ARCADIS Design & Consultancy for natural and built assets

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ENVIRONMENT

Subject:
Emerging Contaminant Sampling Work Plan
NYSEG Goshen Former MGP site
Site No. 3-36-046

Date:
May 17, 2019

Contact:
Jason Golubski, P.E.

Phone:
315.671.9437

Email:
jason.golubski@arcadis.com

Our ref:
B0013080 #10

Dear Mr. Deyette:

On behalf of New York State Electric and Gas Corporation (NYSEG), this letter presents a site-specific work plan for conducting emerging contaminant sampling at Goshen Former Manufactured gas plant (MGP) site located in Goshen, New York. Emerging contaminant sampling is being conducted per New York State Department of Environmental Conservation's (NYSDEC's) request as presented in a May 30, 2018 letter to NYSEG. Details for field sampling, sample analysis, and reporting are presented below.

Field Sampling

In general, field activities will be completed in accordance with the NYSDEC-approved September 14, 2018 Parsons's *New York State Contaminant Field Sampling Plan* (FSP) *and Quality Assurance Project Plan* (QAPP)(Attachment 1). Groundwater samples will be collected from one upgradient (i.e., MW93-1S), and two downgradient wells (i.e., MW18-04S and MW93-2S). Well Locations are highlighted on the attached Figure 1. As part of the field activities, Arcadis will complete the sampling checklist and groundwater sampling log included in Parsons September 2018 QAPP.

As Annual groundwater sampling activities are already planned for the Goshen Former MGP site, purge water and disposable sampling equipment (e.g., tubing) will be containerized in NYSDOT-approved 55-gallon drums along with other purge water/ equipment used during sampling activities.

Sampling Analysis

Collected samples, plus quality assurance/quality control samples (i.e., blind duplicate, matrix spike/matrix spike duplicate, and field/rinse blank), will be

submitted to Alpha Analytical for laboratory analysis for 1,4-dioxane and per- and polyfluoroalkyl substances (PFAS) in accordance with QAPP requirements. Analytical results will be reported using NYSDEC Analytical services Protocol Category B data deliverables.

Reporting

Arcadis will include a summary of the 1,4-dioxane and PFAS sampling activities and results in the annual report that documents monitoring/sampling activities completed in 2019.

Schedule

Emerging contaminant sampling activities are tentatively planned for August/September 2019 and will be conducted concurrently with the planned 2019 groundwater sampling activities. NYSEG will notify NYSDEC at least two weeks prior to completing the field activities. The annual sampling report will be provided to NYSDEC by the end of 2019.

Please contact Tracy Blazicek if you have any questions or require additional information.

Sincerely,

Arcadis of New York, Inc.

Jason Golubski, P.E.
Senior Environmental Engineer

Copies:
Tracy Blazicek, CHMM, NYSEG

Enclosures:

Figure

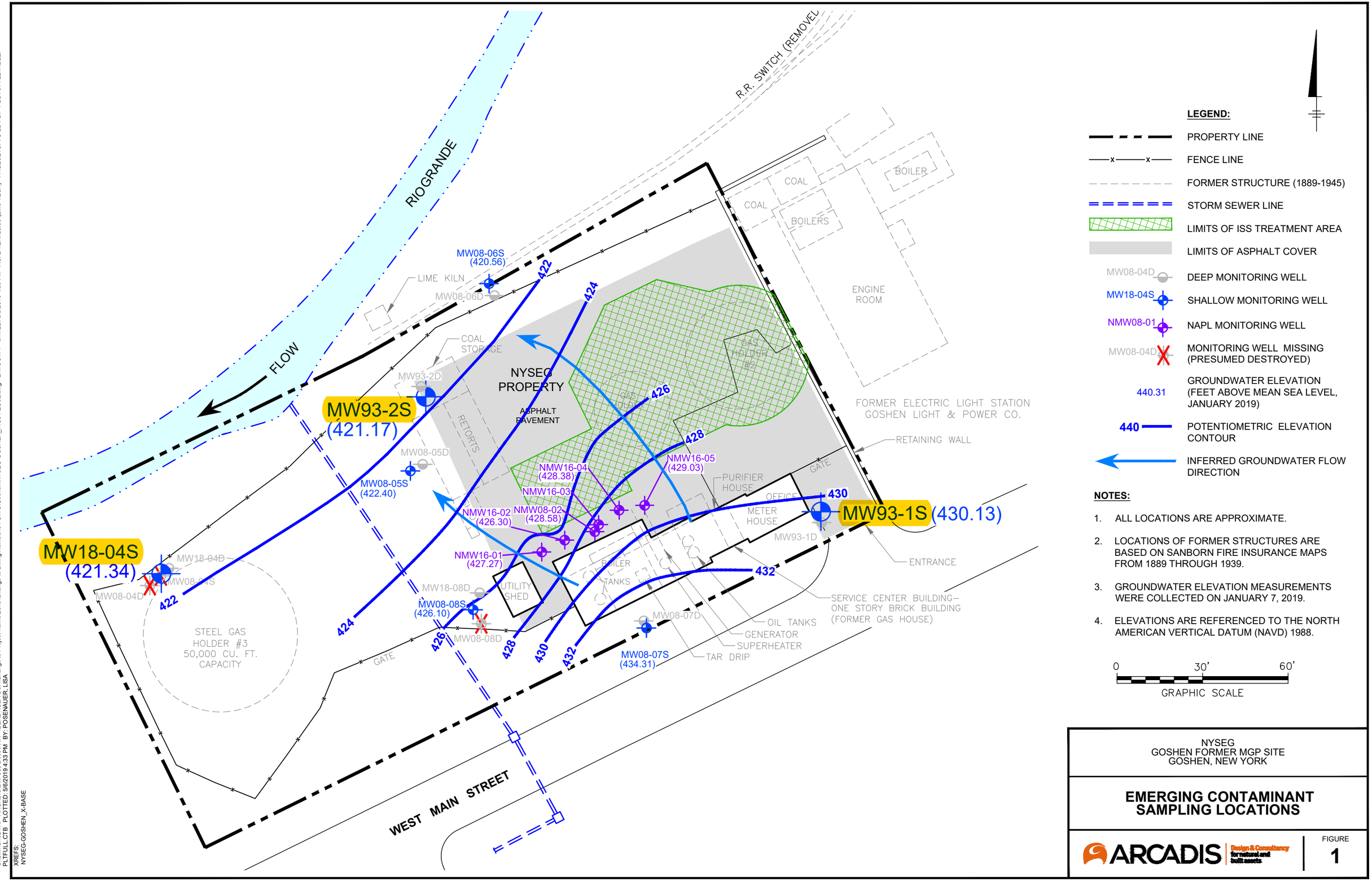
1 Emerging Contaminant Sampling Locations

Attachment

1 New York State Contaminant Field Sampling Plan and Quality Assurance Project Plan

FIGURE 1

Sample Locations



LEGEND:

- PROPERTY LINE
- FENCE LINE
- FORMER STRUCTURE (1889-1945)
- STORM SEWER LINE
- LIMITS OF ISS TREATMENT AREA
- LIMITS OF ASPHALT COVER
- MW08-04D — DEEP MONITORING WELL
- MW18-04S — SHALLOW MONITORING WELL
- NMW08-01 — NAPL MONITORING WELL
- MW08-04D — MONITORING WELL MISSING (PRESUMED DESTROYED)
- 440.31 — GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL, JANUARY 2019)
- 440 — POTENTIOMETRIC ELEVATION CONTOUR
- INFERRED GROUNDWATER FLOW DIRECTION

NOTES:

1. ALL LOCATIONS ARE APPROXIMATE.
2. LOCATIONS OF FORMER STRUCTURES ARE BASED ON SANBORN FIRE INSURANCE MAPS FROM 1889 THROUGH 1939.
3. GROUNDWATER ELEVATION MEASUREMENTS WERE COLLECTED ON JANUARY 7, 2019.
4. ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM (NAVD) 1988.

0 30' 60'

GRAPHIC SCALE

NYSEG
GOSHEN FORMER MGP SITE
GOSHEN, NEW YORK

EMERGING CONTAMINANT SAMPLING LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE 1

CITY: SYRACUSE, NY DIV/GROUP: EBC-IM/DV DB: L.POSENAUER PM/TM: J.BRIEN TR: J.SINAY LYR:(Opt)ON=*;OFF=*REF*
C:\BIM\OneDrive - ARCADIS\BIM 360 Docs\ANA - IBERDROLA USA\Change to Project Name\2019\Change to Billing Number\01-DWG\Goshen\NYSEG-GOSHEN_FIG01-ECSL.dwg LAYOUT: 1 SAVED: 5/3/2019 4:56 PM ACADVER: 23.0S (LMS TECH) PAGESETUP: C:\LB-PDF PLOTSTYLETABLE:
PLTFULL.CTB PLOTTED: 5/6/2019 4:33 PM BY: POSENAUER, LISA
XREFS:
NYSEG-GOSHEN_X-BASE

ATTACHMENT 1

New York State Contaminant Field Sampling Plan and Quality Assurance Project Plan

PARSONS

301 Plainfield Road, Suite 350 | Syracuse, New York 13212
P: 315.451.9560 | F: 315.451.9570 | www.parsons.com

September 14, 2018

Mr. Tracy L. Blazicek, CHMM, PMP
Manager – Programs/Projects
Environmental Remediation
NYSEG
PO Box 5224
Binghamton, NY 13902-5224

Re: New York State Emergent Contaminant Field Sampling Plan and Quality Assurance Project Plan

Dear Mr. Blazicek,

Parsons is pleased to provide Avangrid with this Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP) specific to emergent contaminants groundwater sampling in New York State. This FSP is presented in a way that can be applied to any sampling program where per and polyfluoroalkyl substances (PFAS) and 1,4-dioxane will be a required analysis in addition to the existing analyte list already in place for a given site.

1.0 INTRODUCTION

The objective of this PFAS-specific FSP is to outline methods and procedures that will allow consistency in investigatory field activities, in particular, groundwater sample collection and submission for analysis of emergent contaminants. The methods and procedures described in this FSP have been prepared in accordance with the most recent and applicable United States Environmental Protection Agency (USEPA) regulatory guidance and requirements.

One of the target analytes, PFAS, can be found in many standard environmental sampling materials, including: Fluoropolymer bailer/tubing, some decontamination solutions, and pump bladders/valves. One of the principal PFAS contaminants of concern, perfluorooctanoic acid (PFOA), has been broadly utilized in the production of various everyday items such as: waterproof/stain-resistant clothing, non-stick cookware, and many commonly used plastics. Another of the target analytes, 1,4-dioxane, has been used many products including the manufacturing of pharmaceuticals, personal care products, polyethylene terephthalate (PET) plastic, paint strippers, dyes, greases, varnishes and waxes. The field activities and methods herein have been appropriately modified to prevent cross-contamination, and to avoid the introduction of external contaminant sources during field and sampling events. **Table 1** includes a summary of prohibited and acceptable items for PFAS and 1,4-dioxane sampling.

The New York State Specific QAPP is included in **Appendix A** of this document.

2.0 ANTICIPATED FIELD ACTIVITIES

As discussed in **Section 1**, PFAS and 1-4, dioxane can be found in commonly used sampling materials and equipment. Alternative materials such as those listed in Table 1 will be used to reduce the potential for cross-contamination or the introduction of externally-sourced PFAS during sampling events.

2.1 Groundwater Monitoring and Sampling

Groundwater samples may be collected using various methods depending on specific project objectives. These methods may include purging and sampling, or low-flow sampling techniques to collect representative groundwater samples.

SPECIAL PRECAUTIONS FOR PFAS AND 1,4-DIOXANE SAMPLING

Refer to **TABLE 1** for special clothing, personal protection equipment (PPE), supply and equipment requirements for PFAS and 1,4-dioxane 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 1,4-dioxane and PFAS sampling checklist is included as **Appendix B** and should be filled out daily by field personnel.

Hand Bailing

- Equipment and Supplies
  - Well gauging and sampling logs (no weatherproof field books permitted);
  - Project plans;
  - PPE in accordance with the Health and Safety Plan (HASP) and free of PFAS containing products (see **Table 1**);
  - Photoionization Detector (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 High-density polyethylene (HDPE) bailers and/or stainless-steel bailers;
  - PFAS-free polypropylene rope;
  - Temperature, conductivity, and pH meter;
  - Turbidity meter;
  - Graduated 5-gallon buckets plus lids;
  - Decontamination supplies;

- HDPE plastic sheeting;
- Clear tape, duct tape;
- Coolers and ice;
- Laboratory sample bottles, chain of custody, and shipping labels.

- Purging
  - Prior to sampling, the static water level 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 5-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 a Standard Groundwater Sampling Log (**Appendix C**).
  - 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.

- 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

Nephelometric Turbidity Units (NTUs) before sample collection. If turbidity levels remain high, discuss the possibility of having the analytical laboratory filter samples prior to analysis.

- Record the appearance of the groundwater on a Standard Groundwater Sampling Log.
- 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 carefully transfer the contents to the appropriate bottle for the PFAS analysis. 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 order specified for the project.
- Inspect labels to see that the samples are properly identified.
- The volatile organic compounds Volatile Organic Compounds (VOC) containers should be filled first 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 (samples should 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 deionized water provided by the analytical laboratory 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 New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (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 specific work plan. Samples will be managed in accordance with the QAPP. Chain of Custody procedures will be followed as outlined in the QAPP.

Pumping

- 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);
  - PFAS-free polypropylene rope;
  - Temperature, conductivity, and pH meter;
  - Turbidity meter;
  - Graduated 5-gallon buckets plus lids;
  - Generator
  - 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;
  - Decontamination supplies;
  - HDPE plastic sheeting;
  - Clear tape, duct tape;
  - Coolers and ice;
  - Laboratory sample bottles, chain of custody, and shipping labels.

- Purging
  - Prior to sampling, the static water level 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 just below the top of the water column.
  - 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 a Standard Groundwater Sampling Log (**Appendix C**).
  - 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.
- 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 (**Appendix C**). Turbidity reading should be less than 50 NTUs before sample collection. If turbidity levels remain high, consult the NYSDEC manager to discuss the possibility of having the analytical laboratory filter samples prior to analysis.
  - Record the appearance of the groundwater on a Standard Groundwater Sampling Log.
  - 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 carefully transfer the contents to the appropriate bottle for the PFAS analysis. 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 order specified for the project.
- 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 field 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 deionized water provided by the analytical laboratory 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 Work Assignment Scoping Documents. Samples will be managed in accordance with the QAPP. Chain of Custody procedures will be followed as outlined in the QAPP.

