APPENDIX A – FIELD SAMPLING PLAN

FINAL FIELD SAMPLING PLAN (FSP)
TONAWANDA COKE SITE
SITES 109 & 110
3875 RIVER ROAD
TONAWANDA, NEW YORK

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LIST OF ACRONYMS

ACRONYM	Definition
ASTM	American Society for Testing and Materials
COC	contaminant of concern
DNAPL	dense non-aqueous phase liquid
DOT	Department of Transportation
EDD	electronic data deliverable
EIM	Enterprise Information Management
ELAP	Environmental Laboratory Approved Program
FSP	Field Sampling Plan
ft bgs	feet below ground surface
HASP	Health and Safety Plan
HDPE	high-density polyethylene
IDW	Investigation Derived Waste
LDPE	low-density polyethylene
LIMS	laboratory information system
LNAPL	light non-aqueous phase liquid
MS/MSD	Matrix Spike/Matrix Spike Duplicates
NTU	nephelometric turbidity unit
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
ORP	oxidation-reduction potential
PET	polyethylene terephthalate
PFAS	Per- and Polyfluoroalkyl Substances
PFOA	perflourooctanoic acid
PFOS	perfluorooctanesulfonic acid
PID	photoionization detector
PPE	personal protective equipment
PSHEP	Project Safety, Health, and Environmental Plan
PVC	polyvinyl chloride
QAPP	Quality Assurance Project Plan
TCC	Tonawanda Coke Corporation
TCLP	Toxicity Characteristic Leaching Procedure
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

1.0 PROJECT DESCRIPTION

1.1 Introduction

This Field Sampling Plan (FSP) has been prepared for the Honeywell field operations at the Tonawanda Coke Site, Sites 109 and 110, located at 3875 River Road, Tonawanda, New York. This FSP covers installation of groundwater monitoring wells, groundwater sampling, surface and subsurface soil sampling, surveying, and test pitting and is intended to be amended as needed to address subsequent site activities.

The objective of this FSP is to outline methods and procedures that will allow consistency in investigatory field activities across a potentially broad range of specific project goals and objectives. The methods and procedures described in this FSP have been prepared in accordance with the most recent and applicable New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (NYSDOH) regulatory guidances and requirements. Health and safety considerations and emergency procedures associated with this project are documented in the site Project Safety, Health, and Environment Plan (PSHEP).

The anticipated scope is described in detail in Section 2 and includes:

- Test pitting
- Groundwater sampling
- Surface soil sampling
- Subsurface soil sampling
- Well installation
- Surveying

One of the contaminants of concern (COC), Per- and Polyfluoroalkyl Substances (PFAS), can be found in many standard environmental sampling materials, including: Fluoropolymer bailer/tubing, some decontamination solutions, and pump bladders/valves. Two of the principal target analytes, perflourooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), have been broadly utilized in the production of various everyday items such as: waterproof/stain-resistant clothing, non-stick cookware, and many commonly used plastics. The field activities and methods herein have been appropriately modified to prevent cross-contamination, and to avoid the introduction of external contaminant sources. **Table 1** includes a summary of prohibited and acceptable items for PFAS sampling. Appendix A provides NYSDEC's Part 375 Remedial Programs Guidelines for Sampling and Analysis of PFAS (January 2020).

2.0 ANTICIPATED FIELD ACTIVITIES

Various field activities will be conducted during execution of the remedial investigation scope of work. Detailed descriptions of procedures and methods for each field activity are provided in Sections 2.2 through 2.9. Field activities that are anticipated are summarized below.

Monitoring Well Installation: Up to seven groundwater monitoring wells will be installed at Sites 109 and 110. Wells will be screened in the fill down to the top of the clay layer, with the top of the screen above the water table. The exact well design will be based on the conditions present, including depth to water table and depth to the clay layer. Soil samples will be collected from each monitoring well location as described under "Soil Borings."

Groundwater Samples: Groundwater samples will be collected from multiple newly-installed monitoring wells as well as one existing well using low-flow methods. PFAS sampling and analysis will follow guidance provided in NYSDEC's "Guidelines for Sampling and Analysis of PFAS."

Test Pits: A series of test pits will be excavated throughout Sites 109 and 110. Test pits will be excavated to the top of clay layer (2 to 10 feet below ground surface [ft bgs]) and soil and fill materials will be visually assessed. Three soil/fill samples will be collected for chemical analysis at select test pit locations from the following depth intervals; 0 to 2 inches below ground surface, 2 to 12 inches below ground surface, and underlying fill. PFAS sampling and analysis will follow guidance provided in NYSDEC's "Guidelines for Sampling and Analysis of PFAS."

Soil Borings: Multiple soil borings (all at Site 109) will be completed and three soil samples (0 to 2 and 2 to 12 inches below grade; underlying fill) will be collected from each boring. Soil borings will be installed to the top of clay (approximately 2 to 10 ft bgs). Soil samples will also be collected from the 0 to 2 and 2 to 12 inch intervals at all new monitoring well locations.

Surveying: Soil boring locations and elevations, monitoring well top of casing elevations, surface elevations and locations, and test pit locations (four corners) will all be surveyed.

Properly collected environmental sample data will be used to conduct a Focused Feasibility Study. The applicable field activities that will be conducted during execution of the remedial investigation, as well as the methods and procedures for each are described in detail in the following sections.

2.1 Sample Nomenclature System

The Field Team Leader will manage data generated in the field. This person or their designee will be responsible for recording and documenting sampling activities in the field logs, on sampling records (as appropriate), and on COC forms (when samples are collected) as described in Section 4.2.2. The records may be photocopied and stored in the project file along with the original.

A sample nomenclature system was developed with the data management team. Each sample name will be unique to include a location ID and field sample ID. The following sample naming conventions will be used for each sampling task:

Groundwater Samples:

Naming Format: Monitoring well ID-Sample Date

Example: MW-5-2020-02052020. Groundwater sample from MW-5-2020

Soil Samples:

Naming Format: Soil boring/Test pit ID-depth interval-Sample Date

Example: SB-2-2020-4-6-02052020. Soil sample from SB-2-2020, from 4 to 6 feet deep, collected on February 5, 2020

Waste Characterization Samples:

Naming Format: Sample number-waste type-date

Examples: IDW-01-SW-10192020 (SW = solid waste collected on October 19, 2020)

IDW-02-LW-10192020 (LW = liquid waste collected on October 19, 2020)

IDW-03-DW-101920 (DW = debris/mixed waste such as sample tubing, PPE, etc. collected on October 19, 2020)

Upon collection of the sample(s), a field team member will affix an identification label to the sample container(s). A label provided by the laboratory may be used or any other label that includes the information provided herein. An example of a label is located in Appendix B. This label must contain, as a minimum, the following information:

- Project Name
- Field Sample ID - The unique number that identifies the sample
- Date of sample collection – use six digit date (mm/dd/yy)
- Time of sample collection - use 24-hour format (hh:mm)
- Sample Medium - Water, soil, sediment, sludge, leachate, etc.
- Sample Method - Grab or Composite
- Preservation - Type of preservation added
- Analyses - use the method reference from the COC, (such as VOA-624 Full Scan, or A2340C Hardness)
- Initials - The initials of the sample collector

The field team leader will create the COC using the approved format provided in Appendix B. The field team leader will be responsible for verifying that information on the COC is consistent with the information recorded in the field book, on the sample log sheets, and on the bottle labels.

The field team leader will transmit the electronic COC to the Data Manager within 24 hours of COC completion. The Data Manager will enter the field sample information into the system and create COC data in EIM. The sample order will match the COC.

Upon entry of COC data, a text file will be generated by the Data Manager who transmits this text file via e-mail to the laboratory for entry in the laboratory information system (LIMS). The text file must be received by the laboratory within 48 hours of receipt of samples.

Within 24 hours of receipt of the text file, the laboratory must send an acknowledgement to the Data Manager indicating all the sample identification numbers and the analyses to be conducted on each sample. The Data Manager will review the acknowledgement and confirm that no errors have been made. If errors are detected, the Data Manager will coordinate with the laboratory to resolve the issue.

The Data Manager will track receipt of preliminary data and electronic data deliverables (EDDs) against the sample receipt date indicated by the laboratory for compliance with contract terms. The Data Manager will issue weekly reports of any data not received within contract terms and elevate any occurrence of non-compliance to the attention of the Project Manager.

2.2 Soil Borings and Test Pits

Soil borings will be advanced to facilitate the collection of soil samples and the installation of monitoring wells. Soil samples will be used to develop an understanding of site-specific subsurface conditions, and to document those conditions. Soil samples will also be submitted for laboratory analysis to evaluate soil quality and potential remedial activities, if necessary.

