Non-Potable Water and Solids).

LC-MS/MS analysis for PFAS using methodologies based on EPA Method 537.1 is the procedure to use for environmental samples. Isotope dilution techniques should be utilized for the analysis of PFAS in all media. Reporting limits for PFOA and PFOS in aqueous samples should not exceed 2 ng/L. Reporting limits for PFOA and PFOS in solid samples should not exceed 0.5 µg/kg. Reporting limits for all other PFAS in aqueous and solid media should be as close to these limits as possible. If laboratories indicate that they are not able to achieve these reporting limits for the entire *PFAS Analyte List*, site-specific decisions regarding acceptance of elevated reporting limits for specific PFAS can be made by the DER project manager in consultation with the DER chemist.

Additional Analysis

Additional laboratory methods for analysis of PFAS may be warranted at a site, such as the Synthetic Precipitation Leaching Procedure (SPLP) and Total Oxidizable Precursor Assay (TOP Assay). Commercially methods are also available for biota and air samples.

SPLP is a technique used to determine the mobility of chemicals in liquids, soils and wastes, and may be useful in determining the need for addressing PFAS-containing material as part of the remedy. SPLP by EPA Method 1312 should be used unless otherwise specified by the DER project manager in consultation with the DER chemist.

Impacted materials can be made up of PFAS that are not analyzable by routine analytical methodology. A TOP Assay can be utilized to conceptualize the amount and type of oxidizable PFAS which could be liberated in the environment, which approximates the maximum concentration of perfluoroalkyl substances that could be generated if all polyfluoroalkyl substances were oxidized. For example, some polyfluoroalkyl substances may degrade or transform to form perfluoroalkyl substances (such as PFOA or PFOS), resulting in an increase in perfluoroalkyl substance concentrations as contaminated groundwater moves away from a source. The TOP Assay converts, through oxidation, polyfluoroalkyl substances (precursors) into perfluoroalkyl substances that can be detected by routine analytical methodology.

Please note that TOP Assay analysis of highly-contaminated samples, such as those from an AFFF (aqueous film-forming foam) site, can result in incomplete oxidation of the samples and an underestimation of the total perfluoroalkyl substances.

Commercial laboratories have adopted methods which allow for the quantification of targeted PFAS in air and biota. The EPA's Office of Research and Development (ORD) is currently developing methods which allow for air emissions characterization of PFAS, including both targeted and non-targeted analysis of PFAS. Consult with the DER project manager and the DER chemist for assistance on analyzing biota/tissue and air samples.

Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS

The following guidelines (general and PFAS-specific) can be used to assist with the development of a QAPP for projects within DER involving sampling and analysis of PFAS.

General Guidelines in Accordance with DER-10

- Document/work plan section title – Quality Assurance Project Plan
- Summarize project scope, goals, and objectives
- Provide project organization including names and resumes of the project manager, Quality Assurance Officer (QAO), field staff, and Data Validator
    - The QAO should not have another position on the project, such as project or task manager, that involves project productivity or profitability as a job performance criterion
- List the ELAP-approved lab(s) to be used for analysis of samples
- Include a site map showing sample locations
- Provide detailed sampling procedures for each matrix
- Include Data Quality Usability Objectives
- List equipment decontamination procedures
- Include an "Analytical Methods/Quality Assurance Summary Table" specifying:
    - Matrix type
    - Number or frequency of samples to be collected per matrix
    - Number of field and trip blanks per matrix
    - Analytical parameters to be measured per matrix
    - Analytical methods to be used per matrix with minimum reporting limits
    - Number and type of matrix spike and matrix spike duplicate samples to be collected
    - Number and type of duplicate samples to be collected
    - Sample preservation to be used per analytical method and sample matrix
    - Sample container volume and type to be used per analytical method and sample matrix
    - Sample holding time to be used per analytical method and sample matrix
- Specify Category B laboratory data deliverables and preparation of a DUSR

Specific Guidelines for PFAS

- Include in the text that sampling for PFAS will take place
- Include in the text that PFAS will be analyzed by LC-MS/MS for PFAS using methodologies based on EPA Method 537.1
- Include the list of PFAS compounds to be analyzed (*PFAS Analyte List*)
- Include the laboratory SOP for PFAS analysis
- List the minimum method-achievable Reporting Limits for PFAS
    - Reporting Limits should be less than or equal to:
        - Aqueous – 2 ng/L (ppt)
        - Solids – 0.5 µg/kg (ppb)
- Include the laboratory Method Detection Limits for the PFAS compounds to be analyzed
- Laboratory should have ELAP certification for PFOA and PFOS in drinking water by EPA Method 537.1, EPA Method 533, or ISO 25101
- Include detailed sampling procedures
    - Precautions to be taken
    - Pump and equipment types
    - Decontamination procedures
    - Approved materials only to be used
- Specify that regular ice only will be used for sample shipment
- Specify that equipment blanks should be collected at a minimum frequency of 1 per day per matrix

Appendix B - Sampling Protocols for PFAS in Soils, Sediments and Solids

General

The objective of this protocol is to give general guidelines for the collection of soil, sediment and other solid samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Containers

Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in to contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel spoon
- stainless steel bowl
- steel hand auger or shovel without any coatings

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification. Previous results of "non-detect" for PFAS from the UCMR3 water supply testing program are acceptable as verification.

Sampling Techniques

Sampling is often conducted in areas where a vegetative turf has been established. In these cases, a pre-cleaned trowel or shovel should be used to carefully remove the turf so that it may be replaced at the conclusion of sampling. Surface soil samples (e.g. 0 to 6 inches below surface) should then be collected using a pre-cleaned, stainless steel spoon. Shallow subsurface soil samples (e.g. 6 to ~36 inches below surface) may be collected by digging a hole using a pre-cleaned hand auger or shovel. When the desired subsurface depth is reached, a pre-cleaned hand auger or spoon shall be used to obtain the sample.

When the sample is obtained, it should be deposited into a stainless steel bowl for mixing prior to filling the sample containers. The soil should be placed directly into the bowl and mixed thoroughly by rolling the material into the middle until the material is homogenized. At this point the material within the bowl can be placed into the laboratory provided container.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A soil log or sample log shall document the location of the sample/borehole, depth of the sample, sampling equipment, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

Appendix C - Sampling Protocols for PFAS in Monitoring Wells

General

The objective of this protocol is to give general guidelines for the collection of groundwater samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including plumbers tape and sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel inertia pump with HDPE tubing
- peristaltic pump equipped with HDPE tubing and silicone tubing
- stainless steel bailer with stainless steel ball
- bladder pump (identified as PFAS-free) with HDPE tubing

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Monitoring wells should be purged in accordance with the sampling procedure (standard/volume purge or low flow purge) identified in the site work plan, which will determine the appropriate time to collect the sample. If sampling using standard purge techniques, additional purging may be needed to reduce turbidity levels, so samples contain a limited amount of sediment within the sample containers. Sample containers that contain sediment may cause issues at the laboratory, which may result in elevated reporting limits and other issues during the sample preparation that can compromise data usability. Sampling personnel should don new nitrile gloves prior to sample collection due to the potential to contact PFAS containing items (not related to the sampling equipment) during the purging activities.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Collect one equipment blank every day that sampling is conducted and minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers
- Additional equipment blank samples may be collected to assess other equipment that is utilized at the monitoring well
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A purge log shall document the location of the sample, sampling equipment, groundwater parameters, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

Appendix D - Sampling Protocols for PFAS in Surface Water

General

The objective of this protocol is to give general guidelines for the collection of surface water samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel cup

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Where conditions permit, (e.g. creek or pond) sampling devices (e.g. stainless steel cup) should be rinsed with site medium to be sampled prior to collection of the sample. At this point the sample can be collected and poured into the sample container.

If site conditions permit, samples can be collected directly into the laboratory container.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Collect one equipment blank every day that sampling is conducted and minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A sample log shall document the location of the sample, sampling equipment, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

Appendix E - Sampling Protocols for PFAS in Private Water Supply Wells

General

The objective of this protocol is to give general guidelines for the collection of water samples from private water supply wells (with a functioning pump) for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Drinking water samples collected using this protocol are intended to be analyzed for PFAS by ISO Method 25101. The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials (e.g. plumbers tape), including sample bottle cap liners with a PTFE layer.

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Locate and assess the pressure tank and determine if any filter units are present within the building. Establish the sample location as close to the well pump as possible, which is typically the spigot at the pressure tank. Ensure sampling equipment is kept clean during sampling as access to the pressure tank spigot, which is likely located close to the ground, may be obstructed and may hinder sample collection.