Low Flow Purging and Sampling

- 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);
    - Polypropylene rope;
    - Temperature, conductivity, and pH meter;
    - Turbidity meter;
    - Graduated 5-gallon buckets;
    - 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);
    - Flow-through cell;
    - Generator;
    - Extension cords;
    - Decontamination supplies;
    - HDPE plastic sheeting;
    - Clear tape; duct tape
    - Coolers and ice;
    - Laboratory sample bottles, chains of custody, and shipping labels.
- Purging
    - Equipment will be decontaminated prior to use at each location.
    - Prior to sampling, the static water level 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 PFAS-free bailer or a weighted string. The measurements will be recorded on the field data sheets.

- 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 on the field data sheets.

- The intake of the peristaltic or bladder 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 flow by clamping the tubing.

- During purging pH, specific conductivity, temperature, ORP (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 a Low-Flow Groundwater Sampling Log (**Appendix C**).

- 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

1. Turbidity readings should be less than 50 NTUs before sample collection. If turbidity levels remain high, consult the NYSDEC manager to discuss the possibility of having the analytical laboratory filter samples prior to analysis.
2. 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 the overall Field Sampling Plan.

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 hand-held turbidity meter. All measurements will be recorded on a Low Flow Groundwater Sampling 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.
- 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 a Standard Groundwater Sampling Log.
- 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 carefully transfer the contents to the appropriate bottle for the PFAS analysis. 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 order specified for the project.
- 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 deionized water provided by the analytical laboratory 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 Work Assignment Scoping Documents. Samples will be managed in accordance with the QAPP. Chain of Custody procedures will be followed as outlined in the QAPP.

Sincerely,

PARSONS

Sara M. Weishaupt

Sara Weishaupt
Project Manager

cc: Heather Phillip, Parsons

Enc: Table 1 – Prohibited and Acceptable Items for Emergent Contaminant Sampling
Appendix A – New York State Specific Quality Assurance Project Plan – Emergent Contaminant Sampling
Appendix B – 1,4 Dioxane and PFAS Sampling Checklist
Appendix C – Standard Groundwater Sampling Log

Table 1

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

New York State Specific Quality Assurance Project Plan – Emergent Contaminant Sampling

New York State Specific
Quality Assurance Project Plan (QAPP)

Prepared For:

AVANGRID

89 East Avenue

Rochester, NY 14649

Prepared By:

PARSONS

301 Plainfield Road, Suite 350
Syracuse, NY 13212

September 2018

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LIST OF ACRONYMS

ASTM	American Society for Testing and Materials
BFB	4-Bromofluorobenzene
ºC	Degrees Celsius
CAR	Corrective Action Request
CCV	Continuing Calibration Verification
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
cm/s	centimeter per second
cy	cubic yards
DER	Division of Environmental Remediation
DFTPP	decafluorotriphenylphosphine
DOT	Department of Transportation
DQO	Data Quality Objective
DUSR	Data Usability Summary Report
EDD	Electronic Data Deliverable
ELAP	Environmental Laboratory Accreditation Program
EIMS	Environmental Information Management System
FSP	Field Sampling Plan
GC	Gas Chromatography
GC/ECD	Gas Chromatography/Electron Capture Detection
GC/MS	Gas Chromatography/Mass Spectroscopy
ICP	Inductively Coupled Plasma
ICV	Initial Calibration Verification
IDL	Instrument Detection Limit
ICP/AES	Inductively Coupled Plasma/Atomic Emission Spectroscopy
LCS	Laboratory Control Sample
LIMS	Laboratory Information Management System

LIST OF ACRONYMS (CONTINUED)

LNAPL	Light Non-aqueous Phase Liquid
LPM	Laboratory Project Manager
MD	Matrix Duplicate
MDL	method detection limit
mg/kg	milligram per kilogram
mL	milliliter
MS	Matrix Spike
MSB	Matrix Spike Blank
MS/MD	Matrix Spike/Matrix Duplicate
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSD	Matrix Spike Duplicate
NCM	Nonconformance Memo
ng	nanograms
NIST	National Institute of Standards and Technology
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OM	Operations Manager
PARCCS	Precision, Accuracy, Representativeness, Completeness, Comparability, and Sensitivity
PE	Performance Evaluation
PFAS	Polyfluoroalkyl Substances
PFOA	perflourooctanoic acid
PID	photoionization detector
PQL	practical quantitation limit
PRRL	Project Required Quantitation Limit
PT	Performance Testing
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control

LIST OF ACRONYMS (CONTINUED)

QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
QL	Quantitation Limit
RL	Reporting Limit
ROD	Record of Decision
RPD	Relative Percent Difference
SDG	Sample Delivery Group
SOP	Standard Operating Procedure
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
ug	micrograms
USEPA	Unites States Environmental Protection Agency
VOC	Volatile Organic Compound
VTSR	validated time of sample receipt

SECTION 1

PROJECT DESCRIPTION

1.1 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared to support activities and specifies quality assurance/quality control (QA/QC) procedures for field sampling and laboratory measurements of polyfluoroalkyl substances (PFAS) pertaining to AVANGRID sites regulated by the New York State Department of Environmental Conservation (NYSDEC). The specific objectives of the QAPP are:

- Foster data quality that is sufficient to meet the investigation objectives and to support the decision-making process; and
- Provide a standard for control and review of measurement data to confirm that the data are scientifically sound, representative, comparable, defensible, and of known quality.

This QAPP has been prepared in accordance with USEPA guidance (USEPA, 2000a, 2002b). Project or site specific work plans will have additional scope and quality requirements that may not be addressed in this QAPP.

Project scope and descriptions of the work assignment are provided in the work plans and Field Sampling Plan (FSP). The target analytes, polyfluoroalkyl substances (PFAS), can be found in many standard environmental sampling materials, including: Fluoropolymer bailer/tubing, some decontamination solutions, and pump bladders/valves. One specific PFAS compound, perflourooctanoic acid (PFOA), has 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.

SECTION 2

PROJECT ORGANIZATION

2.1 PROJECT AND TEAM ORGANIZATION

The project organization and the function and responsibility of each group affected by the QAPP are presented in the site work plans or scoping documents. The project organization is designed to promote the exchange of information and for efficient project operation. Key contact information is also summarized in the scoping documents.

2.1.1 Analytical Services

The analytical laboratory (or laboratories) will analyze environmental samples collected from the AVANGRID PFAS sites. Laboratory operations will be conducted under the supervision of a general manager or laboratory director and a quality assurance manager. A project manager and alternate will be assigned. The project manager will be the primary point of contact and will be responsible for coordination and quality of all laboratory activities associated with the project. The laboratory's project manager will manage project sample receipt, analysis scheduling, and data reporting. In case of temporary absence, the direct supervisor will assume the responsibilities of the absent employee or delegate the responsibility to qualified personnel. Sample Management Staff is responsible for receiving, logging, and maintaining internal custody of samples during the sample's residence in the laboratory. In addition, the laboratory will ensure that project analytical requirements are met; monitor project analytical compliance and immediately notify Parsons if conflict or discrepancies arise; initiate and implement appropriate corrective actions; ensure adequate quality review of deliverables prior to release; and participate in coordination meetings.

2.2 SPECIAL TRAINING/CERTIFICATION

Management and field personnel must review the requirements of this QAPP to make certain that persons assigned to specific tasks have appropriate credentials and experience. The Field Team Leaders will check that all onsite personnel have read and understood the QAPP.

Field personnel will be required to adhere to the project Health and Safety Plan (HASP) and FSP. They must also follow applicable task-specific health and safety plans that project subcontractors develop before they begin investigation activities.

Laboratories will have trained and experienced staff capable of performing the analyses specified in this QAPP. Laboratories will have New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP) certification for all project analyses where applicable. Additionally, the laboratories must be able to demonstrate that they have analyzed performance-evaluation or proficiency-testing samples within 12 months of beginning the analyses.

All personnel independent of the laboratory generating the data who are performing data validation and verification must have experience in data validation, quality assurance oversight, and auditing. The data validator must have a Bachelor's degree in chemistry or natural sciences

with a minimum of 20 credit hours in chemistry; one year experience in the implementation and application of analytical laboratory methodologies; and one year experience evaluating data packages of all matrices (e.g., soil, water, air, tissue) for compliance and usability with respect to the USEPA National Functional Guidelines with regional modifications.

SECTION 3

DATA QUALITY OBJECTIVES AND DATA QUALITY CRITERIA

3.1 INTRODUCTION

A systematic planning process will develop site-specific data quality objective (DQOs). These DQOs will clarify study objectives, define the appropriate type of data, and specify tolerable levels of potential errors. These parameters, in turn, will be the basis for establishing the quality and quantity of data needed to support the utility of the data. This section was prepared in accordance with USEPA Guidance for the Data Quality Objectives Process (USEPA, August 2000). Project DQOs will be developed using the "seven-step" DQO process, consisting of the following steps:

Step 1: State the problem
Step 2: Identify the decision
Step 3: Identify inputs to the decision
Step 4: Define the study boundaries
Step 5: Define the decision rule
Step 6: Specify tolerable limits of decision error
Step 7: Optimize the design

Data quality objectives specify the underlying reason for collecting the data and the data type, quality, quantity, and uses needed to make decision, and they provide the basis for designing data collection activities. DQOs and quality assurance objectives are related data quality planning and evaluation tools for all sampling and analysis tools.

The purpose of this QAPP is to provide a standard for control and review of measurement data to ensure they are scientifically sound, representative, comparable, defensible, and of known quality. The data will be used to evaluate the physical and chemical attributes of samples collected. The project objective for analytical testing is to characterize the physical characteristics and chemical constituents and to provide data to support the decision-making process.

The data produced during sampling activities will be compared with the defined QA objectives and criteria for precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS) to see that the data reported are representative of actual conditions at the site.

This data assessment activity is an on-going coordinated process with data production and is intended to assure that data produced during the project are acceptable for use in subsequent evaluations. Both statistical and qualitative evaluations will be used to assess the quality of the data. The primary evaluation of the data will be based upon the field quality control samples described in Section 8.1.1 and the laboratory quality control samples described in Section 8.1.2. The "blank" samples (laboratory QC blank samples and field QC blank samples) will be used to evaluate whether or not the laboratory and/or the field team's procedures for handling of samples

represent a possible source of sample contamination. Laboratory duplicate sample results will be used to evaluate analytical precision. Field duplicate sample results will be used to evaluate the overall precision of the sampling and analysis process, as well as sample representativeness and site heterogeneity. Laboratory control samples will be used to evaluate the accuracy of analytical results, as well other analysis-specific criteria, such as surrogate compound recoveries for PFAS. Matrix spike/matrix spike duplicate (MS/MSD) analysis of project samples will be used to evaluate potential sample matrix effects on the analytical results (both of the sample utilized for MS/MSD and of other samples collected from the site). For all sample results, the impact of sample-specific, analysis-specific, and site-specific factors will be evaluated and an assessment will be made as to their impact, if any, on the data. Duplicate sample (field and laboratory QC samples) results will be used to evaluate data precision.

3.1.1 Data Use Objectives

Data use objectives define why analyses are being conducted and how ultimately the data will be used to meet the overall project objectives. For the AVANGRID PFAS activities, these project objectives are stated in the scoping documents or project work plans.

3.2 DATA QUALITY OBJECTIVES (PARCCS PARAMETERS)

3.2.1 Introduction

DQOs are based on the premise that different data uses require different levels of data quality. The term *data quality* refers to a degree of uncertainty with respect to PARCCS data quality indicators. Specific objectives are established to develop sampling protocols and identify applicable documentation, sample handling procedures, and measurement system procedures. These DQOs are established by onsite conditions, objectives of the project, and knowledge of available measurement systems. Overall work assignment DQOs are presented and discussed in detail in this QAPP. A wide range of data quality is achieved through the use of various analytical methods. The following data quality levels are widely accepted as descriptions of the different kinds of data that can be generated for various purposes:

- **Level I, Field screening or analysis using portable instruments (e.g., photoionization detector [PID]):** Results are often not compound-specific but results are available in real time. Depending on the analysis being performed and the instrumentation used, the results may be considered qualitative, semi-quantitative, or quantitative.
- **Level II, Field analysis using more sophisticated portable analytical instruments (e.g., on-site mobile laboratory):** There is a wide range in the quality of data that can be generated depending on the use of suitable calibration standards, reference materials, and sample preparation equipment. Results are available in real-time or typically within hours of sample collection.

- **Level III, All analyses performed in an off-site analytical laboratory using methods other than USEPA-approved analytical methods**: These data generally do not include the level of formal documentation required under Level IV and are not subject to formal data validation. These data are typically used for engineering studies (e.g., treatability testing), site investigations and remedial design.
- **Level IV, Data generated using USEPA methods and enhanced by a rigorous QA program, supporting documentation, and data validation procedures:** These data are typically used for engineering studies (e.g., treatability testing), risk assessment, site investigations, and remedial design, and may be suitable for litigation/enforcement activities. Results are both qualitative and quantitative.

Project data quality level requirements for sample analyses have been determined to be as follows:

- Level I data quality will be obtained for field screening data collected with portable instruments such as pH meters, temperature probes, and Photoionization Detectors (PIDs) which will be used for health and safety and field operational monitoring. In addition, these instruments or field test kits may be used to produce data for determining where to collect a sample to assess impacts and for field screening of samples to be designated for laboratory confirmation analyses.
- A Level II data quality assurance program will be executed by the field team for obtaining data.
- A Level III data quality assurance program will be executed by the laboratory for chemical analyses not required to be Level IV, such as pH.
- A Level IV data quality assurance program will be executed, in general, by the laboratory for chemical analyses necessary to meet the work assignment objectives.

3.2.2 PARCCS Parameters (Data Quality Indicators)

3.2.2.1 Precision

Precision is an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Specifically, it is a quantitative measurement of the variability of a group of measurements compared to their average value (USEPA, 1987). Precision is usually stated in terms of standard deviation, but other estimates such as the coefficient of variation (relative standard deviation), absolute difference (D), range (maximum value minus minimum value), relative range, and relative percent difference (RPD) are common.

The objectives for precision for each chemical are based on the capabilities of the approved EPA analytical method with respect to laboratory performance. For this project, field-sampling precision will be determined by analyzing coded (blind) duplicate samples for the same parameters, and then, during data validation, calculating the %RPD for duplicate sample results. Field duplicate precision criteria for the water samples will be 30%RPD. The laboratory will determine analytical precision by calculating the %RPD or %D, as applicable to the analytical method being used, e.g., pH will be evaluated using %D.