Depending on site-specific objectives and/or drilling conditions, soil borings may be advanced using hand, direct-push, or conventional hollow stem auger drilling methods. PFAS free solutions such as Alconox® or 7th Generation Free & Clear Dish Soap will be used to decontaminate drill tooling and sampling equipment. **Table 1** includes a summary of prohibited and acceptable PFAS items. A PFAS sampling checklist is included as **Appendix C** and should be filled out daily by field personnel.

2.2.1 Hand Auger

This method can be used to collect shallow soil samples. The advantage of this method is that it can be used in places where overhead utilities or other site conditions do not allow for utilization of direct push or conventional drill methods. The disadvantage is that only shallow borings can be completed using this method and each boring may be time-consuming. When used, the following procedures will be followed by field personnel:

- Soil boring will be advanced by hand using a hand auger or similar hand tool.
- Soil samples retrieved from the borehole will be described for: 1) percent recovery; 2) soil type; 3) color; 4) moisture content; 5) texture; 6) grain size and shape; 7) consistency; 8) evidence of staining or other chemically-related impacts; and 9) any other relevant observations. In addition, soil will be screened with a photoionization detector (PID) to allow evaluation of the bulk volatile organic concentration of each soil sample. Should compound-specific monitoring be required to meet project objectives or by the Health & Safety Plan (HASP), then this monitoring will be conducted using appropriate monitoring devices/meter (i.e., Draeger tubes, mercury vapor analyzer, 4-gas meter, etc.).
- Soils will be described in accordance with the Unified Soil Classification System (USCS) and the modified Burmister system. This descriptive information will be recorded on a soil boring log form. An example of the typical soil boring log form is provided in **Appendix D**.
- Samples for headspace screening will be collected. A representative portion of each soil sample will be placed in a re-sealable plastic (e.g., Ziploc®) bag filled approximately half full. The bag will be labeled with the boring number and interval sampled. After allowing the bagged soil to warm, the tip of the sample probe attached to the PID will be inserted into the bag to measure the headspace for organic vapors.
- Soils collected for headspace screening will not be used for laboratory analysis, rather the sample will be taken directly from the auger. Soil samples collected for laboratory analysis will be submitted to an approved NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratory. Analyses will be conducted using U.S. Environmental Protection Agency (USEPA) methodologies. Samples will be managed in accordance with the Quality Assurance Project Plan (QAPP).
- Soils extracted during the advancement of the hand-augered borings will be used to backfill the boring, provided that the boring is not to be used for installation of a monitoring well. However, soils that exhibit "gross" contamination, as evidenced by staining or free-phase product, or any visual, olfactory, or high PID readings, will be managed in accordance with **Section 2.9**. In this event, bentonite chips or pellets will be used to backfill the boring(s).
- Hand tools will be decontaminated between each boring in accordance with methods specified in **Section 2.8**.
- Decontamination water will be handled in accordance with **Section 2.9**.

- The boring location will be surveyed.

2.2.2 Direct Push Method

This drilling method is typically used to collect shallow overburden soils and create boreholes for temporary or permanent (using pre-pack screens) monitoring well installations. This method is advantageous in that it typically allows for the advancement of numerous borings in a relatively short period of time. The disadvantage of this method is that it is typically limited to shallow overburden soils (less than 50 feet below grade) which exhibit relatively low densities. When used, the following procedures will be followed by field personnel:

- Soil samples will be collected continuously from the ground surface to the bottom of the borings using four-foot long, MacroCore™ samplers using PFAS free acetate liners.
- Soil samples retrieved from the borehole will be described for: 1) percent recovery; 2) soil type; 3) color; 4) moisture content; 5) texture; 6) grain size and shape; 7) consistency; 8) evidence of staining or other chemically-related impacts; and 9) any other relevant observations. In addition, soil will be screened with a photoionization detector (PID) to allow evaluation of the bulk volatile organic concentration of each soil sample. Should compound-specific monitoring be required to meet project objectives or by the Health & Safety Plan (HASP), then this monitoring will be conducted using appropriate monitoring devices/meter (i.e., Draeger tubes, mercury vapor analyzer, 4-gas meter, etc.).
- Soils will be described in accordance with the Unified Soil Classification System (USCS) and the modified Burmister system. This descriptive information will be recorded on a soil boring log form. An example of the typical soil boring log form is provided in **Appendix D**.
- Samples for headspace screening will be collected. A representative portion of each soil sample will be placed in a re-sealable plastic (e.g., Ziploc®) bag filled approximately half full. The bag will be labeled with the boring number and interval sampled. After allowing the bagged soil to warm, the tip of the sample probe attached to the PID will be inserted into the bag to measure the headspace for organic vapors.
- Soils collected for headspace screening will not be used for laboratory analysis, rather the sample will be taken directly from the liner/spoon. Soil samples collected for laboratory analysis will be submitted to an approved NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratory. Analyses will be conducted using U.S. Environmental Protection Agency (USEPA) methodologies. Samples will be managed in accordance with the Quality Assurance Project Plan (QAPP).
- Soils extracted during the advancement of the direct-push borings will be used to backfill the boring, provided that the boring is not to be used for installation of a monitoring well. However, soils that exhibit "gross" contamination, as evidenced by staining or free-phase product, or any visual, olfactory, or high PID readings, will be managed in accordance with **Section 2.9**. In this event, bentonite chips or pellets will be used to backfill the boring(s).
- Drilling equipment will be decontaminated between each boring in accordance with methods specified in **Section 2.8**.
- Decontamination water will be handled in accordance with **Section 2.9**.
- The boring location will be surveyed.

2.2.3 Conventional Drill Rig Methods

Typical drilling methods used to collect shallow and deeper overburden soils and create boreholes for monitoring well installations include:

- Hollow stem augers
- Drive and wash or spin and wash flush joint casing

- Fluid rotary methods (using potable water only)
- Air rotary

These drilling methods typically allow for the advancement of borings through most soil types including denser soils (e.g., glacial till), and when coupled with split spoon sampling conducted in accordance with American Society for Testing and Materials (ASTM) Method D1586, can provide geotechnical information. When used, the following procedures will be followed by field personnel:

- Soil samples will be collected continuously from the ground surface to the bottom of the borings using 2-inch diameter split-barrel samplers in accordance with ASTM Method D1586.
- Soil samples retrieved from the borehole will be described for: 1) percent recovery; 2) soil type; 3) color; 4) moisture content; 5) density; 6) texture; 7) grain size and shape; 8) consistency; 9) evidence of staining or other chemically-related impacts; and 10) any other relevant observations. In addition, soil will be screened with a PID to allow evaluation of the bulk volatile organic concentration of each soil sample. Soils will be described in accordance with the USCS and the modified Burmister system. This descriptive information will be recorded on a soil boring log form. An example of the typical soil boring log form is provided in **Appendix D**.
- Samples for headspace screening samples will be collected. A representative portion of each soil sample will be placed in a re-sealable plastic (e.g., Ziploc®) bag filled approximately half full. The bag will be labeled with the boring number and interval sampled. After allowing the bagged soil to warm, the tip of the sample probe attached to the PID will be inserted into the bag to measure the headspace for organic vapors.
- Soil samples for laboratory analysis will be submitted to an approved NYSDOH ELAP-certified laboratory. Analyses will be conducted using USEPA methodologies as specified in the Work Assignment Scoping Documents. Samples will be managed in accordance with the QAPP.
- Soils extracted during the advancement of the hollow stem auger borings will be managed in accordance with **Section 2.9**.
- Drilling equipment will be decontaminated between each boring in accordance with methods specified in **Section 2.8**.
- Decontamination water will be handled in accordance with **Section 2.9**
- The boring location will be surveyed.

2.2.4 Test Pits

Test pits will be excavated using a backhoe. Test pitting can provide an opportunity to collect soil samples from the shallow subsurface and can expose a larger area of the subsurface to be observed compared to traditional drilling or direct-push methods. Analytical soil samples can be collected from the test pit wall only when the slope is stable, access to the test pit can be easily made, the test pit is less than three feet deep, and a PID and 4-gas meter have confirmed that the conditions allow entry to the pit. Analytical soil samples may also be collected from the excavator bucket. When collecting the soil sample, the soil that has contacted the excavator bucket should be avoided.