Prior to sampling, a faucet downstream of the pressure tank (e.g., wash room sink) should be run until the well pump comes on and a decrease in water temperature is noted which indicates that the water is coming from the well. If the homeowner is amenable, staff should run the water longer to purge the well (15+ minutes) to provide a sample representative of the water in the formation rather than standing water in the well and piping system including the pressure tank. At this point a new pair of nitrile gloves should be donned and the sample can be collected from the sample point at the pressure tank.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- If equipment was used, collect one equipment blank every day that sampling is conducted and minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A sample log shall document the location of the private well, sample point location, owner contact information, sampling equipment, purge duration, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate and available (e.g. well construction, pump type and location, yield, installation date). Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appendix F - Sampling Protocols for PFAS in Fish

This appendix contains a copy of the latest guidelines developed by the Division of Fish and Wildlife (DFW) entitled “General Fish Handling Procedures for Contaminant Analysis” (Ver. 8).

Procedure Name: General Fish Handling Procedures for Contaminant Analysis

Number: FW-005

Purpose: This procedure describes data collection, fish processing and delivery of fish collected for contaminant monitoring. It contains the chain of custody and collection record forms that should be used for the collections.

Organization: Environmental Monitoring Section
Bureau of Ecosystem Health
Division of Fish and Wildlife (DFW)
New York State Department of Environmental Conservation (NYSDEC)
625 Broadway
Albany, New York 12233-4756

Version: 8

Previous Version Date: 21 March 2018

Summary of Changes to this Version: Updated bureau name to Bureau of Ecosystem Health. Added direction to list the names of all field crew on the collection record. Minor formatting changes on chain of custody and collection records.

Originator or Revised by: Wayne Richter, Jesse Becker

Date: 26 April 2019

Quality Assurance Officer and Approval Date: Jesse Becker, 26 April 2019

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

GENERAL FISH HANDLING PROCEDURES FOR CONTAMINANT ANALYSES

A. Original copies of all continuity of evidence (i.e., Chain of Custody) and collection record forms must accompany delivery of fish to the lab. A copy shall be directed to the Project Leader or as appropriate, Wayne Richter. All necessary forms will be supplied by the Bureau of Ecosystem Health. Because some samples may be used in legal cases, it is critical that each section is filled out completely. Each Chain of Custody form has three main sections:

   1. The top box is to be filled out **and signed** by the person responsible for the fish collection (e.g., crew leader, field biologist, researcher). This person is responsible for delivery of the samples to DEC facilities or personnel (e.g., regional office or biologist).

   2. The second section is to be filled out **and signed** by the person responsible for the collections while being stored at DEC, before delivery to the analytical lab. This may be the same person as in (1), but it is still required that they complete the section. Also important is the **range of identification numbers** (i.e., tag numbers) included in the sample batch.

   3. Finally, the bottom box is to record any transfers between DEC personnel and facilities. Each subsequent transfer should be **identified, signed, and dated**, until laboratory personnel take possession of the fish.

B. The following data are required on each **Fish Collection Record** form:

   1. Project and Site Name.

   2. DEC Region.

   3. All personnel (and affiliation) involved in the collection.

   4. Method of collection (gill net, hook and line, etc.)

   5. Preservation Method.

C. The following data are to be taken on each fish collected and recorded on the **Fish Collection Record** form:

   1. Tag number - Each specimen is to be individually jaw tagged at time of collection with a unique number. Make sure the tag is turned out so that the number can be read without opening the bag. Use tags in sequential order. For small fish or composite samples place the tag inside the bag with the samples. The Bureau of Ecosystem Health can supply the tags.

   2. Species identification (please be explicit enough to enable assigning genus and species). Group fish by species when processing.

   3. Date collected.

   4. Sample location (waterway and nearest prominent identifiable landmark).

   5. Total length (nearest mm or smallest sub-unit on measuring instrument) and weight (nearest g or

smallest sub-unit of weight on weighing instrument). Take all measures as soon as possible with calibrated, protected instruments (e.g. from wind and upsets) and prior to freezing.

6. Sex - fish may be cut enough to allow sexing or other internal investigation, but do not eviscerate. Make any incision on the right side of the belly flap or exactly down the midline so that a left-side fillet can be removed.

D. General data collection recommendations:

1. It is helpful to use an ID or tag number that will be unique. It is best to use metal striped bass or other uniquely numbered metal tags. If uniquely numbered tags are unavailable, values based on the region, water body and year are likely to be unique: for example, R7CAY11001 for Region 7, Cayuga Lake, 2011, fish 1. If the fish are just numbered 1 through 20, we have to give them new numbers for our database, making it more difficult to trace your fish to their analytical results and creating an additional possibility for errors.

2. Process and record fish of the same species sequentially. Recording mistakes are less likely when all fish from a species are processed together. Starting with the bigger fish species helps avoid missing an individual.

3. If using Bureau of Ecosystem Health supplied tags or other numbered tags, use tags in sequence so that fish are recorded with sequential Tag Numbers. This makes data entry and login at the lab and use of the data in the future easier and reduces keypunch errors.

4. Record length and weight as soon as possible after collection and before freezing. Other data are recorded in the field upon collection. An age determination of each fish is optional, but if done, it is recorded in the appropriate "Age" column.

5. For composite samples of small fish, record the number of fish in the composite in the Remarks column. Record the length and weight of each individual in a composite. All fish in a composite sample should be of the same species and members of a composite should be visually matched for size.

6. Please submit photocopies of topographic maps or good quality navigation charts indicating sampling locations. GPS coordinates can be entered in the Location column of the collection record form in addition to or instead for providing a map. These records are of immense help to us (and hopefully you) in providing documented location records which are not dependent on memory and/or the same collection crew. In addition, they may be helpful for contaminant source trackdown and remediation/control efforts of the Department.

7. When recording data on fish measurements, it will help to ensure correct data recording for the data recorder to call back the numbers to the person making the measurements.

E. Each fish is to be placed in its own individual plastic bag. For small fish to be analyzed as a composite, put all of the fish for one composite in the same bag but use a separate bag for each composite. It is important to individually bag the fish to avoid difficulties or cross contamination when processing the fish for chemical analysis. Be sure to include the fish's tag number inside the bag, preferably attached to the fish with the tag number turned out so it can be read. Tie or otherwise secure the bag closed. **The Bureau of Ecosystem Health will supply the bags.** If necessary, food grade bags may be procured from a suitable vendor (e.g., grocery store). It is preferable to redundantly label each bag with a manila tag tied between the knot and the body of the bag. This tag should be labeled with the project name, collection location, tag number, collection date, and fish species. If scales are collected, the scale envelope should be labeled with

the same information.

F. Groups of fish, by species, are to be placed in one large plastic bag per sampling location. **The Bureau of Ecosystem Health will supply the larger bags.** Tie or otherwise secure the bag closed. Label the site bag with a manila tag tied between the knot and the body of the bag. The tag should contain: project, collection location, collection date, species and **tag number ranges**. Having this information on the manila tag enables lab staff to know what is in the bag without opening it.

G. Do not eviscerate, fillet or otherwise dissect the fish unless specifically asked to. If evisceration or dissection is specified, the fish must be cut along the exact midline or on the right side so that the left side fillet can be removed intact at the laboratory. If filleting is specified, the procedure for taking a standard fillet (SOP PREPLAB 4) must be followed, including removing scales.

H. Special procedures for PFAS: Unlike legacy contaminants such as PCBs, which are rarely found in day to day life, PFAS are widely used and frequently encountered. Practices that avoid sample contamination are therefore necessary. While no standard practices have been established for fish, procedures for water quality sampling can provide guidance. The following practices should be used for collections when fish are to be analyzed for PFAS:

No materials containing Teflon.
No Post-it notes.
No ice packs; only water ice or dry ice.
Any gloves worn must be powder free nitrile.
No Gore-Tex or similar materials (Gore-Tex is a PFC with PFOA used in its manufacture).
No stain repellent or waterproof treated clothing; these are likely to contain PFCs.
Avoid plastic materials, other than HDPE, including clipboards and waterproof notebooks.
Wash hands after handling any food containers or packages as these may contain PFCs.
Keep pre-wrapped food containers and wrappers isolated from fish handling.
Wear clothing washed at least six times since purchase.
Wear clothing washed without fabric softener.
Staff should avoid cosmetics, moisturizers, hand creams and similar products on the day of sampling as many of these products contain PFCs (Fujii et al. 2013). Sunscreen or insect repellent should not contain ingredients with "fluor" in their name. Apply any sunscreen or insect repellent well downwind from all materials. Hands must be washed after touching any of these products.