The laboratory will determine analytical precision by calculating the RPD for the results of the analysis of the laboratory duplicates and matrix spike duplicates. The formula for calculating %RPD is as follows:

$$\%RPD = \frac{|V1 - V2|}{(V1 + V2)/2} \times 100$$

where:

RPD	=	Relative percent difference
V1, V2	=	Values to be compared
|V1 - V2|	=	Absolute value of the difference between the two values
(V1 + V2)/2	=	Average of the two values

For data evaluation purposes, in instances where both sample concentrations are less than five times (<5x) the RL, duplicate precision will be evaluated using the calculated %D result. In this instance, the applicable precision criterion will be two times the RL (2xRL). If a value is not detected, the %RPD criterion will be considered to be not applicable and the %RPD will not be calculated (i.e. precision will not be quantitatively determined). The data quality objectives for analytical precision, calculated as the RPD between duplicate analyses, are presented in Table 3.1.

3.2.2.2 Accuracy

Accuracy is a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern (Taylor, 1987) or the difference between a measured value and the true or accepted reference value. The accuracy of an analytical procedure is best determined by the analysis of a sample containing a known quantity of material and is expressed as the percent of the known quantity that is recovered or measured. The recovery of a given analyte depends on the sample matrix, method of analysis, and the specific compound or element being determined. The concentration of the analyte relative to the detection limit of the analytical method is also a major factor in determining the accuracy of the measurement. Concentrations of analytes that are less than the quantitation limits are less accurate because they are more affected by such factors as instrument "noise." Higher concentrations will not be as affected by instrument noise or other variables and, thus, will be more accurate.

The objectives for accuracy for each chemical are based on the capabilities of the approved USEPA analytical method with respect to laboratory performance. Analytical accuracy is typically assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), the percent recoveries of matrix spike compounds added to selected samples, and the percent recoveries of spike compounds added to laboratory control samples (LCS). An LCS will be analyzed to provide additional information on analytical accuracy. Additionally, initial and continuing calibrations must be performed and accomplished within the

established method control limits to define the instrument accuracy before analytical accuracy can be determined for any sample set.

Accuracy is normally measured as the percent recovery (%R) of a known amount of analyte, called a *spike*, added to a sample (matrix spike or laboratory control). The accuracy on a per sample basis will be measured using surrogates for the organics analyses. The %R is calculated as follows:

Matrix Spike Recovery: $\%\ \text{Recovery} = \dfrac{SSR - SR}{SA} \times 100$

where:

%R	=	Percent recovery
SSR	=	Spike sample result: concentration of analyte obtained by analyzing the sample with the spike added
SR	=	Sample result: the background value; *i.e.*, the concentration of the analyte obtained by analyzing the sample
SA	=	Spiked analyte: concentration of the analyte spike added to the sample

Surrogate Recovery: $\%\ \text{Recovery} = \dfrac{\text{Concentration (or amount) found}}{\text{Concentration (or amount) spiked}} \times 100$

LCS Recovery: $\%\ \text{Recovery} = \dfrac{\text{Concentration (or amount) found}}{\text{Concentration (or amount) spiked}} \times 100$

The acceptance limits for accuracy for each parameter are presented in Table 3.1.

3.2.2.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point or an environmental condition. Representativeness is a qualitative parameter and is most concerned with the proper design of the sampling program (USEPA, 1987). Samples must be representative of the environmental media being sampled. An important factor in the selection of sample locations and sampling procedures will be obtaining representative samples.

Field and laboratory procedures will be performed in such a manner as to ensure, to the degree technically possible, that the data derived represents the in-place quality of the material sampled. Care will be exercised to see that chemical compounds are not introduced to the sample from

sample containers, handling, and analysis. Field blanks, equipment rinse blanks, trip blanks, and laboratory method/prep blanks will be analyzed to monitor for potential sample contamination from field and laboratory procedures.

The assessment of representativeness also must consider the degree of heterogeneity in the material from which the samples are collected. Sampling heterogeneity will be evaluated during data validation through the analysis of coded (blind) field duplicate samples. The analytical laboratory will also follow acceptable procedures to assure the samples are adequately homogenized prior to taking aliquots for analysis such that the reported results are representative of the sample received. Chain-of-custody procedures will be followed to document the possession of sample containers from the time of container preparation through sample collection and receipt back at the laboratory. Field QC samples will be collected and analyzed to provide information to evaluate sample representativeness. Details of field QC sample collection (field blanks, equipment rinse blanks, trip blanks, temperature blanks, field duplicates) and chain-of-custody procedures are presented in Section 4.2 and Section 8.1.1.

3.2.2.4 Completeness

Completeness is defined as the percentage of measurements that meet the project's data quality objectives (USEPA, 1987). Completeness is calculated for each method (or analyte) and sample matrix for an assigned group of samples. Completeness for a data set represents the results usable for data interpretation and decision making. The completeness objective for the analytical and field data is 95%. Completeness is defined as follows for all sample measurements:

$$\%C = \frac{V}{T} \times 100$$

where:

%C = Percent completeness

V = Number of measurements judged valid (not rejected during data validation)

T = Total number of measurements

Completeness, which is expressed as a percentage, is calculated by subtracting the number of rejected and unreported results from the total planned results and dividing by the total number of results. Results rejected because of out-of-control analytical conditions, severe matrix effects, broken or spilled samples, or samples that could not be analyzed for any other reason, negatively affect influence completeness and are subtracted from the total number of results to calculate completeness.

3.2.2.5 Comparability

Comparability expresses the degree of confidence with which one data set can be compared to another (USEPA, 1987). The comparability of all data collected for this project will be managed by:

- Using identified standard methods (including laboratory standard operating procedures) for both sampling and analysis phases of this project
- Requiring traceability of all analytical standards and/or source materials to the USEPA or National Institute of Standards and Technology (NIST)
- Requiring that calibrations be verified with an independently prepared standard from a source other than that used for calibration (if applicable)
- Using standard reporting units and reporting formats including the reporting of QC data
- Performing data validation on the analytical results, including the use of data qualifiers in all cases where appropriate
- Evaluating the sample collection information and analytical QC sample results
- Requiring that the significance of all validation qualifiers be assessed any time an analytical result is used for any purpose.

By taking these steps during the investigation, future users of either the data or the conclusions drawn from them will be able to judge the comparability of these data and conclusions.

3.2.2.6 Sensitivity and Quantitation Limits

When selecting an analytical method during the DQO process, the achievable detection limit (MDL) and method reporting limit (RL) must be evaluated to verify that the method will meet the project quantitation limits necessary to support project decision making requirements. This process ensures that the analytical method sensitivity has been considered and that the methods used can produce data that satisfy users' needs while making the most effective use of resources. The concentration of any one target compound that can be detected and/or quantified is a measure of sensitivity for that compound. Sensitivity is instrument, compound, method, and matrix specific and achieving the required project quantitation limit (RL) and/or method detection limit (MDL) objectives depends on instrument sensitivity and potential matrix effects. With regard to instrument sensitivity, it is important to monitor the instrument performance to ensure consistent instrument performance at the low end of the calibration range. Instrument sensitivity will be monitored through the analysis of method/prep blanks, calibration check samples, and low standard evaluations.

Laboratories generally establish limits that are reported with the analytical results; these results may be called reporting limits, detection limits, quantitation limits, or other terms. These laboratory-specific limits, apply undiluted analyses and must be less than or equal to the project RLs. The RL, also known as the practical quantitation limit (PQL), represents the concentration of an analyte that can be routinely measured in the sampled matrix within stated limits and with confidence in both identification and quantitation. Throughout various documents RL and PQL may be interchanged, but they effectively have the same meaning. The RLs are established based on specific knowledge about the analyte, sample matrix, project specific requirements, and regulatory requirements. The RL is typically established by the laboratory at the level of the lowest calibration standard and is generally in the range of two to ten times the MDL.

The MDL is defined as "the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results" (40 CFR 136 Appendix B). MDLs are experimentally determined and verified for each target analyte of the methods in the sampling program. The laboratory will determine MDLs for each analyte and matrix type prior to analysis of project samples. In addition, when multiple instruments are employed for the analysis of the same method, each individual instrument will maintain a current MDL study. MDLs are statistically calculated in accordance with the Title 40, Code of Federal Regulations Part 136 (40 CFR 136) as promulgated in September 2017. If risk-based project objectives are developed, then where practicable, MDLs must be lower than the risk-based criteria determined for the project.

Laboratory RLs and MDLs for all analyses will meet at a minimum the standards criteria specified in the NYSDEC 6 NYCRR Part 375 Soil Cleanup Objectives for Unrestricted Use and/or the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations."

All analytical results will be reported to the MDL. Analytical results below the MDL will be flagged with a *U* at the RL to indicate the data are non-detect. However, the laboratory will flag analytes detected at a level less than the RL but greater than the MDL (or the laboratory's determined minimum reportable concentration) with a *J* to denote an estimated concentration.

When results are corrected for dry weight, the reporting limits are then elevated accordingly. To compensate for the low solids, modifications are made either to increase the initial volume extracted/digested or to reduce the final volume of extract/digestate.

For samples that do not meet the project-specified RLs or MDLs, (taking into consideration elevated detection limits due to percent solids or percent moisture and aliquots used for the designated analysis), the laboratory must make available compelling documentation (e.g., screening data) and a justifiable explanation for its inability to meet the specified limits using the project protocols. It must also provide an appropriate, justifiable explanation of the issues and resolution in the analytical report/data package (dilution factor, interference, etc.). Excessive, unnecessary dilutions on any sample for a project are unacceptable. The laboratory will analyze all samples initially undiluted, unless for gas chromatography/mass spectroscopy (GC/MS) analyses (i.e., SW8260C and SW8270D), a preliminary GC-screen is performed and indicates that GC/MS instrument damage or compromise may occur if the sample is not analyzed initially at dilution. In this instance, the sample will be analyzed at the lowest possible dilution factor. If multiple extractions/ analyses are performed (such as undiluted and diluted analyses), resulting in several data sets for the same sample, the laboratory will report all data and results from each of the multiple analyses in the data package.

Quantitation limits for all definitive data quality level laboratory analytical methods, compounds, and matrices are presented in Table 3.2.

TABLE 3.1
QUALITY CONTROL LIMITS FOR WATER SAMPLES

			Laboratory Accuracy and Precision				
Analytical Parameters	**Analytical Method**	**Matrix Spike (MS) Compounds**	**MS/MSD (a) % Recovery**	**MS/MSD RPD (b)**	**LCS (c) % Recovery**	**Surrogate Compounds**	**Surrogate % Recovery**
PFAS	537 modified	all PFAS	70-130 or lab QC limit	0-20 or lab QC limit	70-130	Select tracer PFAS	Lab QC Limit

(a) Matrix Spike/Matrix Spike Duplicate

(b) Relative Percent Difference

(c) Laboratory Control Sample

NA - Not Applicable

TABLE 3.2
QUANTITATION LIMITS
AVANGRID NYSDEC PFAS SITES

CAS NO.	COMPOUND	NYSDEC Class GA Ambient Water Quality Standards/Guidance Criteria [1]	Quantitation Limit	UNITS
Per- and Polyfluoroalkyl substances (Modified EPA Method 537)				
2355-31-9	2-(N-methyl perfluorooctanesulfonamido) acetic acid	NS	20	ng/L
27619-97-2	6:2 Fluorotelomer sulfonate	NS	2	ng/L
39108-34-4	8:2 Fluorotelomer sulfonate	NS	2	ng/L
2991-50-6	N-Ethyl-N-((heptadecafluorooctyl)sulphonyl) glycine	NS	20	ng/L
375-73-5	Perfluorobutanesulfonic acid (PFBS)	NS	2	ng/L
375-22-4	Perfluorobutanoic Acid	NS	2	ng/L
	Perfluorodecane Sulfonic Acid	NS	2	ng/L
335-76-2	Perfluorodecanoic acid (PFDA)	NS	2	ng/L
307-55-1	Perfluorododecanoic acid (PFDoA)	NS	2	ng/L
375-92-8	Perfluoroheptane Sulfonate (PFHPS)	NS	2	ng/L
375-85-9	Perfluoroheptanoic acid (PFHpA)	NS	2	ng/L
355-46-4	Perfluorohexanesulfonic acid (PFHxS)	NS	2	ng/L
307-24-4	Perfluorohexanoic acid (PFHxA)	NS	2	ng/L
375-95-1	Perfluorononanoic acid (PFNA)	NS	2	ng/L
754-91-6	Perfluorooctane Sulfonamide (FOSA)	NS	2	ng/L
1763-23-1	Perfluorooctanesulfonic acid (PFOS)	70	2	ng/L
335-67-1	Perfluorooctanoic acid (PFOA)	70	2	ng/L
2706-90-3	Perfluoropentanoic Acid (PFPeA)	NS	2	ng/L
376-06-7	Perfluorotetradecanoic acid (PFTA)	NS	2	ng/L
72629-94-8	Perfluorotridecanoic Acid (PFTriA)	NS	2	ng/L
2058-94-8	Perfluoroundecanoic Acid (PFUnA)	NS	2	ng/L

NOTES:
(1) Groundwater criteria obtained from the NYSDEC document entitled, "Division of Water Technical and Operational Gidance Series (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwter Effluent Limitations, June 1998; Errata Sheet for June 1998 Edition.
ng/L Nanograms per liter
NS No Standard

SECTION 4

DATA ACQUISITION

4.1 SAMPLING METHODS

Any non-disposable sampling equipment used for chemical sampling will be cleaned and decontaminated prior to use to prevent potential cross-contamination between each use. The project Field Activities Plan documents standard operating procedures, best practices, and field decontamination methods to mitigate cross contamination. Additionally, this QAPP describes management, handling, and tracking procedures for investigation-derived waste, including solid and liquid materials, and personal protective equipment.

The special precautions described here will be taken to confirm that each sample collected is representative of the conditions at that location and that the sampling and handling procedures neither alter nor contaminate the sample. If failure in the sampling or measurement system occurs, the procedures specified in Section 10.3 of this QAPP will be followed to identify who is responsible for implementing the appropriate corrective action. This section presents sample container preparation procedures, sample preservation procedures, and sample holding times.