When test pits are used, the following procedures will be followed by field personnel:

- Soil and fill in the test pit will be described for: 1) soil type; 2) color; 3) moisture content; 4) density; 5) texture; 6) grain size and shape; 7) consistency; 8) evidence of staining or other chemically-related impacts; and 9) any other relevant observations. In addition, soil will be screened with a PID to allow evaluation of the bulk volatile organic concentration of each lithology. Soils will be described in accordance with the USCS and modified Burmister system. This descriptive information will be recorded.
- Samples for headspace screening samples will be collected. A representative portion of each soil sample will be placed in a re-sealable plastic (e.g., Ziploc®) bag filled approximately half full. The bag will be labeled

with the boring number and interval sampled. After allowing the bagged soil to warm, the tip of the sample probe attached to the PID will be inserted into the bag to measure the headspace for organic vapors.

- Soil samples for laboratory analysis will be submitted to an approved NYSDOH ELAP-certified laboratory. Analyses will be conducted using USEPA methodologies as specified in the Work Assignment Scoping Documents. Samples will be managed in accordance with the QAPP.
- Soils extracted during the test pit will be managed in accordance with **Section 2.9**.
- The backhoe will be decontaminated between each test pit in accordance with methods specified in **Section 2.8**.
- Decontamination water will be handled in accordance with **Section 2.9**
- The four corners of the test pit will be surveyed.

2.3 Monitoring Well Installation and Construction

Monitoring wells will be used to evaluate the hydrogeologic conditions and groundwater quality. Monitoring wells will be installed to allow characterization of groundwater levels, groundwater flow systems, and groundwater quality. Traditional best practice techniques and procedures shall be subject to modification to prevent the introduction of non-site-derived contaminants including PFAS into target samples as discussed in **Sections 1 and 2**. **Table 1** includes a summary of prohibited and acceptable PFAS items. A PFAS sampling checklist is included as **Appendix C** and should be filled out daily by field personnel.

2.3.1 Monitoring Wells

The scope of work for this project includes installation of monitoring wells in the fill material (overburden) overlying a clay rich layer. Thickness of the fill layer is variable and ranges between approximately one and 10 feet at the site. Monitoring wells will be installed with screens in the fill material.

Monitoring well borings will be advanced using the most appropriate drilling method for subsurface conditions as described above in **Section 2.2.2**. During boring advancement, soil samples will be collected at continuous two-foot intervals using two-inch diameter split barrel samplers in accordance with ASTM Method D1586 and described for: 1) percent recovery; 2) soil type; 3) color; 4) moisture content; 5) density; 6) texture; 7) grain size and shape; 8) consistency; 9) evidence of staining or other chemically-related impacts; and 10) any other relevant observations. In addition, soil will be screened with a PID to allow evaluation of the bulk volatile organic concentration of each soil sample. Soils will be described in accordance with the USCS and the modified Burmister system. This descriptive information will be recorded on a soil boring log form. An example of the typical soil boring log form is provided in Appendix D.

Monitoring wells will be constructed with two-inch ID, threaded, flush-joint, polyvinyl chloride (PVC) casings and appropriately sized well screens. The well screen, plug, and riser should be certified clean from the manufacturer. If they are not, they will be cleaned using a high-pressure steam cleaner with PFAS-free water. Joints and end caps will be threaded or force fittings. No Teflon tape, solvents, or glues will be used to connect well sections. In general, well screens will be five-feet long, unless greater lengths are required to meet project objectives.

The annulus around the screens will be backfilled with clean silica sand. The volume of filter pack required to fill the annular space will be calculated and compared to the volume installed. This information will be recorded in the field log book. The filter pack will be installed in increments as the augers are withdrawn to enable monitoring of progress and to prevent bridging. If bridging occurs, the bridge will be broken before proceeding with installation. The filter pack should extend below the bottom of the screen and two feet above the top of the screen, if possible based on vertical space between top of screen and ground surface. A finer grained “choke”

sand (100% passing a No. 30 sieve and less than 2% passing the No. 200 sieve) will be installed between the sand pack and the bentonite seal described below.

A bentonite chip or pellet seal with a minimum thickness of two feet will be placed above the filter pack. If the seal is installed above the water table, it will be manually hydrated using potable water. Once the bentonite seal is fully hydrated, a "choke" sand, as described above, will be installed six to 12 inches above the bentonite seal. The remainder of the annular space will be filled with cement-bentonite grout to ground surface using a tremie pipe. The grout will be allowed to set before wells are developed.

Well heads may be completed either above grade, or flush with grade. For above grade completions, the well heads will extend approximately three-foot above grade and will be fitted with a protective casing with a lockable lid. An approximate two-foot diameter concrete well pad will be installed around the protective casing. The well pad will be sloped away from the protective casing to shed surface water away from the well head. The well identification will be clearly visible on the inside and outside of the lid of the protective casing. A drain hole will be installed at the base of the protective casing and vent hole will also be located at the top of the protective casing. A locking well cap will be installed at the top of the protective casing.

Well heads in parking lots, roadways, or other areas accessed by vehicular traffic will be completed flush with grade. Flush-mount curb boxes will be fitted over the well head and will be flush to the surrounding grade. The curb box will be set in an approximate two-foot diameter concrete pad. A locking J-plug will be installed on top of the well.

The top of the well casing and ground surface will be marked and surveyed to 0.01 foot, and the elevation will be determined relative to a fixed benchmark or datum. The measuring point on all wells will be on the innermost PVC casing.

Soil cuttings generated during the advancement of the monitoring well borings will remain onsite.

A Well Completion Log will be completed for each well installed. An example of the Well Completion Log is provided in **Appendix E**.

2.4 Monitoring Well Development

After installation, monitoring wells will be developed to remove the fine material which may have settled within the filter pack and to improve/restore the hydraulic communication with the surrounding formation. Traditional best practice techniques and procedures shall be subject to modification to prevent the introduction of non-site-derived contaminants including PFAS into target samples as discussed in **Sections 1 and 2**. **Table 1** includes a summary of prohibited and acceptable PFAS items.

Monitoring well development will be performed or overseen by a field geologist.

- Development will be performed by surging and purging the well, as appropriate, using either a PVC bailer or Watera pump with HDPE tubing and HDPE or stainless steel surge block. Groundwater parameters will be recorded before, during, and after well development. Parameters will include turbidity, pH, temperature, and specific conductance.
- Water levels will be measured in each well to the nearest 0.01 foot prior to during, and after development. Depth to well bottom will be measured prior to and after development.
- Monitoring wells will be developed until the water discharge from the well is 50 nephelometric turbidity units (NTU) or less, or until pH, temperature, and specific conductivity stabilize, or until a maximum of 10 borehole volumes of the water have been removed. If the well goes dry during development, it will be

allowed to recharge to 80% of initial water level and pumped or bailed again. The well will be considered developed after pumping the well dry three times.

- Well development information will be recorded on a Well Development Log. An example of the Well Development Log is provided in **Appendix F**.
- Ideally, dedicated and/or disposable equipment will be used for well development. However, if non-dedicated well development equipment is used, it will be decontaminated after use in accordance with **Section 2.8**.
- Monitoring well development water will be containerized and discharged to the Town of Tonawanda POTW under RITC's Industrial Sewer Connection Permit No. 331 which allows for up to 2,000 gallons per day for equipment decontamination water from investigations on the property.
- Following development, the monitoring wells will be allowed to equilibrate for a minimum of 24 hours prior to groundwater sampling.

2.5 Monitoring Well Abandonment

There may be occasions when monitoring wells will require abandonment. The abandonment approach will be in accordance with NYSDEC Policy CP-43 – Groundwater Monitoring Well Decommissioning Policy. Details regarding the well abandonment will be documented on the Well Decommissioning Record provided in **Appendix G**.

2.6 Groundwater Monitoring and Sampling

These methods may include pumping, or low-flow purging and sampling. Traditional best practice techniques and procedures shall be subject to modification to prevent the introduction of non-site-derived contaminants including PFAS into target samples as discussed in **Sections 1 and 2**.

Quality control samples should be collected at the frequency listed below for the specified parameters.

- Collect one field blank, per field team per day for PFAS.
- Collect one equipment blank per field team, per sample media, per day for PFAS.
- Collect one equipment blank for every 20 field samples (1:20) if sampling equipment is reusable (NOT disposable). An equipment blank is not necessary if sampling equipment is disposable. Check with the data management team to determine when this sample needs to be collected.
- Collect 1:20 (out of total samples collected from both Site 109 and 110) field duplicate and matrix spike/matrix spike duplicate (MS/MSD), at a minimum. Check with the data management team to determine when these samples need to be collected.

SPECIAL PRECAUTIONS FOR PFAS SAMPLING

- Refer to **TABLE 1** for special clothing, PPE, supply and equipment requirements for PFAS and sampling.
- Bottles for PFAS samples should be stored and shipped to and from laboratory in separate coolers from other bottleware/samples.
- DO NOT mix bottleware for PFAS samples with other bottleware to make bottle sets for sample locations.
- Change nitrile gloves prior to handling bottles for PFAS analysis and collection of samples for PFAS analysis.
- A PFAS sampling checklist is included as **Appendix C** and should be filled out daily by field personnel.