I. All fish must be kept at a temperature <45° F (<8° C) immediately following data processing. As soon as possible, freeze at -20° C ± 5° C. Due to occasional freezer failures, daily freezer temperature logs are required. The freezer should be locked or otherwise secured to maintain chain of custody.

J. In most cases, samples should be delivered to the Analytical Services Unit at the Hale Creek field station. Coordinate delivery with field station staff and send copies of the collection records, continuity of evidence forms and freezer temperature logs to the field station. For samples to be analyzed elsewhere, non-routine collections or other questions, contact Wayne Richter, Bureau of Ecosystem Health, NYSDEC, 625 Broadway, Albany, New York 12233-4756, 518-402-8974, or the project leader about sample transfer. Samples will then be directed to the analytical facility and personnel noted on specific project descriptions.

K. A recommended equipment list is at the end of this document.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF FISH AND WILDLIFE
FISH COLLECTION RECORD

Project and Site Name _____ DEC Region _____

Collections made by (include all crew) _____

Sampling Method: □Electrofishing □Gill netting □Trap netting □Trawling □Seining □Angling □Other _____

Preservation Method: □Freezing □Other _____ Notes (SWFDB survey number): _____

FOR LAB USE ONLY- LAB ENTRY NO.	COLLECTION OR TAG NO.	SPECIES	DATE TAKEN	LOCATION	AGE	SEX &/OR REPROD. CONDIT	LENGTH ( )	WEIGHT ( )	REMARKS

richter: revised 2011, 5/7/15, 10/4/16, 3/20/17; becker: 3/23/17, 4/26/19

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
CHAIN OF CUSTODY

I, _____, of _____ collected the
(Print Name) (Print Business Address)

following on _____, 20____ from _____
(Date) (Water Body)

in the vicinity of _____
(Landmark, Village, Road, etc.)

Town of _____, in _____ County.

Item(s) _____

_____

Said sample(s) were in my possession and handled according to standard procedures provided to me prior to collection. The sample(s) were placed in the custody of a representative of the New York State Department of Environmental Conservation on _____, 20_____.

_____ _____
Signature Date

I, _____, received the above mentioned sample(s) on the date specified and assigned identification number(s) _____ to the sample(s). I have recorded pertinent data for the sample(s) on the attached collection records. The sample(s) remained in my custody until subsequently transferred, prepared or shipped at times and on dates as attested to below.

_____ _____
Signature Date

SECOND RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
THIRD RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
FOURTH RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
RECEIVED IN LABORATORY BY (Print Name)	TIME & DATE	REMARKS
SIGNATURE	UNIT	
LOGGED IN BY (Print Name)	TIME & DATE	ACCESSION NUMBERS
SIGNATURE	UNIT	

richter: revised 21 April 2014; becker: 23 March 2017, 26 April, 2019

NOTICE OF WARRANTY

By signature to the chain of custody (reverse), the signatory warrants that the information provided is truthful and accurate to the best of his/her ability. The signatory affirms that he/she is willing to testify to those facts provided and the circumstances surrounding the same. Nothing in this warranty or chain of custody negates responsibility nor liability of the signatories for the truthfulness and accuracy of the statements provided.

HANDLING INSTRUCTIONS

On day of collection, collector(s) name(s), address(es), date, geographic location of capture (attach a copy of topographic map or navigation chart), species, number kept of each species, and description of capture vicinity (proper noun, if possible) along with name of Town and County must be indicated on reverse.

Retain organisms in manila tagged plastic bags to avoid mixing capture locations. Note appropriate information on each bag tag.

Keep samples as cool as possible. Put on ice if fish cannot be frozen within 12 hours. If fish are held more than 24 hours without freezing, they will not be retained or analyzed.

Initial recipient (either DEC or designated agent) of samples from collector(s) is responsible for obtaining and recording information on the collection record forms which will accompany the chain of custody. This person will seal the container using packing tape and writing his signature, the time and the date across the tape onto the container with indelible marker. Any time a seal is broken, for whatever purpose, the incident must be recorded on the Chain of Custody (reason, time, and date) in the purpose of transfer block. Container then is resealed using new tape and rewriting signature, with time and date.

EQUIPMENT LIST

Scale or balance of appropriate capacity for the fish to be collected.

Fish measuring board.

Plastic bags of an appropriate size for the fish to be collected and for site bags.

Individually numbered metal tags for fish.

Manila tags to label bags.

Small envelops, approximately 2” x 3.5”, if fish scales are to be collected.

Knife for removing scales.

Chain of custody and fish collection forms.

Clipboard.

Pens or markers.

Paper towels.

Dish soap and brush.

Bucket.

Cooler.

Ice.

Duct tape.

Appendix G – PFAS Analyte List

Group	Chemical Name	Abbreviation	CAS Number
Perfluoroalkyl sulfonates	Perfluorobutanesulfonic acid	PFBS	375-73-5
	Perfluorohexanesulfonic acid	PFHxS	355-46-4
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanesulfonic acid	PFOS	1763-23-1
	Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluoroalkyl carboxylates	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	PFHpA	375-85-9
	Perfluorooctanoic acid	PFOA	335-67-1
	Perfluorononanoic acid	PFNA	375-95-1
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUA/PFUdA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTriA/PFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTA/PFTeDA	376-06-7
Fluorinated Telomer Sulfonates	6:2 Fluorotelomer sulfonate	6:2 FTS	27619-97-2
	8:2 Fluorotelomer sulfonate	8:2 FTS	39108-34-4
Perfluorooctane-sulfonamides	Perfluroroctanesulfonamide	FOSA	754-91-6
Perfluorooctane-sulfonamidoacetic acids	N-methyl perfluorooctanesulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethyl perfluorooctanesulfonamidoacetic acid	N-EtFOSAA	2991-50-6

Appendix H - Laboratory Guidelines for Analysis of PFAS in Non-Potable Water and Solids

General

New York State Department of Environmental Conservation's Division of Environmental Remediation (DER) developed the following guidelines for laboratories analyzing environmental samples for PFAS under DER programs. If laboratories cannot adhere to the following guidelines, they should contact DER's Quality Assurance Officer, Dana Maikels, at dana.maikels@dec.ny.gov prior to analysis of samples.

Isotope Dilution

Isotope dilution techniques should be utilized for the analysis of PFAS in all media.

Extraction

For water samples, the entire sample bottle should be extracted, and the sample bottle rinsed with appropriate solvent to remove any residual PFAS.

For samples with high particulates, the samples should be handled in one of the following ways:

1. Spike the entire sample bottle with isotope dilution analytes (IDAs) prior to any sample manipulation. The sample can be passed through the SPE and if it clogs, record the volume that passed through.
2. If the sample contains too much sediment to attempt passing it through the SPE cartridge, the sample should be spiked with isotope dilution analytes, centrifuged and decanted.
3. If higher reporting limits are acceptable for the project, the sample can be diluted by taking a representative aliquot of the sample. If isotope dilution analytes will be diluted out of the sample, they can be added after the dilution. The sample should be homogenized prior to taking an aliquot.

If alternate sample extraction procedures are used, please contact the DER remedial program chemist prior to employing. Any deviations in sample preparation procedures should be clearly noted in the case narrative.

Signal to Noise Ratio

For all target analyte ions used for quantification, signal to noise ratio should be 3:1 or greater.

Blanks

There should be no detections in the method blanks above the reporting limits.

Ion Transitions

The ion transitions listed below should be used for the following PFAS:

PFOA	413 > 369
PFOS	499 > 80
PFHxS	399 > 80
PFBS	299 > 80
6:2 FTS	427 > 407
8:2 FTS	527 > 507
N-EtFOSAA	584 > 419
N-MeFOSAA	570 > 419

Branched and Linear Isomers

Standards containing both branched and linear isomers should be used when standards are commercially available. Currently, quantitative standards are available for PFHxS, PFOS, NMeFOSAA, and NEtFOSAA. As more standards become available, they should be incorporated in to the method. All isomer peaks present in the standard should be integrated and the areas summed. Samples should be integrated in the same manner as the standards.