For this program, the laboratory will purchase and distribute certified clean sample containers with chemical preservatives. The sample containers used for chemical analysis must be virgin bottleware, I-Chem^{TM} Series 300 (or equivalent). Vendors are required to provide documentation of analysis for each lot of containers, and the documentation will be kept on file at the laboratory. Alternatively, the laboratory may perform testing to certify that the sample containers are not contaminated. Since the containers supplied by the laboratory will be certified clean, the bottles will not be rinsed in the field prior to use.

Laboratory-supplied sample kits (coolers containing field chain-of-custody forms, custody seals, sample containers, preservatives, and packing material) will be prepared by the laboratory's Sample Management Staff and shipped to the Field Team Leader. The type of containers, required sample volumes, preservation techniques, and holding times for specific analyses are presented in the Table 4.1.

Samples requiring chemical preservation will be collected in sample containers provided by the analytical laboratory that already contain sufficient quantities of the appropriate preservative(s) to ensure that the sample is kept in accordance with the method requirements. The laboratory must provide an adequate amount of pre-preserved bottles with traceable high-purity preservatives, and additional preservative for use if the added amount is not sufficient, based on request by the Field Team Leader and on an as-needed basis if additional bottleware is needed during the field activities. The field team must verify that the preservative has been added appropriately.

TABLE 4.1

WATER SAMPLE CONTAINERIZATION, PRESERVATION, AND HOLDING TIMES

Analysis	Bottle Type	Preservation [a]	Holding Time [b]
PFAS	2-250 mL HDPE	Cool to 4°C	14 days for extraction, 40 days for analysis

(a) All samples to be preserved in ice during collection and transport.

(b) Days from sample collection.

4.2 SAMPLE HANDLING AND CUSTODY

This section presents sample handling and custody procedures for both the field and laboratory. Implementation of proper handling and custody procedures for samples generated in the field is the responsibility of field personnel. Both laboratory and field personnel involved in the chain of custody and transfer of samples will be trained as to the purpose and procedures prior to implementation. For transfer of samples within the laboratory, an internal chain of custody will be required.

4.2.1 Sample Handling

Samples to be collected for the work assignment are specified in the work plan and FSP. After the samples are collected, they will be split as necessary among preserved containers appropriate to the parameters to be analyzed. Each container will be provided with a sample label that will be filled out at the time of collection. The sampler will print label information, specified below, on each label either before or immediately after collecting the sample with an indelible writing instrument. The label will be protected from water and solvents with clear label packing tape.

The following information, at a minimum, is required on each sample label (note: the location ID and the sample ID as described in the Data Management section below inherently identify some of this information, see below):

- Client
- Project name
- Sampling location
- Sample number
- Date and time of sample collection
- Parameters to be analyzed
- Preservative(s) added, if any
- Initials of the sampler.

Following sample collection, excess soil, water, etc., will be wiped from the outside of the sample containers with a paper towel and the lids will be checked to verify they are tightly closed. Each glass container will be wrapped with bubble wrap to minimize breakage during transport. Bottles containing soil, sediment, and water samples will be placed in separate Ziploc® bags (one bag) and set on ice (ice bath not necessary). Documentation of equipment and methods used in the field for treating the samples will be maintained in the field logs, and a chain of custody will be initiated to document transfer of the samples from the field team to the laboratory. In preparation for shipment to the analytical laboratory, the shipment cooler will be packaged as follows:

- Fill a dry shipment cooler with inert cushioning to a depth of 1 inch to prevent bottle breakage. A separate shipment cooler will be used for PFAS samples.
- Place the bagged samples and the laboratory-provided temperature blank upright in the sample cooler. The temperature blank should be placed in the center (horizontally and vertically) with the samples surrounding.
- Place additional cushioning material around the sample bottles as necessary.
- Place bags of ice in the remaining void space to keep the samples cooled to 4°C.
- Complete the chain-of-custody form (see Section 4.2.2). Place the chain-of-custody form in a polyethylene, sealable bag (such as a 1-gal Ziploc® bag or equivalent) and tape the bag to the interior of the cooler lid. Field personnel retain a copy of the chain-of-custody form; another copy is transmitted to the Quality Assurance Officer (QAO) and the Project Manager specified.
- Prior to sealing for shipment, the list of samples will be checked against the container contents to verify the presence of each sample listed on the chain-of-custody record including the temperature blank.
- Affix a custody seal to the cooler.
- Seal the cooler securely with packing tape, taking care not to cover labels if already present.
- Label the cooler appropriately in accordance with the Department of Transportation (DOT) regulations (49 CFR 171 through 179).
- Ship the samples in accordance with the DOT requirements outlined in 49 CFR 171 through 179. Complete the carrier bill of lading and retain a copy on file.
- Samples will be delivered to the laboratory by the most expedient means to meet holding times. Whenever practicable, samples will be shipped on the day of collection for delivery to the laboratory the morning of the day after collection. The laboratory will be required to adhere to holding times for sample analyses. Laboratory performance requirements for analysis turnaround time will be established using the validated time of sample receipt (VTSR) in accordance to NYSDEC requirements. The field team will carefully coordinate sampling activities with the laboratory to see that holding times are met.

The required holding times must be adhered to for the initial sample preparation/analysis. If subsequent reanalysis or re-extraction becomes necessary because of method requirements or

additional requirements stated here, the laboratory will make every effort to perform those re-extractions and/or reanalysis within the primary holding times. Any holding time that is exceeded will be reported immediately to the Project Manager and the QAO by the laboratory QA manager.

4.2.2 Field Sample Custody

The primary objective of sample custody procedures is to create an accurate written record that can be used to trace the possession and handling of samples from the moment of their collection through analysis until their final disposition. A sample (or sample container) will be considered under custody if:

- In a person's possession
- Maintained in view after possession is accepted and documented
- Locked and tagged with custody seals placed on the sample cooler so that no one can tamper with it after having been in physical custody
- In a secured area that is restricted to authorized personnel.

The sample custody flowchart is shown in Figure 4.1.

DATA REQUIRED ON CHAIN-OF-CUSTODY
Project name and client
Signatures of samplers
Sample number, date and time of collection, and grab or composite sample designation
Signatures of individuals involved in sample transfer
If applicable, the air bill or other shipping number
ADDITIONAL ITEMS THAT SHOULD BE INCLUDED:
Sample matrix
Number of sample containers
Analyses to be performed,
Preservative(s)
Name of the analytical laboratory to which the samples are sent
Method of sample shipment
Project number.

A chain-of-custody record will accompany the samples from the time the samples leave the original sampler's possession through the sample shipments' receipt at the laboratory. Triplicate copies of the chain-of-custody record must be completed for each sample set collected. See chart for data requirements.

If samples are split and sent to different laboratories, a copy of the chain-of-custody record is sent with each sample.

The REMARKS space on the chain-of-custody form is used to indicate if the sample is a matrix spike/matrix spike duplicate (MS/MSD), or any other sample information for the laboratory. Since they are not specific to any one-sample point, blanks are indicated on separate rows. Immediately prior to sealing the sample cooler, the sampler will sign the chain-of-custody form and write the date and time on the first RELINQUISHED BY space. The sampler will also write the method of shipment, the shipping cooler identification number, and the shipper air bill number on the top of the chain-of-custody form. Mistakes will be crossed out with a single line in ink and initialed by the author.

Sampling personnel will retain one copy of the chain-of-custody form, and the other two copies are put into a sealable plastic bag and taped inside the lid of the shipping cooler. The cooler lid is closed, custody seals provided by the laboratory are affixed to the latch and across the back and front lids of the cooler, and the person relinquishing the samples signs his or her name across the seal. The seal is taped, and the cooler is wrapped tightly with clear packing tape. Field personnel then relinquish the cooler to personnel responsible for shipment, typically an overnight carrier.

The chain-of-custody seal must be broken to open the sample cooler. Breakage of the seals before receipt at the laboratory may indicate tampering. If tampering is apparent, the laboratory will contact the Field Team Leader for direction on whether to proceed with the analyses.

Sampling personnel record the information placed on the chain-of-custody record in the field logs. They also include in the log a detailed description of the exact locations from which the samples were collected, any pertinent conditions under which the samples were obtained, and the lot number of the containers used.

4.2.3 Laboratory Sample Management

The laboratory has a designated Sample Management Staff responsible for receiving samples in the laboratory, opening the coolers, checking the sample integrity and custody seals, logging samples into the laboratory information management system (LIMS), and controlling the handling and storage of samples while in the laboratory. The laboratory is a secure facility and only authorized laboratory personnel are allowed to handle active samples. The laboratory maintains an SOP for sample management.

4.2.4 Sample Receipt and Logging

Upon receipt at the laboratory, sample-receiving personnel inspect the samples for integrity of the custody seal, check the shipment against the chain-of-custody form, and note any discrepancies. Specifically, the sample-receiving personnel note any damaged or missing sample containers. At this time, the field chain-of-custody record is completed and signed by the Sample Management Staff.

Using the temperature blank in each cooler, the temperature of each incoming sample cooler is measured and recorded during the sample receipt and log-in procedures before samples are placed in laboratory cold storage. Similarly, the laboratory documents that its cold storage facilities are being maintained through daily (at a minimum) documented temperature measurements using a thermometer.

Upon receipt, Sample Management Staff measure and record on the preservation documentation sheet the pH of acid- or base-preserved aqueous samples. Any problems observed during sample receipt must be communicated to the Field Team Leader and/or the QAO verbally and either by fax transmission or email within 24 hr (preferably 3 hr beginning with the normal business day or immediately following for problems noted during second shifts or weekends) after discovery and before samples are released to the laboratory for analysis. Problems may include but are not limited to broken bottles, errors or ambiguities in paper work, insufficient sample volume or weight, inappropriate pH, and elevated temperature.

When the shipment is inspected and the chain-of-custody record agree, the sample receiving personnel enter the sample and analysis information into the LIMS and assign each sample a unique laboratory number. This number is affixed to each sample bottle.

4.2.5 Sample Storage Security

While in the laboratory, the samples and aliquots that require cold storage will be stored and will be maintained in a secured refrigerator unless they are being used for preparation and/or analysis. All of the refrigerators in the laboratory used for storage of samples have restricted access and are numbered. In addition, dedicated refrigerators are designated for extracts and analytical standards. The sample storage areas are in the laboratory, and access is limited to laboratory personnel. Specific requirements for sample storage are described below:

- Samples will be removed from the shipping container and stored in their original containers unless damaged.
- Damaged samples will be disposed in an appropriate manner, and the disposal will be documented or repacked as necessary and appropriate.
- Samples and extracts will be stored in a secure area designed to comply with the storage method(s) defined in the contract.
- The storage area will be kept secure at all times. The sample custodian or designated personnel will monitor access to the storage area.
- Standards or reagents will not be stored with samples or sample extracts.

The following standard operating procedures for laboratory sample security will be implemented to confirm that the laboratory satisfies sample chain-of-custody requirements:

- Samples will be stored in a secure area.
- Access to the laboratory will be through a monitored area. Other outside access doors to the laboratory will be kept locked.
- Visitors must sign a visitor’s log and will be escorted while in the laboratory.
- Refrigerators, freezers, and other sample storage areas will be securely maintained.

4.2.6 Retention and Disposal of Samples

The laboratory must retain all excess samples within their original sample bottles for a minimum of 30 days in cold storage (below 4 degrees Celsius) following submission of the validated data to AVANGRID. At that time, the laboratory must contact the Field Team Leader

for authorization for responsible disposal or further storage instructions. At the point at which the laboratory is provided authorization to dispose of the samples, the laboratory will be responsible, and will assume all liability for proper characterization and disposal of samples and bottleware in accordance with all local, state, and federal regulations.

FIGURE 4.1

SAMPLE CUSTODY FLOW CHART

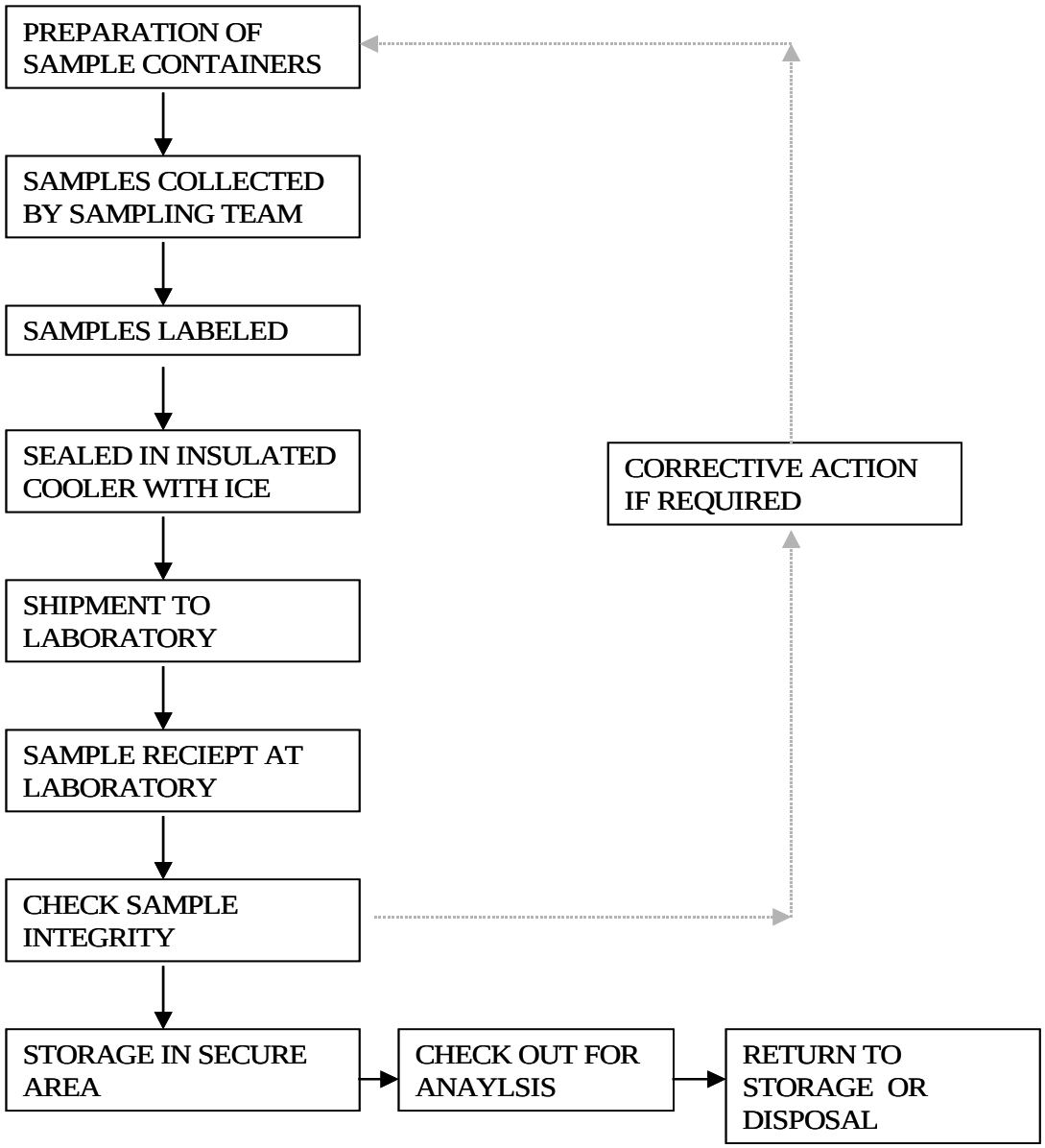

FIGURE 4.2

EXAMPLE CHAIN-OF-CUSTODY RECORD

Submitted to:

Chain Of Custody / Analysis Request

AESI Ref:
COC # :
Lab Use Only
Lab Proj #
Lab ID

Privileged & Confidential
EDD To:
Site Name:
Location of Site:

Client Contact: (name, co., address)
Sampler:
P O #
Analysis Turnaround Time:
Standard - Y
2 weeks -
1 week -
Next Day -
Hardcopy Report To:
Invoice To:

Preservative: 0 0 2
Job No.
Column Study Sediment

Sample Identification

	Location ID	Start Depth (ft)	End Depth (ft)	Field Sample ID	Sample Date	Sample Time	Sample Type	Sample Matrix	Sample Purpose	# of Cont.	Grab/Composite	Field Filtered Sample ?	Units
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													

Special Instructions:

Notes:

Relinquished by — Company — Date/Time — Received by — Company — Date/Time — Condition — Cooler Temp. — Custody Seals Intact

Relinquished by — Company — Date/Time — Received by — Company — Date/Time — Condition — Cooler Temp. — Custody Seals Intact

Preservatives: 0 = None; [1 = HCL]; [2 = HNO3]; [3 = H2SO4]; [4 = NaOH]; [5 = Zn. Acetate]; [6 = MeOH]; [7 = NaHSO4]; 8 = Other (specify):

SECTION 5

DATA MANAGEMENT

5.1 INTRODUCTION

The electronic data management systems for each work assignment will be implemented to process the information effectively without loss or alteration. As of April 1, 2011, the New York State Division of Environmental Remediation (DER) has implemented an Environmental Information Management System (EIMS). The EIMS uses the database software application EQuIS$_{TM}$ from EarthSoft® Inc. In an effort to improve the management of environmental data and reduce paper quantities, all laboratory analytical data minus instrument raw data must be submitted in the DEC-approved Electronic Data Deliverable (EDD).

Data providers must download and install the EQuIS Data Processor (EDP) to check their properly formatted EDD as well as the NYSDEC DER Format file. The EDP performs a series of formatting checks on the EDD and identifies any errors in the data file prior to submission. All EDDs are to be error free when submitted. It is important that the most recent version of the EDP and NYSDEC format file are employed since the valid values used by EIMS are periodically updated for the EDP.

5.2 FIELD DATA MANAGEMENT

The Field Team Leader will manage data generated in the field. He or his designee will be responsible for recording and documenting sampling activities in the field logs, on sampling records (as appropriate), and on chain-of-custody 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 will be coordinated with the Data Management Team. Each sample name will be unique to include location ID and field sample ID. The Database Manager will add data to EIMS through the input module of the system.

DATA INPUT TO EIMS MAY INCLUDE:
– Sample planning information (e.g., sample depth)
– Chain-of-custody data
– Sediment coring logs
– Geotechnical data
– Location and geographic data
– Field measurements
– Meteorological data
– Waste characterization data
– Groundwater levels
– Radiodating data
– Laboratory analytical data

5.3 LABORATORY DATA MANAGEMENT

Laboratory data management involves several important stages that include data transformation, review, verification, and validation, as well as data storage, retrieval, and security. The laboratory will implement a data management system to manage the data from its generation in the laboratory to its final reporting and storage. The data management system will include, but not be limited to, the use of standard record-keeping practices, standard document control systems, and the electronic data management system.

The laboratory data reduction, verification, validation, and reporting procedures and project data management activities, data/information exchange procedures ensure that complete documentation is maintained, transcription and reporting errors are minimized, and data are properly review.

Specific laboratory data management requirements and procedures are discussed in Sections 6 and 9 of this QAPP.

SECTION 6

DOCUMENTS AND RECORDS

6.1 INTRODUCTION

Records will be maintained to document accurately the data generation process during investigation in the field, sample analysis in the lab, and during data validation. Project documentation will be maintained in general accordance with guidelines in the National Enforcement Investigation Center Policies and Procedures (USEPA, 1986). A project file will be maintained that will contain appropriate project documentation; see components in chart. Some of this documentation may be retained electronically in lieu of paper copies. Table 6.1 summarizes the types of project documents and records.

MINIMUM COMPONENTS OF PROJECT FILE
- Project plans and specifications - Field logs and data records - Photographs, maps, and drawings - Sample identification documents - Chain-of-custody records - Data review notes - Report notes and calculations - Progress and technical reports and - Correspondence and other pertinent information - Full analytical data deliverables package provided by the lab, including QC documentation and electronic data deliverable

6.2 FIELD RECORDS

Field personnel are responsible for documenting sample handling activities, observations, and data in field sampling records including field logs, chain-of-custody records, photographs, and pre-design investigation records. The Field Team Leader is responsible for maintaining these documents. Each record is described below.

6.2.1 Field Log

A Field Log will be used to document pre-design investigation activities. The field log will have consecutively numbered pages, and documentation will be recorded using waterproof ink. Incomplete lines, pages, and changes in the log will be lined out with a single line, dated, and

initialed. More detailed procedures for documenting investigation activities (such as field sampling records and boring log forms) and type of information to include in the field log may be developed.

MINIMUM REQUIREMENT FOR INFORMATION IN FIELD LOG
- Responsible person's name
- Date and time of activity
- Equipment and methods used for field preparation of samples
- Field measurements of samples (*e.g.*, pH, temperature)
- Information coordinating sample handling activities with appropriate field activities and chain-of-custody documentation
Daily calibration activities:
Calibrator's name
Instrument name and model
Date and time of calibration
Standards used and their source
Temperature (if appropriate)
Results of calibration
Corrective actions taken (if any)

6.2.2 Electronic Field Data Management

The field sampling program will have an electronic data management component. The system will be designed to specify the necessary samples taken at any given location and to provide the ability to be updated and amended in the field. This will provide a management system that efficiently tracks the needs of the sampling scope. As the samples are taken, log entries are put in the database, and sample labels are printed. At any given time a chain-of-custody record can be printed as well.

6.2.3 Chain-of-Custody Record

The chain of custody record establishes the documentation necessary to trace sample possession from the date and time of sample collection, through sample shipment, to the date and time of arrival at the laboratory designated to perform analysis. The ability to trace the history of a sample is essential to show that the sample collected was, indeed, the sample analyzed and that the sample was not subjected to biasing influences. Evidence of sample traceability and integrity is provided by chain-of-custody procedures. These procedures are necessary to support the validity of the data and will accompany each shipping container.

A copy of the chain-of-custody record will be detached and kept with the field log or placed in the project file; the original record will accompany the shipment.

6.3 LABORATORY RECORDS

Laboratories providing analytical support for this project must maintain records to ensure that all aspects of the analytical processes are adequately documented to ensure legal defensibility of the data.

When a mistake is made, the wrong entry is crossed out with a single line, initialed, and dated by the person making the entry, and the correct information recorded. Obliteration of an incorrect entry or writing over it is not allowed, nor is the use of correction tape or fluid on any laboratory records.

Overwriting or disposal of any electronic media prior to a 5-yr expiration period is strictly prohibited. All electronic and hardcopy data must be stored in an easily accessible climate-controlled environment. The laboratory will exercise "best practices" in terms of frequent, redundant electronic backup procedures on proper long-term storage media to assure that all electronic data representing sample analyses will be maintained for the 5-yr storage period. Electronic data must be stored in a secure, limited-access area with redundant copies stored in fireproof vaults and/ or stored off-site of the laboratory facilities.

Sample preparation in the laboratory must be fully documented and include sample preparation conditions (such as digestion temperatures). In addition, documentation must allow complete traceability to all prepared or purchased reagents, acids and solvents, and reference solutions. All spike solutions and calibration standards must be used prior to labeled expiration dates and stored in accordance with manufacturers recommended conditions. Complete and unequivocal documentation must exist to enable traceability of all prepared spike solutions, calibration standards, and prepared reagents back to the reference materials utilized. Organic extracts must be stored in the same type of vials (amber or clear) as the associated standards at the appropriate storage temperatures.

The unit conventions set forth in the figures for reported data will be consistent with standard laboratory procedures. Reporting units used are those commonly used for the analyses performed. Concentrations in soil and sediment samples will be expressed in terms of weight per unit dry weight, with moisture content reported for each sample.

Laboratory records used to document analytical activities in the laboratory will include reagent and titrant preparation records, standard preparation logs, sample preparation logs, bench data sheets, instrument run logs, and strip chart recordings/chromatograms/computer output. Additional records will include calibration records, maintenance records, nonconformance memos, and Corrective Action Request (CAR) forms.

LAB RECORDS SHOULD CONVEY:
- What was done - When it was done - Who did it and - What was found

REQUIREMENTS FOR LAB RECORDKEEPING
- Data entries must be made in indelible water-resistant ink - Date of each entry and observer must be clear - Observer uses his or her full name or initials - Initial and signature log is maintained so the recorder of every entry can be identified - Information must be recorded in notebook or on other records when the observations are made - Recording information on loose pieces of paper not allowed

6.3.1 Operational Calibration Records

Operational calibration records will document the calibration of instruments and equipment that are corrected on an operational basis. Such calibration generally consists of determining instrumental response against compounds of known composition and concentration or the preparation of a standard response curve of the same compound at different concentrations. Records of these calibrations are maintained in the following documents:

- Standard preparation information, to trace the standards to the original source solution of neat compound, is maintained in LIMS or laboratory standard preparation logs.
- Instrument logbook provides an ongoing record of the calibration for a specific instrument. The logbook should be indexed in the laboratory operations records and should be maintained at the instrument by the chemist. The chemist must sign and date all entries, and the QM or his designee must review them.
- For Level IV data packages, copies of the raw calibration data will be kept with the analytical sample data so the results can readily be processed and verified as one complete data package. If samples from several projects are processed together, the calibration data is copied and included with each group of data. The laboratory will maintain all calibration, analysis, and corrective action documentation (both hard copy and electronic data) for a minimum of 7 years. The documentation maintained must be sufficient to show all factors used to derive the final (reported) value for each sample. Documentation must include all calculation factors such as dilution factor, sample aliquot size, and dry-weight conversion for solid samples. The individual who performs hand calculations must sign and date them. This documentation must be stored with the

raw data. Calculations performed by the data system will be documented and stored as electronic and hard copy data. The instrument printouts will be kept on file, and the electronic data will be stored by the laboratory for a minimum of 7 years.

6.3.2 Maintenance Records

Maintenance records will be used to document maintenance activities, service procedures, and schedules. They must be traceable to each analytical instrument, tool, or gauge. The individual responsible for the instrument must review, maintain, and file these records. These records may be audited by the QAO to verify compliance. Logs must be established to record and control maintenance and service procedures and schedules.

6.3.3 Nonconformance Memos

Nonconformance Memos (NCM) may be either a hard copy record or an electronic database record. In either case, review and release of the record must be documented by the initiator, the analytical group leader where appropriate, the laboratory project manager, and the laboratory QA manager. All internal laboratory nonconformance documentation will be communicated to the Field Team Leader by the laboratory project manager verbally and summarized in the report narrative. The NCM will be used to document equipment that fails calibration and will identify any corrective actions taken.

6.3.4 Corrective Action Request (CAR) Forms

The laboratory must use CAR forms to document any incidents requiring corrective action. The CAR form will be issued to the personnel responsible for the affected item or activity. A copy will also be submitted to the laboratory project manager. The individual to whom the CAR is addressed will return the requested response promptly to the QA personnel and will affix his or her signature and date to the corrective action block after stating the cause of the conditions and corrective action to be taken. QA personnel will maintain a log for status of CAR forms to confirm the adequacy of the intended corrective action and to verify its implementation. CARs will be retained in the project record file.

6.3.5 Analytical Data Reports

Analytical data will be reported as an Electronic Data Deliverable (EDD) and as an analytical data package. The analytical laboratories are required to submit all data, preliminary and final, in formatted EDDs in accordance with NYSDEC's requirements. The laboratory must meet 100% compliance with these requirements. The Parsons Database Manager will submit written requests dictating the requirements and appropriate files to be supplied by the laboratory. The specifications of the EDD are presented in Section 5.

Analytical data reports will be provided by the laboratory within 28 calendar days following receipt of a complete Sample Delivery Group (SDG) and will include the specifications identified in Attachment 1. An SDG is considered to include all samples received for the same project or site, to a maximum of twenty investigative samples not to exceed 5 consecutive days of sampling.

The data package provided by the laboratory will be Level IV data in the NYSDEC ASP Category B format, unless an alternative requirement is specified in a laboratory statement of work (SOW) and will contain all information to support the data validation in accordance with the USEPA Region II Standard Operating Procedures (SOP) as described in Section 9. Additionally, the completed copies of the chain-of-custody records, accompanying each sample from the time of initial bottle preparation to completion of analysis, must be attached to the analytical reports.

6.4 DATA VALIDATION AND AUDIT RECORDS

Data validation personnel are responsible for documenting validation procedures and results in the form of a data usability summary report (DUSR). The QAO will be responsible for maintaining this report and the QAO will be responsible for its distribution. Additionally, audit reports will be prepared and distributed by the QAO. A brief description of each record is described below.

6.4.1 Data Usability Summary Reports

The DUSR will be prepared as required by NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, Appendix 2B, May, 2010. The DUSR will summarize the impacts of using data that do not achieve overall data quality objectives or that do not meet PARCC and sensitivity criteria identified in Section 3.3. Additionally, the report will be used to identify, assess and present issues associated with the overall data.