2.6.1 Hand Bailing

2.6.1.1 Equipment and Supplies

- Well gauging and sampling logs (no weatherproof field books permitted)
- Project plans
- PPE in accordance with the HASP and free of PFAS containing products (see **Table 1**)
- PID, or other monitoring equipment if required by HASP
- PFAS free water level probe (see **Table 1** for list of PFAS free equipment)
- PFAS free electronic oil/water interface probe (see **Table 1** for list of PFAS free equipment)
- Disposable HDPE/PVC bailers and/or stainless steel bailers
- PFAS free polypropylene rope
- Water quality meter (Horiba U-52 or similar)
- Graduated 5-gallon buckets plus lids
- Decontamination supplies
- HDPE plastic sheeting
- Clear tape, duct tape
- Coolers and ice
- Laboratory sample bottles
- Shipping labels

2.6.1.2 Purging

- Prior to sampling, the static water level, depth to well bottom, and thickness of any light non-aqueous phase liquid (LNAPL) or dense non-aqueous phase liquid (DNAPL) will be measured to the nearest 0.01 foot from the surveyed well elevation mark on the top of the PVC casing with a decontaminated oil/water interface probe. NAPL thickness will be confirmed using a clear bailer or a weighted string. The measurement will be recorded in the field book.
- Prior to commencing sampling activities and daily thereafter, the groundwater quality monitoring probes/meters including pH, conductivity, and turbidity will be calibrated in accordance with the manufacturer's instructions. At a minimum, two-point calibrations will be conducted for pH, conductivity, and turbidity. Calibration results will be recorded in the field log notebook.
- Initiate bailing of the well from the bottom. Lower and raise the bailer slowly to avoid causing turbidity. Keep the polypropylene rope on the plastic sheet. Pour the groundwater from the bailer into a graduated five-gallon bucket to measure the volume withdrawn from the well.
- Continue bailing the well until at least three well volumes have been removed or until the well is dry. If the well is dry, allow sufficient time for the well to recover before proceeding. Record this information on the Standard Groundwater Sampling Log. An example of the Standard Groundwater Sampling Log is provided in **Appendix H**.
- During the removal of successive well volumes, measure the water temperature, pH, conductivity, and turbidity with calibrated meters. Record the data on the Groundwater Sampling Field Log.

2.6.1.3 Sampling

- Keep sample bottles cool and with their caps on until they are ready to receive samples. Sample bottles for PFAS samples should be kept separate from other sample bottles. The type of analysis for which a sample is collected determines the type of container, preservative, holding time, and filtering requirement as specified in the QAPP.

- Minimize agitation of the water in the well; begin sampling by lowering the bailer slowly into the well. Lower it only far enough to fill it completely.
- Place a sample of well water in a container and measure and record the water temperature, pH, conductivity, and turbidity with calibrated meters. Record the data on the Groundwater Sampling Field Log. Turbidity reading should be less than 50 NTUs before sample collection. If turbidity levels remain high, consult the project manager to discuss the possibility of having the analytical laboratory filter samples prior to analysis.
- Record the appearance of the groundwater on the Standard Groundwater Sampling Log (**Appendix H**).
- A PFAS field blank should be collected daily during sampling activities. The PFAS field blank is a PFAS sample bottle pre-filled at the laboratory and sent with the sample bottles. Open the PFAS field blank bottle provided by the analytical laboratory and pour into an empty PFAS sample bottle. Gloves should be changed prior to handling the PFAS field blank bottle.
- When you are ready to fill the bottles, remove them from their transport containers (except for PFAS bottles). Prepare them to receive the samples.
- Samples are transferred directly from the bailer to the container. The container should hold any necessary preservative and should be correctly labeled before the sample is transferred to it. Samples should be collected in the following order:
  - PFAS
  - VOCs
  - SVOCs
  - PCBs
  - Pesticides
  - Metals
  - Cyanide
- Inspect labels to see that the samples are properly identified.
- The Volatile Organic Compounds (VOC) containers should be filled with zero headspace, from one bailer, and then securely capped.
- Fill each sample container in accordance with the QAPP or other sampling outline.
- Return each sample bottle to its proper transport container.
- If the sample bottle cannot be filled quickly, keep them cool with the caps on until they are filled.
- Close the PFAS filed blank bottle and return it to the PFAS designated cooler. Be sure to change gloves prior to handling the PFAS field blank bottle. Samples must not be allowed to freeze.
- Record the date and time.
- Secure the well head.
- The sample containers will be labeled, placed in a laboratory-supplied cooler (keeping PFAS sample bottles separate from other sample bottles), with protective packaging (i.e., bubble wrap) and packed on ice (to maintain a temperature of 4 C). Do not use ice packs.
- A PFAS equipment blank should be collected daily from each sample set-up. The equipment blank is collected by pouring or pumping laboratory supplied and certified PFAS free water through sample apparatuses and collecting in appropriate sample bottles. Gloves should be changed prior to collecting the equipment blank sample.
- A temperature blank in the appropriate sample bottle (i.e., no Teflon lined caps for PFAS temperature blank bottles) should accompany each cooler.
- Check that PFAS field blank, and equipment blanks are included in the PFAS sample designated coolers.
- The coolers will be shipped overnight or delivered to the ELAP-certified laboratory for analysis.
- Samples for laboratory analysis will be submitted to an approved NYSDOH ELAP-certified laboratory. Analyses will be conducted using USEPA methodologies as specified in the QAPP. Samples will be managed in accordance with the QAPP. COC procedures will be followed as outlined in the QAPP.

2.6.2 Pumping

2.6.2.1 Equipment and Supplies

- Well gauging and sampling logs (no weatherproof field books permitted)
- Project plans
- PPE in accordance with the HASP and free of PFAS products (see **Table 1**)
- PID, if required by HASP
- PFAS free water level probe (see **Table 1** for list of PFAS free equipment)
- PFAS free electronic oil/water interface probe (see **Table 1** for list of PFAS free equipment)
- Polypropylene rope
- Graduated 5-gallon buckets
- Generator
- Extension cords
- Decontamination supplies
- Water quality meter (Horiba U-52 or similar)PFAS free Peristaltic or bladder pump (see **Table 1** for list of PFAS free equipment)
- HDPE plastic tubing (appropriately sized for the chosen peristaltic or bladder pump)
- HDPE plastic sheeting
- Clear tape, duct tape
- Coolers and ice
- Laboratory sample bottles
- Shipping labels

2.6.2.2 Purging

- Prior to sampling, the static water level and depth to well bottom will be measured to the nearest 0.01 foot from the surveyed well elevation mark on the top of the PVC casing with a decontaminated oil/water interface probe. NAPL thickness will be confirmed using a clear bailer or a weighted string. The measurement will be recorded in the field book.
- Prior to commencing sampling activities and daily thereafter, the groundwater quality monitoring probes/meters including pH, conductivity, and turbidity will be calibrated in accordance with the manufacturer's instructions. At a minimum, two-point calibrations will be conducted for pH, conductivity, and turbidity. Calibration results will be recorded in the field log notebook.
- Prepare the pump for operation. Follow the manufacturer's directions.
- Lower the pump intake to the mid-screen interval.
- Pump the groundwater into a graduated 5-gallon bucket. Continue pumping until at least three well volumes have been removed or the well is pumped dry. Lower the pump's intake as necessary.
- If the well is pumped dry, allow sufficient time for the well to recover before proceeding. Record this information on the Standard Groundwater Sampling Log (**Appendix H**).
- During the removal of successive well volumes, measure the water temperature, pH, conductivity, and turbidity with calibrated meters. Record the data on the Groundwater Sampling Field Log.

2.6.2.3 Sampling

- Keep sample bottles cool and with their caps on until they are ready to receive samples. Sample bottles for PFAS samples should be kept separate from other sample bottles. The type of analysis for which a sample is collected determines the type of container, preservative, holding time, and filtering requirement as specified in the QAPP.