Since a quantitative standard does not exist for branched isomers of PFOA, the instrument should be calibrated using just the linear isomer and a technical (qualitative) PFOA standard should be used to identify the retention time of the branched PFOA isomers in the sample. The total response of PFOA branched and linear isomers should be integrated in the samples and quantitated using the calibration curve of the linear standard.

Secondary Ion Transition Monitoring

Quantifier and qualifier ions should be monitored for all target analytes (PFBA and PFPeA are exceptions). The ratio of quantifier ion response to qualifier ion response should be calculated for each target analyte and the ratio compared to standards. Lab derived criteria should be used to determine if the ratios are acceptable.

Reporting

Detections below the reporting limit should be reported and qualified with a J qualifier.

The acid form of PFAS analytes should be reported. If the salt form of the PFAS was used as a stock standard, the measured mass should be corrected to report the acid form of the analyte.

Appendix H - Data Review Guidelines for Analysis of PFAS in Non-Potable Water and Solids

General

These guidelines are intended to be used for the validation of PFAS analytical results for projects within the Division of Environmental Remediation (DER) as well as aid in the preparation of a data usability summary report. Data reviewers should understand the methodology and techniques utilized in the analysis. Consultation with the end user of the data may be necessary to assist in determining data usability based on the data quality objectives in the Quality Assurance Project Plan. A familiarity with the laboratory's Standard Operating Procedure may also be needed to fully evaluate the data. If you have any questions, please contact DER's Quality Assurance Officer, Dana Maikels, at dana.maikels@dec.ny.gov.

Preservation and Holding Time

Samples should be preserved with ice to a temperature of less than 6°C upon arrival at the lab. The holding time is 14 days to extraction for aqueous and solid samples. The time from extraction to analysis for aqueous samples is 28 days and 40 days for solids.

Temperature greatly exceeds 6ºC upon arrival at the lab*	Use professional judgement to qualify detects and non-detects as estimated or rejected
Holding time exceeding 28 days to extraction	Use professional judgement to qualify detects and non-detects as estimated or rejected if holding time is grossly exceeded

*Samples that are delivered to the lab immediately after sampling may not meet the thermal preservation guidelines. Samples are considered acceptable if they arrive on ice or an attempt to chill the samples is observed.

Initial Calibration

The initial calibration should contain a minimum of five standards for linear fit and six standards for a quadratic fit. The relative standard deviation (RSD) for a quadratic fit calibration should be less than 20%. Linear fit calibration curves should have an R^2 value greater than 0.990.

The low-level calibration standard should be within 50% - 150% of the true value, and the mid-level calibration standard within 70% - 130% of the true value.

%RSD >20%	J flag detects and UJ non detects
R^2 >0.990	J flag detects and UJ non detects
Low-level calibration check <50% or >150%	J flag detects and UJ non detects
Mid-level calibration check <70% or >130%	J flag detects and UJ non detects

Initial Calibration Verification

An initial calibration verification (ICV) standard should be from a second source (if available). The ICV should be at the same concentration as the mid-level standard of the calibration curve.

ICV recovery <70% or >130%	J flag detects and non-detects

Continuing Calibration Verification

Continuing calibration verification (CCV) checks should be analyzed at a frequency of one per ten field samples. If CCV recovery is very low, where detection of the analyte could be in question, ensure a low level CCV was analyzed and use to determine data quality.

CCV recovery <70 or >130%	J flag results

Blanks

There should be no detections in the method blanks above the reporting limits. Equipment blanks, field blanks, rinse blanks etc. should be evaluated in the same manner as method blanks. Use the most contaminated blank to evaluate the sample results.

Blank Result	Sample Result	Qualification
Any detection	<Reporting limit	Qualify as ND at reporting limit
Any detection	>Reporting Limit and >10x the blank result	No qualification
>Reporting limit	>Reporting limit and <10x blank result	J+ biased high

Field Duplicates

A blind field duplicate should be collected at rate of one per twenty samples. The relative percent difference (RPD) should be less than 30% for analyte concentrations greater than two times the reporting limit. Use the higher result for final reporting.

RPD >30%	Apply J qualifier to parent sample

Lab Control Spike

Lab control spikes should be analyzed with each extraction batch or one for every twenty samples. In the absence of lab derived criteria, use 70% - 130% recovery criteria to evaluate the data.

Recovery <70% or >130% (lab derived criteria can also be used)	Apply J qualifier to detects and UJ qualifier to non detects

Matrix Spike/Matrix Spike Duplicate

One matrix spike and matrix spike duplicate should be collected at a rate of one per twenty samples. Use professional judgement to reject results based on out of control MS/MSD recoveries.

Recovery <70% or >130% (lab derived criteria can also be used)	Apply J qualifier to detects and UJ qualifier to non detects of parent sample only
RPD >30%	Apply J qualifier to detects and UJ qualifier to non detects of parent sample only

Extracted Internal Standards (Isotope Dilution Analytes)

Problematic analytes (e.g. PFBA, PFPeA, fluorotelomer sulfonates) can have wider recoveries without qualification. Qualify corresponding native compounds with a J flag if outside of the range.

Recovery <50% or >150%	Apply J qualifier
Recovery <25% or >150% for poor responding analytes	Apply J qualifier
Isotope Dilution Analyte (IDA) Recovery <10%	Reject results

Secondary Ion Transition Monitoring

Quantifier and qualifier ions should be monitored for all target analytes (PFBA and PFPeA are exceptions). The ratio of quantifier ion response to qualifier ion response should be calculated from the standards for each target analyte. Lab derived criteria should be used to determine if the ratios are acceptable. If the ratios fall outside of the laboratory criteria, qualify results as an estimated maximum concentration.

Signal to Noise Ratio

The signal to noise ratio for the quantifier ion should be at least 3:1. If the ratio is less than 3:1, the peak is discernable from the baseline noise and symmetrical, the result can be reported. If the peak appears to be baseline noise and/or the shape is irregular, qualify the result as tentatively identified.

Branched and Linear Isomers

Observed branched isomers in the sample that do not have a qualitative or quantitative standard should be noted and the analyte should be qualified as biased low in the final data review summary report. Note: The branched isomer peak should also be present in the secondary ion transition.

Reporting Limits

If project-specific reporting limits were not met, please indicate that in the report along with the reason (e.g. over dilution, dilution for non-target analytes, high sediment in aqueous samples).

Peak Integrations

Target analyte peaks should be integrated properly and consistently when compared to standards. Ensure branched isomer peaks are included for PFAS where standards are available. Inconsistencies should be brought to the attention of the laboratory or identified in the data review summary report.

SOP # S13

MACTEC STANDARD OPERATING PROCEDURE #S13

SOIL SAMPLE COLLECTION PROCEDURE

April 20, 2020

New York State Department of Environmental Conservation

Program QAPP – D009809

Revision 0

APPROVED:

Charles R Staples

April 27,2020

Charles Staples, PG, Program Technical Lead — Date

Reviewed — Date

_____ _____

_____ _____

_____ _____

SOIL SAMPLE COLLECTION PROCEDURE

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to describe the methods used for obtaining surface and subsurface soil samples for physical, geotechnical, or chemical analysis. Collection of soil samples for laboratory analysis for volatile organic compounds may require specially prepared containers, syringes, or Encore samplers. This SOP also describes the procedures for using the various types of sampling equipment, which include shovels, trowels, and hand-augers.

This procedure is not intended to obviate the need for professional judgment to accommodate unforeseen circumstances. Deviation from this procedure must be approved by the project manager and documented in the field logbook and/or field data records.

2.0 REFERENCES

ASTM International (ASTM), 2018. Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils, Method D1586-18.

ASTM, 2017a. Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System), Method D2487-17e1.

ASTM, 2017b. Standard Practice for Thick Walled, Ring-Lined, Split Barrel, Drive Sampling of Soils, Method D-3550-17.

ASTM, 2015. Standard Practice for Thin-Walled Tube Sampling of Fine-Grained Soils for Geotechnical Purposes, Method D1587-15.

Barth, D.S. and B.J. Mason. 1984. Soil Sampling Quality Assurance User's Guide. EPA-600/4-84-043. Revised 4/16/2004.

Mason, B.J. 1983. Preparation of Soil Sampling Protocol: Techniques and Strategies. EPA-600/4-83-020.

Hewitt, Alan D., et al. 2007. Protocols for Collection of Surface Soil Samples at Military Training and Testing Ranges for the Characterization of Energetic Munitions Constituents. U.S. Army Corps of Engineers. ERDC/CRREL TR-07-10..