6.4.2 Audit Reports

Among other QA audit reports, which may be generated during the conduct of activities, a final audit report for this project may be prepared by the QAO. The report will include:

- Periodic assessment of measurement data accuracy, precision, and completeness
- Results of performance audits and/or system audits
- Significant QA problems and recommended solutions for future projects
- Status of solutions to any problems previously identified

TABLE 6.1
SUMMARY OF FIELD, LABORATORY, AND DATA MANAGEMENT RECORDS

REPORT	PERSON RESPONSIBLE FOR		STORAGE
	MAINTENANCE	DISTRIBUTION	
PROJECT FILES AND FIELD SAMPLING RECORDS			
Field Log	Field Team Leader	Project Manager	Job File at Primary Contractor's Location
Photographs	Field Team Leader	Project Manager	Job File at Primary Contractor's Location
Chain-of-Custody	Field Team Leader	Project Manager	Job File at Primary Contractor's Location
Field Sampling Records	Field Team Leader	Project Manager	Job File at Primary Contractor's Location
LABORATORY RECORDS			
Reagent and Titrant Preparation Records	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Standards Preparation Logs	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Sample Preparation Logs	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Bench Data Sheets	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Instrument Run Logs	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory

TABLE 6.1
SUMMARY OF FIELD, LABORATORY, AND DATA MANAGEMENT RECORDS (CONT.)

REPORT	PERSON RESPONSIBLE FOR		STORAGE
	MAINTENANCE	DISTRIBUTION	
Strip Chart Recordings/ Chromatograms/Computer Output	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Analytical Data Reports	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Log-in Sheets	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Maintenance Records	Quality Assurance Manager	Laboratory Project Manager	Instrument Maintenance Logbook at Laboratory
Periodic Calibration Records	Quality Assurance Manager	Laboratory Project Manager	QA Files at Laboratory
Operational Calibration Records	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Nonconformance Memos	Quality Assurance Manager	Laboratory Project Manager	Maintained in Database File at Laboratory
Corrective Action Request Forms	Quality Assurance Manager	Laboratory Project Manager	Client Correspondence Records at Laboratory
DATA VALIDATION AND AUDIT RECORDS			
Data Validation Reports	Quality Assurance Officer	Quality Assurance Officer	Job File at Primary Contractor's Location
Audit Reports	Quality Assurance Officer	Quality Assurance Officer	Job File at Primary Contractor's Location

SECTION 7

ANALYTICAL PROCEDURES

7.1 INTRODUCTION

To meet program specific regulatory requirements for chemicals of concern, all methods will be followed as stated, with some specific requirements noted below. Chemical analyses for inorganics, organics, and wet chemistry parameters will be conducted in accordance with the QAPP, the scoping documents or work plans, laboratory's SOPs (maintained "on-file" at the laboratory), and with referenced analytical methods including USEPA SW846 Test Methods for Evaluating Solid Waste, Physical, and Chemical (USEPA, 1997), and Methods for Chemical Analysis of Water and Wastes (USEPA, 1983). Where requirements conflict, the technical and QA/QC requirements in this QAPP take precedence.

7.2 STANDARD OPERATING PROCEDURES

Standard Operating Procedures (SOPs) are a written step-by-step description of laboratory operating procedures exclusive of analytical methods. Laboratories providing analytical support for this project will be required to document all procedures in SOPs. The SOPs must address the following areas:

- Storage containers and sample preservatives
- Sample receipt and logging
- Sample custody
- Sample handling procedures
- Sample transportation
- Glassware cleaning
- Laboratory security
- QC procedures and criteria
- Equipment calibration and maintenance
- Documentation
- Safety
- Data handling procedures
- Document control
- Personnel training and documentation
- Sample and extract storage
- Preventing sample contamination
- Traceability of standards
- Data reduction and validation

- Maintaining instrument records and logbooks
- Nonconformance
- Corrective actions
- Records management

SECTION 8

QUALITY CONTROL

8.1 INTRODUCTION

A QC program is a systematic process that controls the validity of analytical results by measuring the accuracy and precision of method and matrix, developing expected control limits, using these to detect anomalous events, and requiring corrective action techniques to prevent or minimize the recurrence of these events. QC measurements for analytical protocols are designed to evaluate laboratory performance, and measurement biases resulting from the sample matrix and field performance.

- **Field performance:** QC samples are used to evaluate the effectiveness of the sampling program to obtain representative samples, eliminating any cross contamination. These samples will include trip blanks, field duplicates and rinse blanks.
- **Sample performance:** Factors associated with sample preparation and analysis influence accuracy and precision. Such factors are monitored by the use of internal QC samples. QC field samples are analyzed to evaluate measurement bias due to the sample matrix based on evaluation of matrix spike (MS) and matrix spike duplicate (MSD) samples. If acceptance criteria are not met, matrix interferences are confirmed either by reanalysis or by inspection of the LCS results to verify that laboratory method performance is in control. Data are reported with appropriate qualifiers or discussion.
- **Laboratory method performance:** All QC criteria for method performance should be met for all target analytes for data to be reported. These criteria generally apply to instrument detector assessment (such as, tunes, ICP interference check sample), calibration, method blanks, and LCS. Variances will be documented and noted in the case narrative of the report.

8.1.1 Field Quality Control Samples

QC samples will be collected in the field as part of the sampling program to allow evaluation of data quality. Field QA/QC samples will consist of the collection and analysis of field blanks, equipment rinse blanks, field duplicates, and matrix spike/matrix spike duplicate (MS/MSD) samples, at a frequency of 1:20 for each sample media. Temperature blanks will accompany each sample shipment container (cooler) shipped to the laboratory for sample analysis. An equipment rinse blank will be collected from disposable sampling equipment at a frequency of once per lot. For PFAS sampling, equipment rinse blanks and field blanks will be collected daily. Standard sample identifiers will identify field QA/QC samples and they may provide no indication of their nature as QA/QC samples.

A summary of the type and collection frequency of field QC sample to be collected respective to the sampling programs specified in this QAPP, is included in Table 8.1. A description of each QC sample is included below.

8.1.1.1 Equipment Rinse Blanks

To assess field sampling and decontamination performance, equipment rinse blanks will be used to evaluate the effectiveness of the decontamination procedures for chemical sampling equipment. Equipment rinse blanks will be collected as part of all chemical sampling programs, except for waste characterization. An equipment rinse blank is a sample of deionized water provided by the laboratory that is poured over or through the sampling equipment (such as split spoon, wipe template) into the sample container. An equipment rinse blank will be collected at a frequency of 1:20 samples per type of sample collection activity using non-disposable sampling equipment. An equipment rinse blank will be collected from disposable sampling equipment at a frequency of once per lot. For PFAS sampling, equipment rinse blanks will be collected daily using laboratory supplied PFAS-free water.

8.1.1.2 Field Duplicates

Coded (blind) field duplicates will be used to assess the precision of field sampling procedures. Precision of a sample is calculated by quantifying the RPD between two sample measurements (Section 3.2.2.1). If the RPD of field duplicate results is greater than the precision criterion, environmental results for the field duplicate pair will be qualified as estimated. The Field Leader responsible for sample collection and processing should be notified to identify the source of variability (if possible), and corrective action should be taken (Section 10.3).

Coded (blind) field duplicates will be collected to evaluate the representativeness and effectiveness of homogenization and proper mixing for soil and aqueous samples. The field duplicate will be analyzed for all of the parameters for which the associated samples are being analyzed. The samples will be labeled in such a manner that the laboratory will not be able to identify the sample as a duplicate sample. This will eliminate bias that could arise by laboratory personnel.

8.1.1.3 Trip Blanks

During field sampling and sample shipping, contamination may be introduced to the samples that could affect the accuracy of analysis results. Trip blanks will be used during sample shipment to detect cross-contamination. Each cooler of aqueous samples sent to the laboratory for analysis of VOCs only will contain one trip blank. Trip blanks are prepared only when VOCs samples are taken and are analyzed for VOCs analytes. The trip blank consists of a VOC sample vial filled in the laboratory with Environmental Information Management System (ASTM) Type II reagent grade water, transported to the sampling site, handled like an environmental sample, and returned to the laboratory for analysis. Trip blanks are not opened in the field. Trip blanks will not be analyzed for the NYSDEC PFAS projects.

8.1.1.4 Field Blank

The primary purpose of this type of blank is to provide an additional check on possible sources of contamination. A field blank serves a similar purpose as a trip blank regarding water quality and sample bottle preparation. However, it is primarily used to indicate potential contamination from ambient air as well as from sampling instruments used to collect and transfer samples from

point of collection into sample containers. A field blank will be collected daily for PFAS sampling using laboratory supplied PFAS-free water.

8.1.1.5 Temperature Blank

The temperature blank is used to indicate the temperature of the sample cooler upon receipt at the laboratory. A temperature blank consists of laboratory reagent in a 40-ml glass vial sealed with a Teflon® septum. Any cooler temperature exceeding the allowable 4 ± 2 degrees Celsius (°C) must be noted and the QAO notified prior to sample analyses.

8.1.2 Laboratory Quality Control Samples

QC data from the laboratory are necessary to determine precision and accuracy of the analyses and to demonstrate the absence of interferences and contamination of glassware and reagents. The laboratory will analyze QC samples routinely as part of the laboratory QC procedures. Laboratory QC results will consist of analysis of MS/MSD, LCS, method/preparation blanks, and surrogate spikes. The frequency of the analysis of laboratory QC is summarized in Table 8.2. QC samples will be prepared and analyzed utilizing the same preparation and analysis procedures as the field samples. These laboratory QC sample analyses will be run independently of the field QC samples. Results of these analyses will be reported with the sample data and kept in the project QC data file.

QC samples will be prepared and analyzed utilizing the same preparation and analysis procedures as the field samples. Re-preparation and/or reanalysis of the laboratory QC samples due to a failing recovery and/or precision failure without the re-preparation and reanalysis of the associated samples is prohibited. In all events, QC failures, holding time exceedances, or any other non-standard occurrence must be communicated immediately to the QAO and prior to reporting and then, with approval to report the data, summarized in the case narrative. If the criteria are not met, appropriate corrective action must be taken as specified in Section 9.1 and Section 10.

8.1.2.1 Matrix Spike/Matrix Spike Duplicate/ Matrix Duplicates

MS/MSD samples for organics, metals, and wet chemistry parameters will be taken at a frequency of 1 per 20 field samples (per SDG) per matrix per method. A “batch” is considered up to twenty samples from the same matrix, of the same extraction/digestion type, prepared and/or analyzed by a given analyst, within 12-hr, within an extraction/digestion event, whichever is more frequent. These samples are used to assess the effect of the sample matrix on the recovery of target compounds or target analytes by spiking a normal field sample with a known concentration of the analyte of interest. Samples identified as blanks (e.g., trip blank, field blank, equipment rinse blank) will not be used for the MS/MSD preparation or analysis.

Spiked samples will be analyzed, and the percent recovery will be calculated. Results of the analysis will be used to evaluate accuracy and precision of the actual sample matrix. For MS/MSD, the result will be compared and used to evaluate the precision of the actual sample matrix. The percent recovery for each analyte in the MS and MSD should fall within the limits established by laboratory QC protocol.

The original sample, MS, and MSD sample aliquots will be treated exactly the same throughout the sample preparation and analysis and will not be homogenized more than any other project sample (either in the field or at the laboratory). The spike samples will be analyzed for the

same parameters as the sample. Field personnel must indicate on the chain-of-custody form which sample(s) are designated as MS/MSD. If samples are not designated for these QC purposes and/or insufficient sample is available the Project Manager and/or QAO will be notified for resolution.

8.1.2.2 Laboratory Control Samples

Laboratory Control Samples (LCS) are designed to check the accuracy of the analytical procedure by measuring a known concentration of an analyte of interest. An LCS will be analyzed for each analytical batch requested for sample preparation and analysis. LCSs must be prepared at a frequency of one per batch for all analytical methods. If high LCS recoveries are observed and the associated samples are reported as "not detected" for the requested target analytes, no action is necessary other than to note the issue in the case narrative of the final analytical report.

8.1.2.3 Method and Preparation Blanks

Laboratory blank samples (also referred to as method or preparation blanks) are designed to detect contamination resulting from the laboratory environment or sample preparation procedure. Method blanks verify that method interferences caused by contaminants in solvents, reagents, glassware, or in other sample processing hardware, are known. Method blanks will be analyzed for each analytical batch using similar preparation techniques (separatory funnel and liquid/liquid extraction) to assess possible contamination and evaluate which corrective measures may be taken, if necessary.

Method blanks associated with field samples must undergo all of the processes performed on investigative samples, including but not limited to pre-filtration and sample cleanups. The blank will be deionized water for water samples or a purified solid matrix such as sodium sulfate for extractable soil samples. Where all the field samples in a batch do not require an additional cleanup procedure, an additional blank may be prepared to check the performance of the additional cleanup and will be associated with the field samples getting the specific additional cleanup. Where this is done, both blanks will be reported, and the procedure described in the case narrative. Method blanks must be prepared at a frequency of one per analytical batch.

8.1.2.4 Surrogate Spike Analyses

Surrogate spikes (applicable to organic analysis only) are used to determine the efficiency of analyte recovery in sample preparation and analysis. Calculated percent recovery of the spikes is used to measure the accuracy of the analytical method. A surrogate spike is prepared by adding a known amount of a compound similar in type to the analytes of interest. Surrogate compounds will be added to all samples analyzed by USEPA Methods, including method blanks, MS/MSDs, project environmental samples, and duplicate samples in accordance with the method.

8.2 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

8.2.1 Field Equipment

Equipment failure will be minimized by routinely inspecting all field equipment to ensure that it is operational and by performing preventative maintenance procedures. Field sampling equipment will be inspected prior to sample collection activities, and repairs will be made prior to decontamination and reuse of the sampling equipment. PFAS-specific requirements for field sampling equipment are described in the FSP. Equipment, instruments, tools, gauges, and other items requiring preventive maintenance will be serviced in accordance with the manufacturer's specified recommendations and written procedure, based on the manufacturer's instructions or recommendations. Maintenance will be performed in accordance with the schedule specified by the manufacturer to minimize the downtime of the measurement system. Qualified personnel must perform maintenance work.

MINIMUM ROUTINE PREVENTIVE MAINTENANCE
Removal of foreign debris from exposed surfaces
Storage in a cool dry place protected from the elements
Daily inspections
Verification of instrument calibrations (Section 8.3.1)

A list of critical spare parts will be developed prior to the initiation of fieldwork. Field personnel will have ready access to critical spare parts to minimize downtime while fieldwork is in progress. A service contract for rapid instrument repair or backup instruments may be substituted for the spare part inventory.