- Place a sample of well water in a container and measure and record the water temperature, pH, conductivity, and turbidity with calibrated meters. Record the data on the Groundwater Sampling Field Log. Turbidity reading should be less than 50 NTUs before sample collection. If turbidity levels remain high, consult the project manager to discuss the possibility of having the analytical laboratory filter samples prior to analysis.
- Record the appearance of the groundwater on the Standard Groundwater Sampling Log (**Appendix H**).
- A PFAS field blank should be collected daily during sampling activities. The PFAS field blank is a PFAS sample bottle pre-filled at the laboratory and sent with the sample bottles. Open the PFAS field blank bottle provided by the analytical laboratory and pour into an empty PFAS sample bottle. Gloves should be changed prior to handling the PFAS field blank bottle.
- When you are ready to fill the bottles, remove them from their transport containers (except for PFAS bottles). Prepare them to receive the samples.
- Samples are transferred directly to the container. The container should hold any necessary preservative and should be correctly labeled before the sample is transferred to it. Samples should be collected in the following order:
  - PFAS
  - VOCs
  - SVOCs
  - PCBs
  - Pesticides
  - Metals
  - Cyanide
- Inspect labels to see that the samples are properly identified.
- Fill each sample container in accordance with the QAPP or other sampling outline.
- Return each sample bottle to its proper transport container.
- If the sample bottle cannot be filled quickly, keep them cool with the caps on until they are filled.
- Close the PFAS filed blank bottle and return it to the PFAS designated cooler. Be sure to change gloves prior to handling the PFAS field blank bottle. Samples must not be allowed to freeze.
- Record the date and time.
- Secure the well head.
- The sample containers will be labeled, placed in a laboratory-supplied cooler (keeping PFAS sample bottles separate from other sample bottles), with protective packaging (i.e., bubble wrap) and packed on ice (to maintain a temperature of 4 C). Do not use ice packs.
- A PFAS equipment blank should be collected daily from each sample set-up. The equipment blank is collected by pouring or pumping laboratory supplied and certified PFAS free water through sample apparatuses and collecting in appropriate sample bottles. Gloves should be changed prior to collecting the equipment blank sample.
- A temperature blank in the appropriate sample bottle (i.e., no Teflon lined caps for PFAS temperature blank bottles) should accompany each cooler.
- Check that PFAS field blank, and equipment blanks are included in the PFAS designated coolers.
- The cooler will be shipped overnight or delivered to the ELAP-certified laboratory for analysis.
- Samples for laboratory analysis will be submitted to an approved NYSDOH ELAP-certified laboratory. Analyses will be conducted using USEPA methodologies. Samples will be managed in accordance with the QAPP. COC procedures will be followed as outlined in the QAPP.

2.6.3 Low Flow Purging and Sampling

2.6.3.1 Equipment and Supplies

- Well gauging and sampling logs (no weatherproof field books permitted)
- Project plans
- Personal protective equipment (PPE) in accordance with the HASP and free of PFAS products (see **Table 1**)
- PID, if required by HASP
- PFAS free water level probe (see **Table 1** for list of PFAS free equipment)
- PFAS free electronic oil/water interface probe (see **Table 1** for list of PFAS free equipment)
- Polypropylene rope
- Graduated 5-gallon buckets
- Water quality meter (Horiba U-52 or similar) Flow-through cell
- Generator
- Extension cords
- Decontamination supplies
- PFAS free peristaltic or bladder pump capable of achieving flow rates of 0.5 liters per minute or less (see **Table 1** for list of PFAS free equipment)
- HDPE plastic tubing (appropriately sized for the chosen peristaltic or bladder pump)
- HDPE plastic sheeting
- Clear tape, duct tape
- Coolers and ice
- Laboratory sample bottles
- Shipping labels

2.6.3.2 Purging

- Equipment will be decontaminated prior to use at each location.
- Prior to sampling, the static water level and depth to well bottom will be measured to the nearest 0.01 foot from the surveyed well elevation mark on the top of the PVC casing with a decontaminated water level meter. NAPL thickness will be confirmed using a clear bailer or a weighted cotton string. The measurement will be recorded in the field notes.
- Prior to commencing sampling activities and daily thereafter, the groundwater quality monitoring probes/meters including pH, conductivity, oxidation reduction potential (ORP), dissolved oxygen, and turbidity will be calibrated in accordance with the manufacturer's instructions. At a minimum, two-point calibrations will be conducted for pH, conductivity, and turbidity. The dissolved oxygen probe will be checked against a zero-dissolved oxygen solution. In addition, the dissolved oxygen calibration will be corrected for local barometric pressure and elevation. Calibration results will be recorded in the field notes.
- The intake of the peristaltic or submersible pump will be positioned in the center of the screened interval and the upper end of the tubing will be connected to the flow through cell. Flow rate shall not exceed 0.5 liters/min (500 ml/min). Initially, a flow rate between 200 ml/min and 500 ml/min will be used. The drawdown will be monitored using a water level probe and the flow rate will be reduced if the drawdown exceeds 0.3 feet. Efforts should be made to minimize the generation of air bubbles in the sample tubing by either increasing the flow rate as appropriate, or restricting the flow by clamping the tubing
- During purging, pH, specific conductivity, temperature, ORD (redox), dissolved oxygen, and turbidity will be monitored and recorded at time intervals sufficient to evacuate the volume of the flow-through cell. This information along with water level readings to monitor drawdown will be recorded on the Low Flow

Groundwater Sampling Log. An example of the Low Flow Groundwater Sampling Log is provided in **Appendix I**.

- Well sampling will commence after equilibration of water quality parameters. The equilibration guidelines are as follows:
  - Temperature ± 3% of measurement
  - pH ± 0.1 pH units
  - Specific conductance ± 3% of measurement
  - Redox ±10 mV
  - DO ±10% of measurement
  - Turbidity ± 10% of measurement Turbidity reading should be less than 50 NTUs before sample collection. If turbidity levels remain high, consult the project manager to discuss the possibility of having the analytical laboratory filter samples prior to analysis.
- If the water level will not stabilize even at lower flow rates, then the well will not be able to be sampled using the low flow method. In this situation, the well will be pumped to dryness and the water will be allowed to recover prior to collection of the sample. Purge water will be containerized for characterization and disposal in accordance with **Section 2.9**.

2.6.3.3 Sampling

- Prior to filling the sample bottles, the temperature, pH, dissolved oxygen, conductivity, and ORP will be measured within a flow-through cell. Turbidity will be measured with a separate hand-held turbidity meter or within the flow-through cell. All measurements will be recorded on the Low Flow Groundwater Sampling Log (**Appendix I**). Turbidity reading should be less than 50 NTUs before sample collection. If turbidity levels remain high, consult the project manager to discuss the possibility of having the analytical laboratory filter samples prior to analysis.
- Prior to collecting the sample, the flow-through cell will be disconnected from the tubing.
- Laboratory provided sample containers appropriate to meet USEPA requirements for each analysis will be used. Groundwater will be allowed to flow from the tubing into the sample container carefully to limit aeration of the sample. If preservative is present in a container, the container will not be overfilled.
- Keep sample bottles cool and with their caps on until they are ready to receive samples. Sample bottles for PFAS samples should be kept separate from other sample bottles. The type of analysis for which a sample is collected determines the type of container, preservative, holding time, and filtering requirement as specified in the QAPP.
- Record the appearance of the groundwater on the Standard Groundwater Sampling Log (**Appendix H**).
- A PFAS field blank should be collected daily during sampling activities. The PFAS field blank is a PFAS sample bottle pre-filled at the laboratory and sent with the sample bottles. Open the PFAS field blank bottle provided by the analytical laboratory and pour into an empty PFAS sample bottle. Gloves should be changed prior to handling the PFAS field blank bottle.
- When you are ready to fill the bottles, remove them from their transport containers (except for PFAS bottles). Prepare them to receive the samples.
- Samples are transferred directly to the container. The container should hold any necessary preservative and should be correctly labeled before the sample is transferred to it. Samples should be collected in the following order:
  - PFAS
  - VOCs
  - SVOCs
  - PCBs

  - Pesticides
  - Metals
  - Cyanide
- Inspect labels to see that the samples are properly identified.
- Fill each sample container in accordance with the QAPP or other sampling outline.
- Return each sample bottle to its proper transport container.
- If the sample bottle cannot be filled quickly, keep them cool with the caps on until they are filled.
- Close the PFAS filed blank bottle and return it to the PFAS designated cooler. Be sure to change gloves prior to handling the PFAS field blank bottle.
- Record the date and time.
- Secure the well head.
- The sample containers will be labeled, placed in a laboratory-supplied cooler (keeping PFAS sample bottles separate from other sample bottles), with protective packaging (i.e., bubble wrap) and packed on ice (to maintain a temperature of 4 C). Samples must not be allowed to freeze. Do not use ice packs.
- A PFAS equipment blank should be collected daily from each sample set-up. The equipment blank is collected by pouring or pumping laboratory supplied and certified PFAS free water through sample apparatuses and collecting in appropriate sample bottles. Gloves should be changed prior to collecting the equipment blank sample.
- A temperature blank in the appropriate sample bottle (i.e., no Teflon lined caps for PFAS temperature blank bottles) should accompany each cooler.
- Check that PFAS field blank, and equipment blanks are included in the PFAS designated coolers.
- The cooler will be shipped overnight or delivered to the ELAP-certified laboratory for analysis.
- Samples for laboratory analysis will be submitted to an approved NYSDOH ELAP-certified laboratory. Analyses will be conducted using USEPA methodologies as specified in the QAPP. Samples will be managed in accordance with the QAPP. COC procedures will be followed as outlined in the QAPP.