3.0 DEFINTITIONS

Borehole - Any hole drilled or hydraulically driven into the subsurface for the purpose of identifying lithology, collecting soil samples, and/or installing monitoring wells.

Core Sampler – A metal tube (probe rod), generally 4- to 5-feet long by 2.25- to 3.25-inch OD, typically utilized along with drive rods and a polyvinyl chloride (PVC) or acetate or equivalent liner that is used to collect soil cores utilizing a direct-push rig.

Composite Samples – Composite samples are comprised from at least two grab samples that are thoroughly mixed in a decontaminated bowl to be representative of an area, transect, or vertical section. The result typically is considered an average concentration of the depth interval sampled.

Shelby Tube Sampler – A thin-walled metal tube used to recover relatively undisturbed samples. These tubes are available in various sizes, ranging from 2 to 5 inches in outside diameter and 18 to 54 inches in length. A stationary piston device is included in the sampler to reduce sampling disturbance and increase sample recovery.

Split-Spoon Sampler – A steel tube, split in half lengthwise, with the halves held together by threaded collars at either end of the tube.

Grab Samples – A soil sample that is collected from a specific discrete interval by using such devices as stainless-steel spoon, scoop, sampling device (e.g. syringe, EnCore samplers), or sample container (e.g., wide-mouth jar).

4.0 PROCEDURES

This section contains both the responsibilities and procedures involved with soil sampling. Proper procedures are necessary to ensure the quality and integrity of the samples.

4.1 Responsibilities

Project Manager

The project manager (PM) is responsible for ensuring that sample collection activities are conducted in accordance with this SOP and any other appropriate procedures based on the objectives of the sampling.

Field Operations Lead

The field operations lead (FOL) is responsible for periodic observation of field activities and review of field generated documentation associated with this SOP. The FOL is also responsible for implementation of corrective action (i.e. retraining personnel, additional review of work plans and SOPs, variances to QC sampling requirements, issuing non-conformances, etc.) if problems occur.

Field Personnel

Field personnel assigned to sampling activities are responsible for completing tasks according to specifications outlined in this SOP and other appropriate procedures. All staff are responsible for reporting deviations from procedures to the PM or FOL and documenting them in field data records (FDRs) and/or the field logbook.

4.2 Preparation

Equipment Selection and Sampling Objective Considerations

Specific sampling equipment and methodology will be dictated by the characteristics of the soil to be sampled, field conditions, the type of soil samples required by the project, and the analytical procedures to be employed.

Surface Soils

Soil samples obtained from the near surface (0-2 ft bgs) may be collected using a shovel, trowel, bucket auger, or stainless-steel spoon and bowl. The type of analysis required (e.g., grain-size distribution, physical, chemical) will require specific soil amounts or the use of specialized sampling equipment. Sampling locations or sampling design will be identified in the site specific Field Activities Plan (FAP).

A hand-auger can be used to extract shallow soil samples from depths as deep as three to four feet below the surface. Representative samples are collected directly from the bucket auger after withdrawal from the ground, or in soft soils from a tube sampler attached to the end of auger rods.

Subsurface Soils

Soil samples collected from greater than 2 ft bgs, typically require speciailized equipment such as a drill rig or excavator, depending on site conditions.

Equipment used to collect surface or subsurface soil samples may include, but is not limited to, the following items:

Sample devices and processing materials:

- Stainless steel spoons/trowels.
- Stainless steel hand auger.
- Stainless steel split spoon, split barrel, or continuous sampler.
- Stainless steel bowls/pans.
- Aluminum foil/pans.
- Metal/plastic scraper
- Sample jars and labels.
- Plastic sheeting.
- Appropriate decontamination equipment (e.g. stainless-steel deionized water spraying devices).
- Appropriate personnel protective equipment and safety equipment as specified in the Health and Safety Plan.

Sample handling materials:

- Sample cooler with bagged ice.
- Bubble wrap.
- Paper towels.
- Tape.
- Ziplock freezer bags

Sample description/Record keeping materials:

- Field logbook and boring log.
- Pens with waterproof ink.
- Field data records (FDRs; **examples attached**)
- Chain-of-Custody forms.
- Munsell Soil Color charts.
- Grain size charts; and
- Hand lens.

4.3 Field Procedures

Decontamination

Each piece of sampling equipment shall be decontaminated before initiation of sampling operations and between each sample location and interval. Decontamination procedures will be described in the project work plan but typically consist of a wash and scrub with potable water, brushes and Alconox®/Liquinox® soap followed by a DI water rinse. Refer to the **Field Equipment Decontamination SOP** for guidance. Spent decontamination fluids will be containerized properly, labeled, and appropriately disposed of as addressed in the FAP.

Sample Collection – Surface soils

Upon reaching the sampling location specified in the FAP. Prepare the sampling location by removing all surface materials that are not to be included in the sample (i.e., rocks, twigs, and leaves). Sod (grass and roots) should be remove using a shovel and placed to one side prior to sampling. Record pre-existing surface conditions on the Surface Soil FDR (**examples attached**).

Advance the sampler (shovel, trowel, hand auger, or tube sampler) to the required sample depth. Obtain a sufficient quantity of soil for the desired chemical or physical analyses. If volatile organic compound (VOC) or volatile petroleum hydrocarbon (GRO) samples are scheduled, they should be collected immediately based on the requirements and containers provided by the analytical laboratory. See the **Field Preservation of VOC and GRO Soil Samples SOP** for specific procedures for collection and field preservation of VOC Soil Samples. These samples should be collected directly from the sampler or from the excavated area.

The remaining soil should then be composited in a stainless-steel bowl for all other analytical parameters. Select the appropriate sample container and place the sample in the container. Describe the soil in accordance with Unified Soil Classification System (USCS) soil classification system (Refer to the **Description and Identification of Soil Samples SOP**).

Upon completion of collection of the surface soil sample, backfill the location using the excavated soils and replace sod if required.

Record all observations on the appropriate FDR (surface soil or soil boring; **example attached**) and field logbook. Mark and label sample location with flagging or a pin flag and survey the point using GPS or collect measurements from three identifiable points and record measurements and a diagram in the field logbook or field data record.

Sample Collection – Subsurface soils

Subsurface soils are typically collected during a drilling program and are collected from sample tooling as specified in the FAP. Upon reaching the required sample depth utilizing one of the drilling methods outlined in the FAP and appropriate drilling method SOP (**See SOP Table A-1 for appropriate SOP**), retrieve the sample tooling and prepare for sample collection. Alternatively samples may be collected from a test pit excavation (**Test Pit Oversight SOP**).

Complete core splitting and logging as described in the **Drilling - Soil Boring and Rock Coring Oversight SOP**. Describe the soil in accordance with USCS soil classification system (Refer to the **Description and Identification of Soil Samples SOP**).

If VOC or GRO samples are scheduled, they should be collected immediately after field screening based on the requirements and containers provided by the analytical laboratory. See the **Field Preservation of VOC and GRO Soil Samples SOP** for specific procedures for collection and field preservation of VOC Soil Samples. These samples should be collected directly from the sampler.

The remaining soil should then be composited in a stainless-steel bowl for all other analytical parameters. Select the appropriate sample container and place the sample in the container. If sufficient soil was not obtained for all analysis, additional borehole attempts at the same sample depth may be required.

Repeat this sampling procedure at the intervals specified in the project FAP until the bottom of the borehole is reached and/or last sample collected.

Record all observations on the appropriate FDR (**example attached**) and field logbook. Mark and label sample location with flagging or a pin flag and survey the point using GPS or collect measurements from three identifiable points and record measurements and a diagram in the field logbook or field data record.

Sample Handling

Upon collecting the required amount of soil, cap and label the sample container. Care should be taken to clean the sample container threads using paper towels prior to capping. The outside of the container should also be cleaned.

Clear tape should be used to wrap around the completed label to preserve legibility and prevent loss of the label during handling in wet conditions. Do not tape labels for samples collected for VOC or GRO analysis (See the **Field Preservation of VOC and GRO Soil Samples SOP**).

Place samples into a cooler with ice and begin specified storage and preservation procedures.

Samples will be labelled, handled, and transported in accordance with **Chain of Custody Procedures SOP**, the QAPP, and site-specific FAP.