Non-routine maintenance procedures require field equipment to be inspected prior to initiation of fieldwork to determine whether or not it is operational. If it is not operational, it will be serviced or replaced. Batteries will be fully charged or fresh, as applicable.

8.2.2 Laboratory Instrumentation

Periodic preventive maintenance is required for all sensitive equipment. Instrument manuals will be kept on file for reference if equipment needs repair. The troubleshooting section of factory manuals may be used in assisting personnel in performing maintenance tasks.

Major instruments in the laboratory are covered by annual service contracts with manufacturers or other qualified personnel (internal or external). Under these agreements, trained service personnel make regular preventive maintenance visits. Maintenance is documented and maintained in permanent records by the individual responsible for each instrument.

The laboratory manager is responsible for preparation, documentation, and implementation of the program. The laboratory QA manger reviews implementation to verify compliance during scheduled internal audits.

Written procedures will establish the schedule for servicing critical items to minimize the downtime of the measurement system. The laboratory will adhere to the maintenance schedule and arrange any necessary and prompt service. Qualified personnel will perform required service.

8.3 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Instruments (field and laboratory) used to perform chemical measurements will be properly calibrated prior to use to obtain valid and usable results. The requirement to properly calibrate instruments prior to use applies equally to field instruments as it does to fixed laboratory instruments to generate appropriate data to meet DQOs.

8.3.1 Field Instruments

All field analytical equipment will be calibrated immediately prior to each day's use. The calibration procedures of field instruments (such as PID, pH, temperature), will conform to manufacturer's standard instructions to ensure that the equipment functions within the allowable tolerances established by the manufacturer and required by the project. Personnel performing instrument calibrations must be trained in its proper operation and calibration. Records of all instrument calibration will be maintained by the Field Team Leader in the field log (Section 6.2) and will be subject to audit by the QAO or authorized personnel. The Field Team Leader will maintain copies of all the instrument manuals on the site.

8.3.2 Laboratory Instruments

A formal calibration program will control instruments and equipment used in the laboratory. The program will verify that equipment is of the proper type, range, accuracy, and precision to provide data compatible with specified requirements. Instruments and equipment that measure a quantity or whose performance is expected at a stated level will be subject to calibration. Laboratory personnel or external calibration agencies or equipment manufacturers will calibrate the instruments using reference standards. Upon request, the laboratory will provide all data and information to demonstrate that the analytical system was properly calibrated at the time of analysis including calibration method, frequency, source of standards, concentration of standards, response factors, linear range, check standards, and all control limits. This data will be documented in a calibration record (Section 6.3.1). Calibration records will be prepared and maintained for each piece of equipment subject to calibration.

This section provides an overview of the practices used by the laboratory to implement a calibration program. Detailed calibration procedures, calibration frequencies, and acceptance criteria are specified in the laboratory’s analytical method SOPs. The requirements for the calibration of instruments and equipment depend on the type and expected performance of individual instruments and equipment. Therefore, the laboratory will use the guidelines provided here to develop a calibration program.

Two types of calibration are described in this section: periodic calibration and operational calibration. The results of the calibration activities will be documented in the analytical data package and the calibration records (Section 6.3.1).

- **Periodic calibration:** Performed at prescribed intervals for equipment, such as balances and thermometers. In general, equipment which can be calibrated periodically is a distinct, singular purpose unit and is relatively stable in performance.
- **Operational calibration:** routinely performed as part of an analytical procedure or test method, such as the development of a standard curve for use with an atomic absorption spectrophotometer. Operational calibration is generally performed for instrument systems.

Equipment that cannot be calibrated or becomes inoperable will be removed from service. Such equipment must be repaired and satisfactorily recalibrated before reuse. For equipment that fails calibration, analysis cannot proceed until appropriate corrective action is taken, and the analyst achieves an acceptable calibration. This type of failure will be documented in an NCM (Section 10).

8.3.3 Calibration System

The calibration system includes calibration procedures, equipment identification, calibration frequency, calibration reference standards, calibration failure, and calibration records. These elements are described next.

8.3.3.1 Calibration Procedures

Written procedures will be used by the laboratory for all instruments and equipment subject to calibration. Whenever possible, recognized procedures, such as those published by ASTM or USEPA, will be adopted. If established procedures are not available, a procedure will be developed considering the type of equipment, stability characteristics of the equipment, required accuracy, and the effect of operational error on the quantities measured. Calibration procedure established by the laboratory must, at a minimum, meet the calibration requirements of the method on which the SOP is based.

MINIMUM CALIBRATION PROCEDURES
Equipment to be calibrated
Reference standards used for calibration
Calibration technique and sequential actions
Acceptable performance tolerances
Frequency of calibration
Calibration documentation format

8.3.3.2 Equipment Identification

Equipment that is subject to calibration is identified by a unique number assigned by the laboratory. Calibration records reference the specific instrument identification.

8.3.3.3 Calibration Frequency

Instruments and equipment will be calibrated at prescribed intervals and/or as part of the operational use of the equipment. Calibration frequency will be based on the type of equipment, inherent stability, manufacturer's recommendations, values provided in recognized standards, intended data use, specified analytical methods, effect of error upon the measurement process, and prior experience.

8.3.3.4 Calibration Reference Standards

Two types of reference standards will be used by the laboratory for calibration:

- **Physical standards**, such as weights for calibrating balances and certified thermometers for calibrating working thermometers, refrigerators and ovens, are generally used for periodic calibration. Physical reference standards that have known relationships to nationally recognized standards (such as NIST) or accepted values of natural physical constants will be used whenever possible. If national standards do not exist, the basis for the reference will be documented. Physical reference standards will be used only for calibration and will be stored separately from equipment used in analyses. In general, physical standards will be recalibrated annually by a certified external agency, and documentation will be maintained. Balances will be calibrated against class "S" weights by an outside source annually. Physical standards such as the laboratory's class "S" weights will be recertified annually.
- **Chemical standards,** such as vendor certified stock solutions and neat compounds, will generally be used for operational calibration. The laboratory, to provide traceability for all standards used for calibration and QC samples, will document standard preparation activities.

8.3.4 Operational Calibration

Operational calibration will generally be performed as part of the analytical procedure and will refer to those operations in which instrument response (in its broadest interpretation) is related to analyte concentration. Formulas used for calibration are listed in Table 8.3.

8.3.4.1 Preparation of a Calibration Curve

Preparation of a standard calibration curve will be accomplished by analyzing calibration standards that are prepared by adding the analyte(s) of interest to the solvent that is introduced into the instrument. The concentrations of the calibration standards will be chosen to cover the working range of the instrument or method. All sample measurements will be made within this working range. Average response factors will be used or a calibration curve will be prepared by plotting or regressing the instrument responses versus the analyte concentrations. Where appropriate a best-fit curve may be used for nonlinear curves and the concentrations of the analyzed samples will be back-calculated from the calibration curve.

8.3.4.2 Periodic Calibration

Periodic calibrations are performed for equipment (such as balances and thermometers), that is required in the analytical method, but that is not routinely calibrated as part of the analytical procedure. Table 8.4 lists the periodic calibration requirements used by the laboratories.

8.4 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

In the laboratory, personnel qualifying reagents and standards must be trained to perform the associated instrumental analysis, including instrument calibration, calculations, and data interpretation. Laboratory personnel must document the purchase, receipt, handling, storage, and tracking of supplies and consumables used during analysis. For example, analytical standards, source materials, and reference materials used for instrumental calibration/tunes/checks must be certified and traceable to the USEPA or NIST through reference numbers documented directly in each analytical sequence. Calibration for all requested analyses must be verified by an independent second source reference. Adhering to these procedures precludes the use of expired supplies and consumables or supplies and consumables that do not meet standard acceptance criteria.

Records must be maintained on reagent and standard preparation in the LIMS reagent system or laboratory standard preparation logs. The records should indicate traceability of the standards to their original source solution or neat compound, the name of the material, concentration, the method and date of preparation, the expiration date, storage conditions, and the preparer's initials. Each prepared reagent or standard should be labeled with a unique identifier that links the solution to the preparation documentation that specifies an expiration and/or re-evaluation date for the solution.

TABLE 8.1

SUMMARY OF FIELD QC SAMPLE TYPES AND COLLECTION FREQUENCY

Field QC Sample Type	Sample Type	Collection Frequency
Equipment Rinse Blank	Water	1:20 samples per type of sample collection activity using non-disposable sampling equipment. Once per lot for disposable sampling equipment. Daily for PFAS sampling.
Field Blank	Water	Daily for PFAS sampling.
Trip Blank(1)	Water	One per cooler of aqueous VOC samples
Field Duplicates	Water	1:20 Samples
Extra Volume Sample (collected for MS/MSD)	Water	1:20 Samples

Field QA/QC samples will be identified by using standard sample identifiers that will provide no indication of their nature as QA/QC samples.

Notes: (1) – Not analyzed for NYSDEC PFAS projects.

TABLE 8.2

LABORATORY QUALITY CONTROL SAMPLE FREQUENCY

QC Sample	Frequency
Method/prep Blanks	1 per analytical batch of 1-20 samples, per preparation event
Laboratory Control Sample	1 per analytical batch of 1-20 samples, per preparation event
Surrogates	Spiked into all field and QC samples (Organic Analyses)
Matrix Spike/Matrix Spike Duplicate or Matrix (Laboratory) Duplicate	1 per batch of 1-20 samples

TABLE 8.3

OPERATIONAL CALIBRATION FORMULAS

Application	Formula	Symbols
Linear calibration curves	$C = (R - a_0)/a_1$	C = analytical concentration R = instrument response a_0 = intercept of regression curve (instrument response when concentration is zero) a_1 = slope of regression curve (change in response per change in concentration)
Calibration factors [1]	$CF = A_x / C$	C = concentration (µg/L) CF = calibration factor Ax = peak size of target compound in sample extract
Response factors [2]	$RRF = C_{is} A_x / C_x A_{is}$	C = concentration (µg/L) RF = internal standard response factor Cis = concentration of the internal standard (µg/L) Ax = area of the characteristic ion for the target compound Ais = area of the characteristic ion for the internal standard

1. Used for quantitation by the external standard technique
2. Used for quantitation by the internal standard technique

Note: For organic analysis, the laboratory will make efforts to use the best curve technique for each analyte. This practice is described in detail in the laboratory calibration criteria documents for GC analysis. This may require the use of a quadratic curve for some compounds.

TABLE 8.4

PERIODIC CALIBRATION REQUIREMENTS

Instrument	Calibration Frequency		Corrective Actions
Analytical Balances	Daily:	Sensitivity (with a Class S-verified weight)	Adjust sensitivity
	Annually:	Calibrated by outside vendor against certified Class S weights	Service balance
Thermometers	Annually:	Calibrated against certified NIST thermometers	Tag and remove from service
Automatic Pipettors	Quarterly:	Gravimetric check	Service or replacement

TABLE 8.5

SAMPLE CONCENTRATION CALCULATION FORMULAS

Application	Formula	Symbols
Linear regression calibration curves	$C = (R - a_0)/a_1$	C = analytical concentration R = instrument response a_0 = intercept of regression curve (instrument response when concentration is zero) a_1 = slope of regression curve (change in response per change in concentration)
Calibration factors [1]	$C = A_x V_f / CF V_i$	C = concentration (µg/L) CF = calibration factor A_x = peak size of target compound in sample extract V_f = final volume of extracted sample (mL) V_i = initial volume of sample extracted (mL)
Response factors [2]	$C = C_{is} A_x V_f / RF A_{is} V_I$	C = concentration (µg/L) RF = internal standard response factor C_{is} = concentration of the internal standard (µg/L) A_x = area of the characteristic ion for the target compound V_f = final volume of extracted sample (mL) A_{is} = area of the characteristic ion for the internal standard V_i = initial volume of sample extracted (mL)
Residues [3]	R = (W – T)/V x 1,000,000	R^6 = residue concentration (mg/L) W = weight of dried residue + container (g) T = tare weight of container (g) V = volume of sample used (mL)
Solid samples [4]	K = C V D / W (%S/100)	K = dry-weight concentration (mg/kg) C = analytical concentration (mg/L) V = final volume (mL) of processed sample solution D = dilution factor W = wet weight (g) of as-received sample taken for analysis %S = percent solids of as-received sample

1. Used for quantitation by the external standard technique
2. Used for quantitation by the internal standard technique
3. Used for total, filterable, nonfilterable, and volatile residues as well as gravimetric oil and grease
4. Used to calculate the dry-weight concentration of a solid sample from the analytical concentration of the processed sample.
5. Conversion factor to convert g/mL to mg/L:

$$\frac{mg}{L} = \frac{g}{mL} \times \frac{10^3 mL}{L} \times \frac{10^3 mg}{g}$$

SECTION 9

DATA VALIDATION AND USABILITY ELEMENTS

9.1 DATA REVIEW, VERIFICATION, AND VALIDATION

The data collected during this project will undergo a systematic review for compliance with the DQOs and performance objectives as stated in Section 3. In particular, field, laboratory, and data management activities will be reviewed to confirm compliance with the method QC criteria for performance and accuracy and to show that data were collected in a manner that is appropriate for accomplishing the project objectives. These data will be evaluated as to their usability during data verification. In particular, data outside QC criteria, but not rejected, will be reviewed for possible high and low bias. All data will be validated following verification and reduction.

Qualified data validation personnel will assess and verify data; they will review the data against QC criteria, DQOs (Sections 3 and 9.2.2), analytical method, and USEPA Region 2 SOPs for data review to identify outliers or errors and to flag suspect values. Field and laboratory activities that should be reviewed include, at a minimum, sample collection, handling, and processing techniques; field documentation records; verification of proper analytical methods; analytical results of QC samples; and calibration records for laboratory instruments and field equipment. A review of such elements is necessary to demonstrate whether the DQOs outlined in 3 were met. Samples that deviate from the experimental design and affect the project objectives must be reported to the QAO and data validation personnel.

Departures from standard procedures (in the FSP, this QAPP, or the laboratory SOPs, may lead to exclusion of that data from the project database or validation process, based on discussions with and approval. However, routine field audits involving thorough reviews of sample collection procedures and sample documentation should preclude such deviations from occurring. Additionally, routine laboratory audits will be used to document proper sample receipt, storage, and analysis; instrument calibration; use of the proper analytical methods; and use of QC samples specified in Section 8 to assist in appropriately qualifying the data.

The laboratory's analytical report for each sample delivery group (SDG) will be assembled by collecting and incorporating all the data for each analysis associated with the reported samples; the analytical narratives; and other report-related information such as copies of chain-of-custody forms, communication records, and nonconformance forms. The information included in the analytical data report is summarized in Attachment 1.