2.7 Surface Soil Sampling

Surface soil samples will be collected by either using a stainless steel spoon to fill the sample container directly or collecting surface soil using a stainless steel spoon, shovel, or a hand auger into a stainless steel bowl and then filling sample containers. Sampling equipment will be decontaminated between sampling locations (see **Section 2.8**).

Quality control samples should be collected at the frequency listed below for the specified parameters.

- Collect one equipment blank for every 20 field samples (1:20). Check with the data management team to determine when this sample needs to be collected.
- Collect 1:20 (out of total samples collected from both Site 109 and 110) field duplicate and MS/MSD. Check with the data management team to determine when these samples need to be collected.

2.7.1 Surface Soil Sampling

2.7.1.1 Equipment and Supplies

- Appropriate, pre-cleaned sample bottles will be provided by the analytical laboratory
- Dedicated HDPE containers to collect samples
- PPE in accordance with the HASP
- Stainless steel auger and shovel

- Stainless steel bowls and spoons
- Decontamination chemicals and supplies
- Dedicated, clean cooler with ice
- Sample logs (no weatherproof field books permitted)
- Digital camera

2.7.1.2 Surface Soil Sampling Method

- For each sample collected, observations of soil type will be recorded in field logs (**Appendix J**).
- An auger and/or stainless steel shovel will be used to collect soil samples. Sample locations may be modified in the field to allow for access. Minor clearing of vegetation may be required to access sample locations. To the extent practical, efforts will be made to minimize disturbance to the soils during clearing efforts.
- Upon retrieval, surface soil samples will be processed in the field. Samples will be obtained from the inner portion of the collected sample avoiding surface soil that has contacted sampling device, when possible.
- First, volatile organic compound samples will be obtained from the center of the sample and placed in sample containers. VOC containers will be filled without headspace. The remainder of the interval will be homogenized in a stainless steel mixing bowl and distributed to the appropriate sample jars.
- Fill each sample container in accordance with the QAPP or other sampling outline. Samples should be collected in the following order:
  - PFAS
  - SVOCs
  - VOCs
  - Metals
  - Cyanide
- Equipment will be decontaminated prior to use at each location as described in **Section 2.8**.
- The sample containers will be labeled, placed in a laboratory-supplied cooler with protective packaging (i.e., bubble wrap) and packed on ice (to maintain a temperature of 4 C). The cooler will be shipped overnight or delivered to the ELAP-certified laboratory for analysis.
- Samples for laboratory analysis will be submitted to an approved NYSDOH ELAP-certified laboratory. Analyses will be conducted using USEPA methodologies as specified in the QAPP. Samples will be managed in accordance with the QAPP. COC procedures will be followed as outlined in the QAPP.

2.8 Decontamination of Sampling Equipment

2.8.1 Equipment Decontamination

The following procedures will be used to decontaminate equipment used during the field activities.

- Drilling equipment including the backhoe, bucket, and drilling rig; augers; bits; rods; tools; split-spoon samplers; and tremie pipes will be cleaned with a high-pressure, steam-cleaning unit using potable water before beginning work, following the completion of borings, wells, test pits/excavations, and prior to exiting the site.
- Tools, drill rods, and augers will be placed on polyethylene plastic sheets following pressure washing. Direct contact with the ground will be avoided.
- Augers, rods, and tools will be decontaminated between each drilling location per the above procedures.

- The back of the drill rig and all tools, augers, and rods will be decontaminated at the completion of the work and prior to leaving the site.
- Pressure washers used to aid in equipment decontamination should be free of Teflon tape and parts.

2.8.2 Sampling Equipment Decontamination

2.8.2.1 Equipment and Supplies

- Laboratory supplied and certified PFAS free water
- PFAS free, phosphate-free detergent (see **Table 1**)
- HDPE sheeting
- Plastic buckets and brushes
- PPE in accordance with the HASP

2.8.2.2 Decontamination Procedures

- Prior to sampling, non-dedicated sampling equipment (e.g., bailers, bowls, spoons, certified PFAS-free interface probes, etc.) will be washed with laboratory supplied and certified PFAS free water and a PFAS/phosphate-free detergent (see **Table 1**). Decontamination may take place at the sampling location as long as all liquids are contained in pails, buckets, etc. Traditional best practice techniques and procedures shall be subject to modification to prevent the introduction of non-site-derived contaminants including PFAS into target samples as discussed in **Sections 1 and 2**. **Table 1** includes a summary of prohibited and acceptable PFAS items. A PFAS sampling checklist is included as **Appendix C** and should be filled out daily by field personnel.
- The sampling equipment will then be rinsed with laboratory supplied and certified PFAS free water.
- Between rinses, equipment will be placed on HDPE sheets, if necessary. At no time, will washed equipment be placed directly on the ground.
- Equipment will be wrapped in HDPE for storage or transportation from the designated decontamination area to the sampling location.

TABLES

TABLE 1 PROHIBITED AND ACCEPTABLE ITEMS FOR EMERGENT CONTAMINANT SAMPLING

PROHIBITED	ACCEPTABLE
Field Equipment	
Teflon® containing materials	High Density High density polyethylene (HDPE), stainless steel or polypropylene materials
Low density polyethylene (LDPE) materials	Acetate liners Silicone Tubing
Waterproof field books, waterproof paper and waterproof sample bottle labels	Loose non-waterproof paper and non-waterproof sample labels
Waterproof markers / Sharpies®	Pens
Post-It Notes®	Tape; loose leaf paper
Chemical (blue) ice packs	Wet Ice
Field Clothing and PPE	
New cotton clothing or synthetic water resistant, waterproof, or stain-treated clothing, clothing containing Gore-TexTM	Well-laundered clothing made of natural fibers (preferable cotton)
Clothing laundered using fabric softener	No fabric softener
Boots containing Gore-TexTM or treated with water-resistant sprays	Boots made with polyurethane and PVC
Coated Tyvek®	Laundered cotton clothing
No cosmetics, moisturizers, hand cream, or other related products as part of personal leaning/showering routine on the morning of sampling	Sunscreens - Alba Organics Natural Sunscreen, Yes To Cucumbers, Aubrey Organics, Jason Natural Sun Block, Kiss My Face, and baby sunscreens that are "chemical free", "toxin free", or "natural"
Sunscreens or insecticides except as noted on right	Insect Repellents - Jason Natural Quit Bugging Me, Repel Lemon Eucalyptus Insect Repellant, Herbal Armor, California Baby Natural Bug Spray, Baby Ganics 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	Unlined polypropylene caps
Rain Events	
Waterproof or resistant rain gear	Wet weather gear made of polyurethane and PVC only; field tents that are only touched or moved prior to and following sampling activities
Equipment Decontamination	
Decon 90® Water from an on-site well	Alconox® and/or Liquinox®

TABLE 1 PROHIBITED AND ACCEPTABLE ITEMS FOR EMERGENT CONTAMINANT SAMPLING

PROHIBITED	ACCEPTABLE
Food Considerations	
All food and drink, with exceptions noted on right	Bottled water and hydration fluids (i.e., Gatorade® and Powerade®) to be brought and consumed only in the staging areas
Vehicle Considerations	
Vehicle fabrics, carpets and mats may contain PFASs	Avoid utilizing areas inside vehicle as sample staging areas.

APPENDIX A GUIDELINES FOR SAMPLING AND ANALYSIS OF PFAS (NYSDEC, JANUARY 2020)

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

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Contents

ERRATA SHEET for

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

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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.