5.0 ATTACHMENTS

Surface Soil Sampling Field Data Record

Soil Boring Field Data Record

Test Pit Field Data Record

SOIL BORING LOG

MACTEC

511 Congress Street, Portland Maine 04101

Project Name:			Boring ID:
Project Location:			Page No.
Project No.:	Client:		of:
Boring Location:	Refusal Depth:	Total Depth:	Bore Hole OD:
Weather:	Soil Drilled:	Drilling Method:	Casing Size:
Subcontractor:	Rock Drilled:	Protection Level:	Sampler:
Driller:	Date Started:	Date Completed:	Sampler ID/OD:
Rig Type/Model:	Logged By:	Checked By:	
Reference Elevation:	Water Level:	Time:	

Drilling Information					Sample Information					
Depth (feet bgs)	Sample Number	Penetration (ft) / Recovery (ft)	Blow Counts	N Value	PID Field Screening (ppm)	PID Head Space Reading (ppm)	Analytical Sample Depth (ft)	Sample Description and Classification	USCS Classification	Remarks

NOTES:

TEST PIT RECORD

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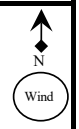
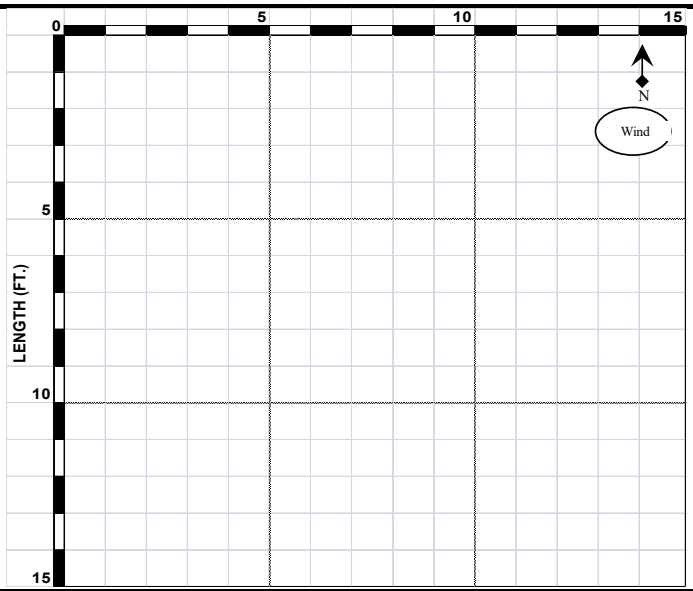
Project Name:		Test Pit ID:
Project Location:		Page No. 1
Project No.:	Client: NYSDEC	of: 1

Test Pit Location:	Monitoring Equipment:	**Location Sketch**
Weather:	Photographs (Y/N): Protection Level:	
Surface Conditions:	Length of Exc: Width of Exc:	
Subcontractor:	Date Started: Date Completed:	
Operator:	Logged By: Checked By:	
Equipment:	Refusal Depth: Total Depth:	
Reference Elevation:	Water Level: Time:	

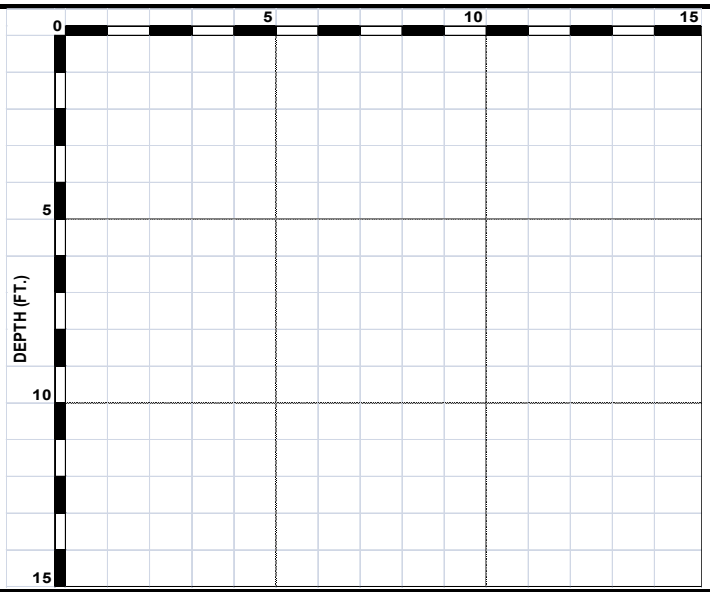


Sample Information			Monitoring						
Depth (ft. bgs)	Sample No. & Type	Pocket Pen/ Torvane (Kg/cm^2)	PID Field Scan	PID Headspace	Lab Tests Performed	Lab Sample ID	Sample Description and Classification	USCS Group Symbol	Remarks

PLAN VIEW



CROSS-SECTIONAL VIEW



NOTES:

SOP # S17

MACTEC STANDARD OPERATING PROCEDURE #S17

DIRECT PUSH SAMPLING

April 20, 2020

New York State Department of Environmental Conservation

Program QAPP – D009809

Revision 0

APPROVED:

April 27. 2020

Jean Firth, PG, Program Manager — Date

Reviewed — Date

_____ _____

_____ _____

_____ _____

DIRECT PUSH SAMPLING

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes methodologies using a direct-push sampling system (e.g. GeoProbe®) that may be used to conduct soil, groundwater, or soil vapor sampling surveys. This technology can be used to collect samples for off-site laboratory analysis or provide screening information that can be used to optimize the future location of soil borings and monitoring well installations and to assess contamination in the vadose zone and saturated overburden.

This procedure is not intended to obviate the need for professional judgment to accommodate unforeseen circumstances. Deviation from this procedure must be approved by the project manager and documented in the field logbook and/or field data records.

2.0 REFERENCES

ASTM International (ASTM), 2017. Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); ASTM D2487-17e1.

Barth, D.S. and B.J. Mason. 1984. Soil Sampling Quality Assurance User's Guide. EPA-600/4-84-043.

Mason, B.J. 1983. Preparation of Soil Sampling Protocol: Techniques and Strategies. EPA-600/4-83-020.

3.0 DRILLING METHODOLOGY

The direct push drilling technique consists of a hydraulic ram unit, usually mounted on a vehicle (ATV, cargo van, or pick-up truck) or drill rig that advances small diameter drill rods to obtain overburden soil, install piezometers and temporary wells for groundwater sampling, and install sample points for vapor samples. Advantages utilizing the method over traditional test boring drilling methods for environmental investigations include low cost, increased maneuverability and access to irregular terrain, and minimization of investigation derived wastes. Disadvantages include depth limitations and small sample volumes for chemical analyses.

The direct push device may employ either dual tube methodology which allows the collection of subsurface soil samples through an outer casing that is set to maintain the integrity of the boring or single-rod method that collects soil into a sleeve liner within the lead rod.

In the dual-tube method borings are advanced by simultaneously driving an outer stainless-steel casing and inner polycarbonate (Lexan®) or acetate tube into the ground. Upon reaching the desired penetration depth, the inner sample tube is withdrawn to collect the discrete subsurface soil samples, leaving the outer casing in place. To sample the next interval of soil, a new length of Lexan® tubing is then inserted into the outer casing (already in the ground) attached to a length of drive pipe, and another length of outer casing is attached to the top of the outer casing that is already in the ground.

In the single-rod method, ¾-inch diameter rods are advanced in 4 to 5-ft sections depending on the length

of the sampler. The lead section is fitted with an inner acetate sleeve. When the top of the desired sampling interval is reached, a tool is used to unlock the drive point and the rod is driven ahead to obtain the soil sample. The entire drill rod is retrieved, and the liner removed for characterization. The process is then repeated to collect the next desired sample. This process may be modified to collect groundwater samples or soil gas samples. Procedures for collecting groundwater or vapor samples will be outlined in the FAP, if required.

4.0 PROCEDURES

This section contains both the responsibilities and procedures involved with direct push sampling oversight and sampling. Proper procedures are necessary to ensure the quality and integrity of the samples.

4.1 RESPONSIBILITIES

Project Manager

The project manager (PM) is responsible for ensuring that sample collection activities are conducted in accordance with this SOP and any other appropriate procedures. This will be accomplished through staff training. The PM will select the appropriate sampling methodology and analytical program based on the objectives of the sampling.

Field Operations Lead

The field operations lead (FOL) is responsible for periodic observation of field activities and review of field generated documentation associated with this SOP. The FOL is also responsible for implementation of corrective action (i.e. retraining personnel, additional review of work plans and SOPs, variances to QC sampling requirements, issuing non-conformances, etc.) if problems occur.

Field Personnel

Field personnel assigned to sampling activities are responsible for completing tasks according to specifications outlined in this SOP and other appropriate procedures. All staff are responsible for reporting deviations from procedures to the PM or FOL.

4.2 Preparation

Utility Locate

Prior to mobilizing to a site, the PM or FOL will ensure that the local utility “one call” service has been notified (e.g. Dig Safely New York). Typically the drilling subcontractor will be resposnsible to call in the utlity ticket. Confirmation of the notifcation and the ticket number will be requested by the PM or FOL for the public records. No work may procede at the site until the ticket has been logged and all ultilities have responded/marked out.

If conducting borings at an active site, the project or field engineer/geologist must contact the appropriate site personnel necessary to receive clearance to drill at specified locations. The names of the personnel authorizing clearance will be documented in the field logbook. The exact location of each boring shall also be reviewed by responsible site personnel to ensure that the area is free of the facility-owned buried utilities. Surface geophysics may be conducted to identify the locations of subsurface facility-specific structures (e.g., drain lines, septic tanks, etc..) and soft dig methods (hand clearing with shovels, post hole diggers, hand augers) may be required.

Direct push locations shall be no closer than 25 feet to overhead utilities or within 5 feet of buried utilities. Direct push methodology allows for small diameter borings that minimize ground disturbance. If project requirements dictate use in proximity to utilities, borings may be advanced if the proper health and safety considerations are applied (e.g. pre-clearing)

Upon arrival at the site the FOL will complete the Utility Clearance Form (**example attached**) to document that utility locate activities and mark out have been completed prior to the initialization of drilling activities.

Equipment Selection and Sampling Considerations

The following materials will be available, as required, during the subsurface soil sampling:

- Personal protective equipment (PPE), monitoring equipment, and other health and safety equipment as specified in the project specific health and safety plan.
- decontamination equipment as specified in the QAPP.
- Stainless steel trowels or spatulas.
- Aluminum Foil.
- Paper Towels.
- Measuring device (e.g. engineer's scale tape or rule).
- Appropriate sample containers and Field Data Records (FDR).
- Photoionization detector (PID).
- Camera
- Field knife with hook blades (if liner sleeves are used to collect the soil samples).
- Field notebook.
- Appropriate decontamination equipment (steam cleaner, materials for a decon pad, etc.) as necessary.
- Drums for IDW containment as specified in the work plans.
- Piezometer construction materials if specified in the FAP.

4.3 Field Procedures

Documentation

In the field book, the supervising geologist/engineer shall record the name of the drilling firm and the names of the driller and his assistant(s). The date, project location, project number, and weather conditions shall be recorded as well.

An accurate time log of drilling activities shall be kept. This log shall be kept in the field logbook and shall include at a minimum, the following:

- Time driller and rig arrive on site
- Time drilling begins
- Any delays in the drilling activities and the cause of such delays
- Time drillers go off site
- Duration of decontamination and investigation derived waste handling
- Down time (those periods when drilling activities cease due to equipment malfunctions, weather, and ordered stoppages)

Monitoring equipment for field screening (PID) and community air monitoring programs (CAMP) will be calibrated daily as per manufacturer's instructions. Equipment information (make, model, and serial number) and calibration readings shall be recorded on the field instrument calibration record (**example attached**). Make note of calibration variances or spanning to non-standard specifications.

Soil boring information including standard penetration depth information, sampling intervals, and soil descriptions will be recorded on the Soil Boring Log FDR (**example attached**). See **the Description and Identification of Soil Samples SOP (see Table A-1 for SOP #)** for soil identification and description methodology.

Field Methodology

The direct-push explorations shall be completed by a qualified direct-push subcontractor, and directed by a qualified field person.

The following procedures will be employed to collect subsurface soil samples. Assembly, advancement, retrieval and opening of the sampler will be completed by the driller.

1. Identify sample locations from the FAP and note the locations in field notebook by measuring 3-point ties to physical features.
2. Drilling contractor will set up an equipment decontamination area and decontaminate equipment as described in the FAP and in accordance with the **Equipment Decontamination SOP S20 (see Table A-1 for SOP #)**. Use new, clean materials for when decontamination is not appropriate

(e.g., disposable gloves and dedicated drive points). Document the decontamination procedure in the field notebook.

3. The driller will assemble the appropriate direct-push sampling apparatus or other direct push tool. Soil samples will be collected using a four to five-foot long 1-to-2-inch diameter core sampler. The FAP will determine if a dual tube split-spoon system or a single rod acrylic liner method will be used for the collection of subsurface soil samples.
4. The driller will drive the sampling tools to the appropriate sampling zone and collect a sample. Retrieve the sampler using an appropriate lifting apparatus (winch or lift hook). Remove the sampler shoe and retrieve the sample in the sample liner.
5. Upon the sampling table the liner will be opened by cutting lengthwise using a hook bladed utility knife or similar cutting implement. Once opened the field staff will prepare a fresh face by using a clean flat edged scraper (e.g. paint scraper) in perpendicular motions to the liner. The resultant fresh face will be screened using a PID for volatiles and carefully examined, noting all soil characteristics, color seam, disturbance, etc. (see the **Description and Identification of Soil Samples SOP identified on Table A-1**). For the field screening of the sample the PID inlet should be just above the soil surface and a hand should be cupped over both for an interval for a period of several seconds to get an accurate reading. This allows for the buildup of VOCs for measurement without interference from ambient air. Colder temperatures will inhibit volatilization and may require longer screening times to get accurate readings.
6. Field staff will take photographs of the soil in the sampler. The sampler should be placed in a good light, preferably against a solid colored background. A ruler for scale and a tag identifying the sample should be placed in the picture. The identifier tag must have the sample number, depth and project name or number written so as to be legible in the photograph. Any photographs taken must be recorded on the FDR.
7. Field staff will collect a representative sample, selected based on the sampling objectives outlined in the FAP and is collected using the appropriate sampling method and container as outlined in **SOPs for Soil Sampling and Field Preservation of VOC and GRO Soil Samples (see Table A-1 for SOP #s)**.
8. Following the collection of representative samples for chemical and/or geotechnical analyses, remaining soil material will be collected into a separate container for VOC headspace screening (see below).
9. Steps 4 to 8 will be repeated, as necessary, until the bottom of the borehole, as outlined in the FAP, is reached (e.g. refusal or a predetermined depth). Frequency of sample collection will either be continuous or at predetermined depths.

10. If a temporary well or piezometer is to be installed see **the Monitoring Well and Microwell Installation SOP (see Table A-1 for SOP#)** for methodology and installation details.
11. The approximate location of the boring will be marked with a wood stake colored with highly visible spray paint and/or flagging. The boring number will also be written on the stake to identify the sample location for surveying purposes.
12. Decontaminate non-disposable equipment or tools that may have come into contact with subsurface soil in accordance with the FAP.
13. Discard all disposable equipment used during sampling activities in a designated location.

Records of each exploration shall be made on a Soil Boring Log (**example attached**) and in the field logbook. All cuttings or other waste will be containerized or disposed of in accordance with planning documents.

Abandonment of Boreholes

After drilling, logging and/or sampling, boreholes should be backfilled by the method required by the applicable agency and described in the project FAP. This typically consists of backfilling to the surface with bentonite chips, pellets or bentonite-cement grout. If bentonite chips or pellets are used, they should be added to the borehole in two-foot lifts and hydrated with water from a potable water supply. This process should be repeated until the entire borehole is plugged using no less than five gallons' water per ten feet of borehole. The surface hole condition should match the pre-drilling condition (asphalt, concrete, or smoothed flush with native surface), unless otherwise specified in the FAP.

Soil Headspace Screening

The purpose of the soil headspace screening procedure is to screen soil sample headspaces for total ionizing VOCs. This is a semi-quantitative method used to identify the presences, absence, and relative concentrations of VOCs in soil. Headspace screening is performed with a photoionization detector (PID). Headspace readings may be completed in between sample runs. Headspace readings should be transcribed on to the soil boring log FDR.

1. Record and document background VOC readings in ambient air. If it is not feasible to screen samples in an area with a clean background, document the highest background reading.
2. Half fill a clean jar or Ziplock™ type plastic bag with soil. Quickly cover the jar with aluminum foil or close the plastic bag and label the container.
3. Vigorously shake the sample to disperse soil and wait for approximately 5 minutes. Record the ambient temperature at which screening is performed. If outside temperatures are below 50°F, try to warm the samples in a heated vehicle or building.
4. Shake the sample again after 5 minutes.

5. Insert the tip of the PID through the foil or into the plastic bag and record the highest meter response, typically after approximately 3 to 15 seconds.
6. After screening all samples, re-check background and record significant variations.