APPENDIX B SAMPLE BOTTLE LABELS

PARSONS
301 Plainfield Road, Suite 350
Syracuse, NY 13212

Project/Client: Honeywell	Sample Medium:
Sample Number:	Sample Type:
Test Parameters:	
Container No.	Preservative:
Date &Time:	Sampler:

PARSONS
301 Plainfield Road, Suite 350
Syracuse, NY 13212

Project/Client: Honeywell	Sample Medium:
Sample Number:	Sample Type:
Test Parameters:	
Container No.	Preservative:
Date &Time:	Sampler:

PARSONS
301 Plainfield Road, Suite 350
Syracuse, NY 13212

Project/Client: Honeywell	Sample Medium:
Sample Number:	Sample Type:
Test Parameters:	
Container No.	Preservative:
Date &Time:	Sampler:

PARSONS
301 Plainfield Road, Suite 350
Syracuse, NY 13212

Project/Client: Honeywell	Sample Medium:
Sample Number:	Sample Type:
Test Parameters:	
Container No.	Preservative:
Date &Time:	Sampler:

PARSONS
301 Plainfield Road, Suite 350
Syracuse, NY 13212

Project/Client: Honeywell	Sample Medium:
Sample Number:	Sample Type:
Test Parameters:	
Container No.	Preservative:
Date &Time:	Sampler:

PARSONS
301 Plainfield Road, Suite 350
Syracuse, NY 13212

Project/Client: Honeywell	Sample Medium:
Sample Number:	Sample Type:
Test Parameters:	
Container No.	Preservative:
Date &Time:	Sampler:

PARSONS
301 Plainfield Road, Suite 350
Syracuse, NY 13212

Project/Client: Honeywell	Sample Medium:
Sample Number:	Sample Type:
Test Parameters:	
Container No.	Preservative:
Date &Time:	Sampler:

PARSONS
301 Plainfield Road, Suite 350
Syracuse, NY 13212

Project/Client: Honeywell	Sample Medium:
Sample Number:	Sample Type:
Test Parameters:	
Container No.	Preservative:
Date &Time:	Sampler:

PARSONS
301 Plainfield Road, Suite 350
Syracuse, NY 13212

Project/Client: Honeywell	Sample Medium:
Sample Number:	Sample Type:
Test Parameters:	
Container No.	Preservative:
Date &Time:	Sampler:

PARSONS
301 Plainfield Road, Suite 350
Syracuse, NY 13212

Project/Client: Honeywell	Sample Medium:
Sample Number:	Sample Type:
Test Parameters:	
Container No.	Preservative:
Date &Time:	Sampler:

APPENDIX C 1,4 DIOXANE AND PFAS SAMPLING CHECKLIST

PARSONS

Site Name: _____
Weather (temp/precip): _____

Task: _____
Date: _____

Field Clothing and PPE:

☐ Ansell TNT® Powder-Free Nitrile Gloves ONLY
☐ No clothing or boots containing Gore-Tex™
☐ No clothing or boots treated with water-resistant spray
☐ Safety boots made from polyurethane and PVC or leather boots covered with overboots
☐ No materials containing Tyvek®
☐ Field crew has not used fabric softener on clothing
☐ Field crew has not used cosmetics, moisturizers, hand cream, or other related products this morning
☐ Field crew has not applied unauthorized sunscreen or insect repellant
☐ Samplers don fresh nitrile gloves for each sample collected

Field Equipment:

☐ No Teflon® or LDPE containing materials other than QED brand LDPE
☐ All sample materials made from stainless steel, HDPE, acetate, silicon, or polypropylene or QED brand LDPE
☐ No waterproof field books, waterproof paper or waterproof bottle labels, waterproof markers/Sharpies®
☐ No plastic clipboards, binders, or spiral hard cover notebooks
☐ No Post-It Notes®
☐ Coolers filled with regular ice only; no chemical (blue) ice packs in possession

Sample Containers:

☐ Containers for PFAS shipped in separate cooler
☐ Sample containers made of HDPE or polypropylene
☐ Caps are unlined and made of HDPE or polypropylene

Wet Weather (as applicable):

☐ Wet weather gear made of polyurethane and PVC only

Equipment Decontamination:

☐ PFAS-free water on-site for decontamination of sample equipment; no other water sources to be used
☐ Alconox® or 7th Generation Free & Clear Dish Soap to be used as decontamination cleaning agents

Food Considerations:

☐ 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

Vehicle Considerations:

☐ Avoid utilizing areas inside vehicle as sample staging areas

Sampling Equipment and Supply Summary (include brand names and serial numbers where available):

Decontamination fluid source(s): _____

Soap and other fluids used: _____

Gloves:_____ Rope: _____

Sampling Equipment: _____

Deviation Summary:

If possible, materials identified as potentially containing PFAS should be relocation to a separate area of the site as far away as possible from the sampling location(s) and containerized if practicable. Notes should include method of response including type of materials on site and how they were moved and containerized.

Deviations include: _____

_____

_____

_____

Field Team Leader Name: _____

Field Team Leader Signature: _____

Field Team Member Name	Field Team Member Signature

APPENDIX D TEST BORING LOG

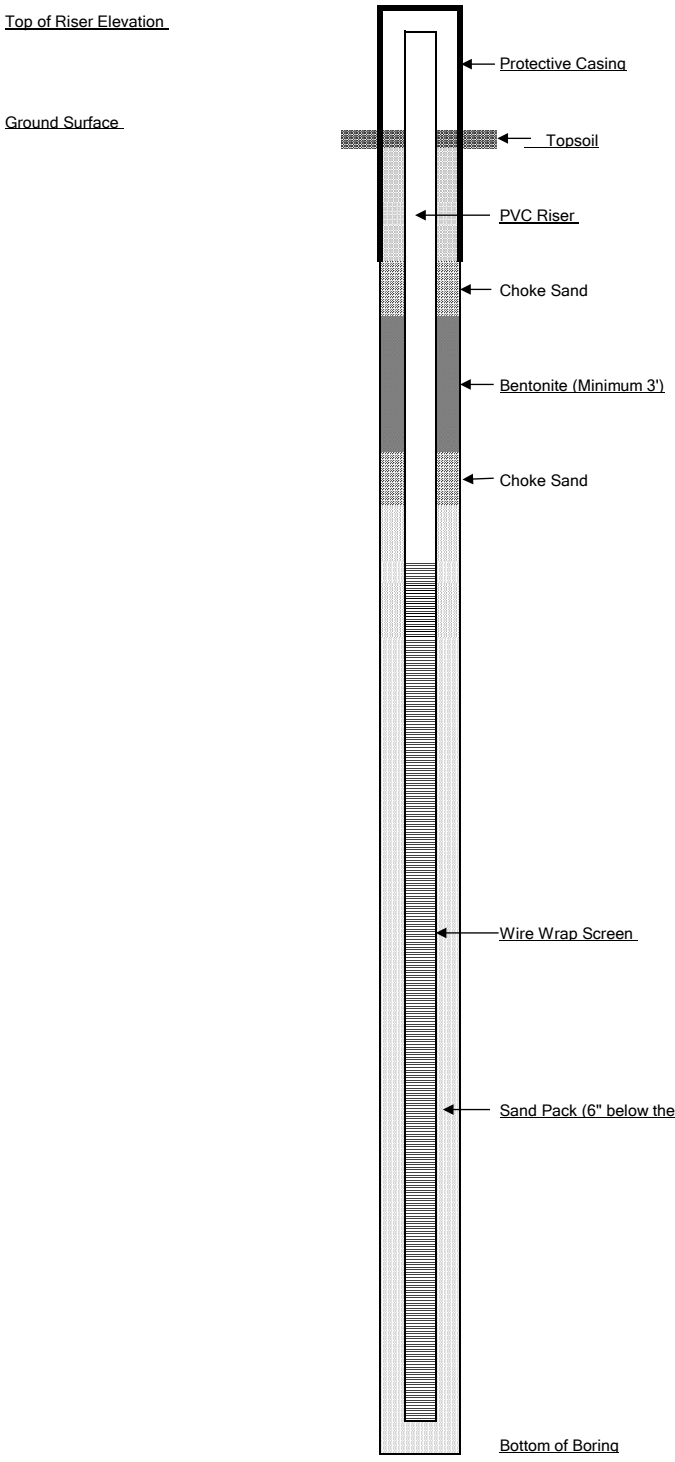
	TEST BORING LOG	REPORT OF BORING
Client: Proj. Loc: File No.:	Sampler: 2" split Spoon Hammer: 140-lb Fall: 30"	Page 1 of Location: Start Date: End Date:
Boring Company: Foreman: OBG Geologist:		Screen = \ Grout Riser Sand Pack Bentonite

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing PID (ppm)	Field Testing Time

APPENDIX E WELL COMPLETION LOG

Well Construction Log

WELL NO.:	CLIENT:
PROJ. NO.:	DRILLING CONTRACTOR:
INSPECTOR:	DATE END:
DATE START:	DRILLING METHOD:
LOCATION:	DRILLER:
SITE NAME:	RIG TYPE:



SHALLOW CASING

Material:
Diameter:
Depth BGS:
Water Tight Seal: Yes, Grout

RISER PIPE

Material: PVC
Type: Sch
Joint Type: FLUSH THREADED
Interval:
Diameter: 2.0 INCHES

CHOKE SAND

Material:
Brand Name: U.S. Silica
Amount Used:
Grain Size Dist.:
Interval:
Tremied:

SEAL

Material: Bentonite
Type:
Amount Used:
Interval:

CHOKE SAND

Material:
Brand Name: U.S. Silica
Amount Used:
Grain Size Dist.:
Interval:
Tremied:

FILTER PACK

Material:
Brand Name: U.S. Silica
Amount Used:
Grain Size Dist.:
Interval:
Tremied:

SCREEN

Material: PVC
Diameter: 2.0 INCHES
Slot Size & Type: Wire Wrap
Interval BGS:

SUMP

Interval BGS:
Bottom Cap: PVC

APPENDIX F WELL DEVELOPMENT LOG

WELL DEVELOPMENT LOG

Well ID:

Date		Field Personnel		Weather	
Site Name		Contractor		Project No.	
Site Location		Evacuation Method			

Well information:

Depth to Bottom (Initial) *	ft.	Date(s) Installed		Date(s) Developed	
Depth to Bottom (Final)*	ft.	Driller		Development Time	Start:
Depth to Water (Initial)*	ft.	Well Diameter	in.		Stop:
Depth to Water (Final)*	ft.	Casing Volume	gal.		Total:
* Measuring point		Pump setting* (intake)			

Well Volumes	Volume of Water Removed (Gallons)	Temperature ^{O}C	pH s.u	Conductivity mS/cm	Turbidity (NTU)	Approximate Flow Rate (gal/min)	Depth to Water (ft.)	Appearance of Water
Start								
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Development Water Characteristics:

Total volume of Development water removed:

Physical appearance at start		Physical appearance at end	
Color		Color	
Odor		Odor	
Sheen/Free Product		Sheen/Free Product	

NOTES:

Geologist Signature:

APPENDIX G WELL DECOMMISSIONING RECORD

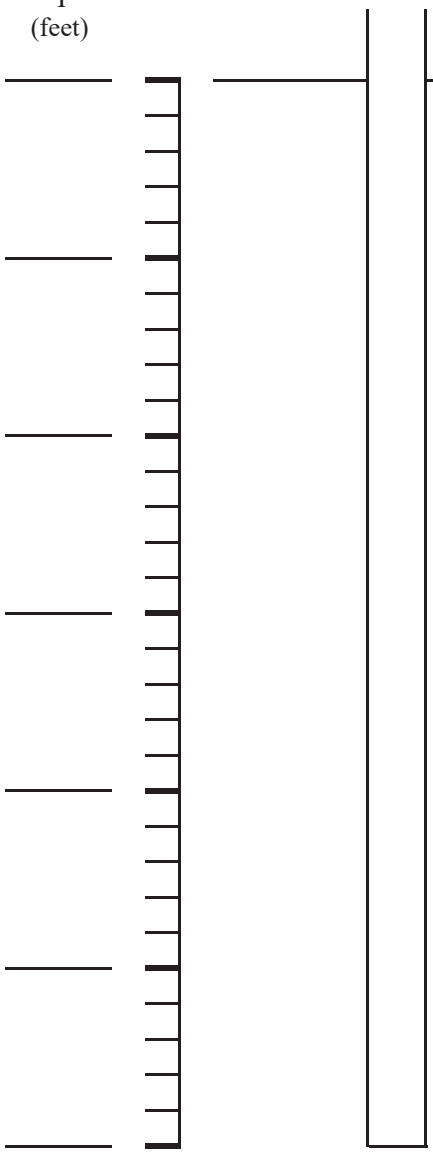
WELL DECOMMISSIONING RECORD

Site Name:	Well I.D.:
Site Location:	Driller:
Drilling Co.:	Inspector:
	Date:

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING	
Interval Drilled	
Drilling Method(s)	
Borehole Dia. (in.)	
Temporary Casing Installed? (y/n)	
Depth temporary casing installed	
Casing type/dia. (in.)	
Method of installing	
CASING PULLING	
Method employed	
Casing retrieved (feet)	
Casing type/dia. (in)	
CASING PERFORATING	
Equipment used	
Number of perforations/foot	
Size of perforations	
Interval perforated	
GROUTING	
Interval grouted (FBLS)	
# of batches prepared	
For each batch record:	
Quantity of water used (gal.)	
Quantity of cement used (lbs.)	
Cement type	
Quantity of bentonite used (lbs.)	
Quantity of calcium chloride used (lbs.)	
Volume of grout prepared (gal.)	
Volume of grout used (gal.)	

WELL SCHEMATIC*



COMMENTS:

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Drilling Contractor

Department Representative

APPENDIX H STANDARD GROUNDWATER SAMPLING LOG

Standard Ground Water Sampling Log

Date _____
Site Name _____ Weather _____
Location _____ Well # _____
Project No. _____ Evacuation Method _____
Personnel _____ Sampling Method _____

Well Information:

Depth of Well * _____ ft.
Depth to Water * _____ ft.
Length of Water Column _____ ft.
Volume of Water in Well _____ gal.(s)
3X Volume of Water in Well _____ gal.(s)

Water Volume /ft. for:
_____ 2" Diameter Well = 0.163 X LWC
_____ 4" Diameter Well = 0.653 X LWC
_____ 6" Diameter Well = 1.469 X LWC

Volume removed before sampling _____ gal.(s)
Did well go dry? _____

* Measurements taken from [ ] Well Casing [ ] Protective Casing [ ] (Other, Specify) _____

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard		84 S Standard	
7.0 Standard		1413 S Standard	
10.0 Standard			

Water parameters:

Gallons Removed	**Temperature Readings**	**pH Readings**	**Conductivity Readings uS/cm**	**Turbidity Readings Ntu**
initial	initial	initial	initial	initial

Water Sample:
Time Collected _____

Physical Appearance at Start		Physical Appearance at Sampling	
Color		Color	
Odor		Odor	
Turbidity (> 100 NTU)		Turbidity (> 100 NTU)	
Sheen/Free Product		Sheen/Free Product	

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH

Notes:

APPENDIX I LOW FLOW GROUNDWATER SAMPLING LOG

Low Flow Ground Water Sampling Log

Date _____ Personnel _____ Weather _____

Site Name _____ Evacuation Method _____ Well # _____

Site Location _____ Sampling Method _____ Project # _____

Well information:

Depth of Well * _____ ft.

Depth to Water * _____ ft.

Length of Water Column _____ ft.

Depth to Intake * _____ ft.

* Measurements taken from

_____ Top of Well Casing

_____ Top of Protective Casing

_____ (Other, Specify)

Start Purge Time: _____

		10.0%	0.1	3%	10 mV	10%	10%	100-500 ml/min
Elapsed Time (min)	**Depth To Water (ft)**	**Temperature (celsius)**	**pH**	**Conductivity (ms/cm)**	**Oxidation Reduction Potential**	**Dissolved Oxygen (mg/l)**	**Turbidity (NTU)**	**Flow Rate (ml/min).**

End Purge Time: _____

Water sample:

Time collected: _____

Total volume of purged water removed: _____

Physical appearance at start

Color _____

Odor _____

Sheen/Free Product _____

Physical appearance at sampling

Color _____

Odor _____

Sheen/Free Product _____

Field Test Results:

Dissolved ferrous iron: _____

Dissolved total iron: _____

Dissolved total manganese: _____

Analytical Parameters:

Sample	Container Type	# Collected	Field Filtered	Preservative	Container pH

APPENDIX J SURFACE SOIL SAMPLING RECORD

PARSONS
SURFACE SOIL SAMPLING RECORD

SITE NAME: _____

PROJECT NUMBER: _____

SAMPLING DATE / TIME: _____

WEATHER: _____

SAMPLERS: _____ of _____

_____ of _____

SAMPLE ID: _____

SAMPLING METHOD: _____

DEPTH OF SAMPLE: _____

DESCRIPTION OF SAMPLING POINT

LOCATION: _____

PHYSICAL APPEARANCE: _____

VEGETATION: _____

DRAINAGE DIRECTION: _____

SAMPLE DESCRIPTION

TEXTURE: _____

COLOR: _____

ODOR: _____

OTHER: _____

FIELD TESTS

TEMPERATURE: _____ REDOX: _____

pH: _____ DISSOLVED O2: _____

CONDUCTIVITY: _____ OTHER: _____

SAMPLE ANALYSIS / QA/QC / CHAIN OF CUSTODY

ANALYZE FOR: _____

QA/QC SAMPLE ID: _____

ANALYZE QA/QC SAMPLES FOR: _____

DATE/TIME REFRIGERATED: _____

CHAIN OF CUSTODY NUMBER: _____

SHIPPED VIA: _____

LABORATORY: _____

COMMENTS / MISCELLANEOUS _____