The PID has a reliable reporting limit of 1 part per million in air. Readings at or below the reporting limit should be reported as not-detected "ND".

Screening results will vary based on sample temperature, compounds present, age of the sample, and the degree to which the sample has been agitated and crumbled. Field personnel should remain consistent in their headspace measurement methodology to avoid biasing samples.

5.0 ATTACHMENTS

Utility Clearance Form

Soil Boring Log

Field Instrument Calibration Record

Utility Clearance Form

Site Name: _____ Project No./Task No.: _____

Site Address: _____ One Call Ticket No.: _____

Ticket Good until: _____

Project Manager Name: _____ PM Phone No.: _____

Locations cleared by facility? _____ Date Cleared: _____

Utility Clearance:

Potential Utilities		Identified		Colors	Utility Company Name(s)	Utilities
Member of One Call	*Non Members	Utility Marked	Utility Responded not Present			
						WHITE - Proposed Excavation
						****PINK** - Temporary Survey Markings
						RED - Electric Power Lines, Cables, Conduit and Lighting Cables
						YELLOW - Gas, Oil, Steam, Petroleum or Gaseous Materials
						ORANGE - Communication, Alarm or Signal Lines, Cables or Conduit
						BLUE - Potable Water
						PURPLE - Reclaimed Water, Irrigation and Slurry Lines
						GREEN - Sewers and Drain Lines

*Contact local municipality

** Survey markings need to be protected. If disturbed or destroyed, replace markings.

Private Utility Locator/Geophysical Survey

Method to be used:
___ Pipe and Cable Location
___ Ground Penetrating Radar
___ Magnetics and Electromagnetics

Non-Destructive Excavation Method to be used

___ *Hand Dig
___ Soil Vacuum
___ Air Knife
___ Water Knife

* Use electrically insulated gloves if potential for power lines

Field Clues Observed/Evaluated:

___ Overhead power lines
___ Cell phone/radio antennas
___ Trench patches
___ Trench settlement
___ Trench drains
___ Utility manholes
___ Manholes just outside building
___ Valve risers
___ Floor cleanout covers
___ Floor drains
___ Patches in concrete floors
___ Drainage ditches in area
___ Utility vaults
___ Transformer pads
___ Conduits from power panels into slab
___ Above ground propane tanks
___ Fire protection rooms
___ Fire protection lines
___ Fire hydrant locations – valves in ground
___ Footings under structural columns
___ Guard shack – service utilities
___ Bathroom and kitchen facilities
___ Radiant heat systems in slabs (ask)
___ Cooling units outside building
___ Process water to equipment in factory
___ Sprinkler system landscaping
___ Grounding systems near perimeter
___ Water tower on site.
___ Foundation drains - building perimeter

Additional Notes/Remarks: _____

_____

Confidence Level that All Utilities have been identified:

___ High ___ Medium High ___ *Moderate ___ *Medium Low ___ *Low

*Contact PM. Get PM and OM permission prior to proceeding

*Cleared by PM? _____ *Cleared by OM? _____

SOIL BORING LOG

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Project Name:			Boring ID:
Project Location:			Page No.
Project No.:	Client:		of:
Boring Location:	Refusal Depth:	Total Depth:	Bore Hole OD:
Weather:	Soil Drilled:	Drilling Method:	Casing Size:
Subcontractor:	Rock Drilled:	Protection Level:	Sampler:
Driller:	Date Started:	Date Completed:	Sampler ID/OD:
Rig Type/Model:	Logged By:	Checked By:	
Reference Elevation:	Water Level:	Time:	

Drilling Information					Sample Information					
Depth (feet bgs)	Sample Number	Penetration (ft) / Recovery (ft)	Blow Counts	N Value	PID Field Screening (ppm)	PID Head Space Reading (ppm)	Analytical Sample Depth (ft)	Sample Description and Classification	USCS Classification	Remarks

NOTES:

FIELD INSTRUMENT CALIBRATION RECORD

PROJECT NAME: _____ TASK NO: _____ DATE: _____
PROJECT NUMBER: _____ MACTEC CREW: _____
PROJECT LOCATION: _____ SAMPLER NAME: _____
WEATHER CONDITIONS (AM): _____ SAMPLER SIGNATURE: _____
WEATHER CONDITIONS (PM): _____ CHECKED BY: _____ DATE: _____

MULTI-PARAMETER WATER QUALITY METER

METER TYPE _____
MODEL NO. _____
UNIT ID NO. _____

AM CALIBRATION Start Time _____/End Time_____

POST CALIBRATION CHECK Start Time _____/End Time_____

	Units	Standard Value	Meter Value	*Acceptance Criteria (AM)	Standard Value	Meter Value	*Acceptance Criteria (PM)
pH (4)	SU	4.0		+/- 0.1 pH Units			
pH (7)	SU	7.0		+/- 0.1 pH Units	7.0		+/- 0.3 pH Units
pH (10)	SU	10.0		+/- 0.1 pH Units			
Redox	+/- mV	240		+/- 10 mV	240		+/- 10 mV
Conductivity	mS/cm	1.413		+/- 0.5 % of standard	1.413		+/- 5% of standard
DO (saturated)	%	100		+/- 2% of standard			
DO (saturated)	mg/L[1] (see Chart 1)			+/- 0.2 mg/L			+/- 0.5 mg/L of standard
DO (<0.1)	mg/L	<0.1		< 0.5 mg/L			
Temperature	°C						
Baro. Press.	mmHg						

TURBIDITY METER

METER TYPE _____
MODEL NO. _____
UNIT ID NO. _____

	Units	Standard Value	Meter Value	Standard Value	Meter Value	*Acceptance Criteria (PM)
<0.1 Standard	NTU	<0.1		<0.1		+/- 0.3 NTU of stan.
20 Standard	NTU	20		20		+/- 5% of standard
100 Standard	NTU	100		100		+/- 5% of standard
800 Standard	NTU	800		800		+/- 5% of standard

PHOTOIONIZATION DETECTOR

METER TYPE _____
MODEL NO. _____
UNIT ID NO. _____

Background	ppmv	<0.1		<0.1		within 5 ppmv of BG
Span Gas	ppmv	100		100		+/- 10% of standard

O_2-LEL 4 GAS METER

METER TYPE _____
MODEL NO. _____
UNIT ID NO. _____

Methane	%	50		50		+/- 10% of standard
O_2	%	20.9		20.9		+/- 10% of standard
H_2S	ppmv	25		25		+/- 10% of standard
CO	ppmv	50		50		+/- 10% of standard

OTHER METER

METER TYPE _____
MODEL NO. _____
UNIT ID NO. _____

							See Notes Below for Additional Information

☐ Equipment calibrated within the Acceptance Criteria specified for each of the parameters listed above.
☐ Equipment (not) calibrated within the Acceptance Criteria specified for each of the parameters listed above**.

MATERIALS RECORD

Deionized Water Source: Portland FOS
Lot#/Date Produced: _____
Trip Blank Source: Laboratory provided
Sample Preservatives Source: Laboratory provided
Disposable Filter Type: in-line 0.45µm cellulose
Calibration Fluids / Standard Source:
- DO Calibration Fluid (<0.1 mg/L) Portland FOS
- Other _____
- Other _____
- Other _____

	Cal. Standard Lot Number	Exp. Date
pH (4)		
pH (7)		
pH (10)		
ORP		
Conductivity		
<0.1 Turb. Stan.		
20 Turb. Stan.		
100 Turb. Stan.		
800 Turb. Stan.		
PID Span Gas		
O_2-LEL Span Gas		
Other		

NOTES:

* = Unless otherwise noted, calibration procedures and acceptance criteria are in general accordance with USEPA Region 1 SOPs for Field Instrument Calibration (EQASOP-FieldCalibrat) and Low Stress Purging and Sampling (EQASOP-GW001), each dated 1/19/2010. Additonal acceptance criteria obtained from instrument specific manufacturer recommendations.
** = If meter reading is not within acceptance criteria, clean/replace probe and re-calibrate, or use calibrated back-up meter if available. If project requirements necessitate use of the instrument, clearly document any deviations from acceptance criteria on all data sheets and log book entries.
1 = DO Saturated standard value is calculated based on Oxygen Solubility at Indicated Pressure Chart from the USEPA Region 1 SOP for Field Instrument Calibration (EQASOP-FieldCalibrat), dated 1/19/2010.

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FIELD INSTRUMENT CALIBRATION RECORD