Before the laboratory submits data, the laboratory's data review process will include a full first level "technical" review by the laboratory's analyst during sample analysis and data generation. The review must include a check of all QC data for errors in transcription, calculations, and dilution factors and for compliance with QC requirements. Failure to meet method performance QC criteria may result in the reanalysis of the sample or analytical batch. After the

initial review is completed, the data will be collected from summary sheets, workbooks, or computer files and assembled into a data package.

The laboratory's first review will be followed by a second-level technical review of the data package. The second level review may be performed by a peer trained in the procedures being reviewed or by the appropriate analytical group supervisor. The reviewer will check the data packages for completeness and compliancy with the project requirements and will certify that the report meets the DQOs for PARCCS specifications. The report narrative will be generated at this stage of the data review. Any problems discovered during the review and the corrective actions necessary to resolve them will be communicated to the responsible individual, who will discuss the findings with the laboratory QA manager for resolution.

The first and second review will be conducted throughout sample analysis and data generation to validate data integrity during collection and reporting of analytical data. Data review checklists will be used to document the performance and review of the QC and analytical data.

Before the laboratory's final release to the client, the data will undergo a final review by the laboratory's QA officer or his/her designee. This third level review is to confirm that the report is complete and meets project requirements for performance and documentation. The laboratory's QA officer must review reports involving non-conforming data issues. A summary of all non-conformances will be included in the case narrative. The report will then be released to the client for data validation, and a copy will be archived by the laboratory for a period of 7 yrs.

The laboratory analytical data will be validated using project-specific data validation procedures to confirm that data meet the applicable data quality objectives. Depending on the type of data and the intended data uses, the data validation process for a given SDG (or a specific percentage of sample analyses) or analytical method may be performed following a Level IV protocol (full validation), or a Level III protocol (sample plus QC summary data only, no raw data review). The project-specific Level III data validation protocol will provide a level of review resulting in the generation of a data usability summary report (DUSR), as defined by NYSDEC DER-10 requirements. Level III validation will be performed on all DQO Level III and all DQO Level IV data. Ten percent (10%) of the DQO Level IV Data for each analytical method will undergo a Level IV validation. Certain geotechnical and field screening data may be evaluated in a manner suitable for the intended data uses.

A data validation report will be issued and reviewed by the QAO before finalization. The data validation report will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain-of-custody procedures, and a summary assessment of PARCCS criteria for each analytical method. The validation criteria are objective and are not sample dependent, except for consideration of sample matrix effects. The criteria specify performance requirements that should be under the control of the field-sampling contractor or analytical laboratory. This QAPP will be the primary reference for evaluating the data.

After data validation, the data will be evaluated for consistency with site conditions and developed conceptual models. Data validation personnel will prepare a project DUSR that summarizes the implications of the use of any data out of criteria. In addition, the data usability

report will include the percentage of sample completeness for critical and non-critical samples and a discussion of any issues in representativeness of the data that may develop as a result of validation. The data usability report will address overall data quality and achievement of PARCCS criteria and assess issues associated with the overall data and data quality for all validated Level III and Level IV data.

9.2 VERIFICATION AND VALIDATION METHODS

9.2.1 Laboratory

The laboratory will verify and assess analytical data against the stated requirements on the chain-of-custody record, the sample handling procedures (Section 4), and the QC parameters. The laboratory data reviewers will also check that transcriptions of raw or final data and calculations were performed correctly and are verified.

Following data verification, analytical data generated by the laboratory will be reduced and managed based on the procedures specified in this QAPP and analytical methodologies. Data reduction includes all processes that change either the values or numbers of data items. The data reduction processes used in the laboratory includes establishment of calibration curves, calculation of sample concentrations from instrument responses, and computation of QC parameters. Table 8.5 lists the formulas used to calculate sample concentrations.

The reduction of instrument responses to sample concentrations takes different forms for different types of methods. For most analyses, the sample concentrations are calculated from the measured instrument responses using a calibration curve. The sample concentrations can be back-calculated from a regression equation fitted to calibration data. For gravimetric and titrimetric analyses, the calculations are performed according to equations given in the method. For chromatographic analyses, the unknown concentrations are determined using either calibration factors (external standard procedure) or relative response factors (internal standard procedure). GC analyses are generally quantitated using the external standard technique; GC/MS analyses are quantitated using the internal standard technique. These calculations are generally performed by the associated computerized data systems.

Validated analytical data will be loaded into a database and reported in tabular format. Database fields will include the field sample identification, laboratory sample identification, blinded sample number, analytical results, detection limits, and validation qualifiers. The usability of the data will be evaluated by the QAO or designee.

9.2.2 Analytical Data Validation

The data review process is performed in two phases:

1. **Initial phase, contract compliance screening (CCS)**: Review of sample data deliverables for completeness. Completeness is evaluated by ensuring that all required data deliverables are received in a legible format with all required information. The CCS process also includes a review of the chain-of-custody forms, case narratives, and RLs. Sample resubmission requests, documentation of nonconformances with respect to data

deliverable completeness, and corrective actions often are initiated during the CCS review. The results of the CCS process are incorporated into the data validation process.

2. **Second phase, data validation:** A project-specific data validation procedure based on a "Level III" or the "Level IV" validation protocol will be performed on the analytical results from the fixed-base laboratory or laboratories, with the exception of the bench-scale testing data. The Level III validation protocol, which be applied to Level III data packages and Level IV data packages not receiving "full" Level IV validation includes a review of summary information to determine adherence to analytical holding times; results from analysis of field duplicates, method blanks, field blanks, surrogate spikes, MS/MSDs, LCSs, and sample temperatures during shipping and storage. Data qualifiers are applied to analytical results during the data validation process based on adherence to method protocols and laboratory-specific QA/QC limits. The Level IV validation protocol incorporates the Level III validation protocol and adds calculation checks from the raw data of reported and summarized sample data and QC results.

FULL VALIDATION (USEPA LEVEL IV EQUIVALENT)	
Organic Analytical Methods	**Inorganic Constituents, Wet Chemistry Parameters**
Percentage of solids	Percentage of solids
Sample preservation and holding times	Sample preservation and holding times
Instrument tuning	Calibrations
Instrument calibrations	Blank results
Blank results	Interference check samples (inorganics only)
System monitoring compounds or surrogate recovery compounds (as applicable)	LCSs
Internal standard recovery results	Project Required Reporting Limit (PRRL) standard check samples
MS and MSD results	Duplicates
LCS results	MSs (pre-digestions and post-digestions for inorganics only)
Target compound identification	ICP serial dilutions and
Chromatogram quality	Results verification and reported detection limits
Duplicate results	
Compound quantitation and reported RLs	
System performance and	
Results verification	

The laboratory will send the required analytical data package deliverables, consisting of hardcopy versions and the EDD, following completion of the laboratory's validation process (Section 9.2.2). Data validation will be performed in accordance with the USEPA Region 2 Data

Validation SOPs for organic and inorganic data review (USEPA, 2016a, 2016b, 2016c, 2016d, 2016e). In addition, Parsons will refer to this QAPP and the Work Assignment Scoping Documents to verify that DQOs were met. If problems are identified during data validation, the QAO and the laboratory QA manager will be alerted, and corrective actions will be requested. The LPM and data validation chemists will maintain close contact with the QAO to ensure all nonconformance issues are acted upon prior to data manipulation and assessment routines.

Data validation will be conducted using the USEPA guidelines (USEPA, 2017a, 2017b) as supplementary guidelines. Where USEPA guidelines and SW-846 disagree, this QAPP and data validation professional judgment will prevail.

Trained and experienced data validation chemists will perform the data validation work. The QAO will review the data validation report before it is finalized. The data validation report will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain-of-custody procedures, and a summary assessment of PARCCS criteria for each analytical method. A detailed assessment of each SDG will follow. Based on the results of data validation, the validated analytical results reported will be assigned a usability flag (see chart below).

USABILITY FLAGS FOR VALIDATED RESULTS	
U	Not detected at given value
UJ	Analyte not detected; associated quantitation limit is an approximate (estimated) values.
J	Estimated value
J+	Estimated biased high
J-	Estimated biased low
N	Presumptive evidence at the value given
NJ	Analysis indicates presence of analyte tentatively identified; the associated numerical value is its approximate concentration
R	Result not useable and
No flag	Result accepted without qualification

9.3 RECONCILIATION WITH USER REQUIREMENTS

Following data validation by qualified personnel, the data will be evaluated by the QAO and the project manager as to consistency with site conditions and developed conceptual models to determine whether field and analytical data meet the requirements for decision making. Specifically, the results of the measurements will be compared to the DQOs (Section 3).

The DQOs will be considered complete and satisfied if the data are identified as usable and if no major data gaps are identified. For example, the objective for data collected under the characterization program is to further refine the limits of dredging and/or capping. If the collected data sufficiently characterizes these limits in a manner that is acceptable for remedial action, then the DQO is satisfied. In cases where data may be considered not usable (for example, rejected during data validation), resampling may be required at a specific location. If resampling is not possible, the data will be identified and noted in the project database to make data users aware of its limitations.

SECTION 10

ASSESSMENT AND OVERSIGHT

10.1 ASSESSMENTS AND RESPONSE ACTIONS

Performance and system audits of both field and laboratory activities may be performed. Any such audits will be performed at a frequency to be determined to ensure that sampling and analysis activities are completed in accordance with the procedures specified in the FSP and this QAPP.

Quality assurance audits will be carried out under the direction of the QAO on field activities, including sampling and field measurements. They will be implemented to verify that established procedures are being followed and to evaluate the capability and performance of project and subcontractor personnel, items, activities, and documentation of the measurement system(s).

The QAO will plan, schedule, and approve system and performance audits based on procedures customized to the project requirements. If required, the QAO may request additional personnel with specific expertise from company and/or project groups to assist in conducting performance audits. Quality auditing personnel will not have responsibility for field or laboratory project work.

10.2 PROJECT-SPECIFIC AUDITS

Project-specific audits include system and performance audits of sampling and analysis procedures, and of associated recordkeeping and data management procedures. Project-specific audits will be performed on a discretionary basis at a frequency determined by the project manager.

10.2.1 System Audits

The QAO may perform system audits. Such audits will encompass a qualitative evaluation of measurement system components to ascertain their appropriate selection and application. In addition, field and laboratory QC procedures and associated documentation may be system-audited including the field log, field sampling records, laboratory analytical records, sample handling, processing, and packaging in compliance with the established procedures, maintenance of QA procedures, and chain-of-custody procedures. These audits may be carried out during execution of the project to confirm that sampling crews employ consistent procedures. However, if conditions adverse to quality are detected additional audits may occur.

Findings from the audit will be summarized and provided to the PM and/or designated personnel so that necessary corrective action can be monitored from initiation to closure.

10.2.2 Performance Audits

The laboratory may be required to conduct an analysis of PE samples or provide proof that PE samples were submitted by an approved USEPA or NYSDEC performance testing provider within the past 12 months. If necessary, proof that applicable PE samples have been analyzed at the laboratory within the past 12 months will be included in the laboratory procurement package.

10.2.3 Formal Audits

Formal audits are any system or performance audit that the QAO documents and implements. These audits encompass documented activities performed by qualified lead auditors to a written procedure or checklist to verify objectively that QA requirements have been developed, documented, and instituted in accordance with contractual and project criteria. At the discretion of the project manager, the QAO or designated personnel may conduct formal audits on project and subcontractor work during the course of the project.

Auditors who have performed the site audit after gathering and evaluating all data will write audit reports. Items, activities, and documents determined by lead auditors to be in noncompliance must be identified at exit interviews conducted with the involved management. Noncompliance will be logged and documented through audit findings. These findings will be attached to and become part of the integral audit report. These audit-finding forms are directed to management to resolve satisfactorily the noncompliance in a specified and timely manner.

The QAO has overall responsibility to see that all corrective actions necessary to resolve audit findings are acted upon promptly and satisfactorily. Audit reports will be submitted to the PM after completion of the audit. Serious deficiencies will be reported to the PM on an expedited basis. Audit checklists, audit reports, audit findings, and acceptable resolutions will be approved by the QAO prior to issue. Verification of acceptable resolutions may be determined by re-audit or documented surveillance of the item or activity. Upon verification acceptance, the QAO will close out the audit report and findings.

10.2.4 Laboratory Audits

Internal laboratory audits will be performed routinely to review and evaluate the adequacy and effectiveness of the laboratory's performance and QA program, to ascertain if the QAPP is being completely and uniformly implemented, to identify nonconformances, and to verify that identified deficiencies are corrected. The laboratory QA manager is responsible for such audits and will perform them according to a schedule planned to coincide with appropriate activities on the project schedule and sampling plans. Such scheduled audits may be supplemented by additional audits for one or more of the following reasons:

- When significant changes are made in the QAPP
- When necessary to verify that corrective action has been taken on a nonconformance reported in a previous audit
- When requested by the laboratory's project manager or QA manager.

10.2.4.1 Laboratory Performance Audits

Performance audits are independent sample checks made by a supervisor or auditor to arrive at a quantitative measure of the quality of the data produced by one section or the entire measurement process. Performance audits are conducted by introducing control samples, in addition to those used routinely, into the data production process. These control samples include PE samples of known concentrations. The results of performance audits will be evaluated against acceptance criteria. The results will be summarized and maintained by the laboratory QA manager

and distributed to the supervisors who must investigate and respond to any results that are outside control limits.

10.2.4.2 Laboratory Internal Audits

The laboratory QA manager conducts routine internal audits of each laboratory section for completeness, accuracy, and adherence to SOPs. The laboratory audit team will verify that the laboratory's measurement systems are operated within specified acceptable control criteria and that a system is in place to confirm that out-of-control conditions are efficiently identified and corrected.

10.2.4.3 Laboratory Data Audits

The laboratory will maintain raw instrument data for sample analyses on magnetic tape media or optical media in a secured fireproof safe. During routine audits, the audit team will verify the processing of the raw data file by reviewing randomly selected electronic data files and comparing the results with the hardcopy report. Tapes will be archived for a period of 7 yr. Tapes will be also available for audit by the QAO upon request.

10.2.4.4 Laboratory Audit Procedures

Prior to an audit, the designated lead auditor will prepare an audit checklist. During an audit and upon its completion, the auditor will discuss the findings with the individuals audited and discuss and agree on corrective actions to be initiated. The auditor will prepare and submit an audit report to the designated responsible individual of the audited group, the PM, and the QAO. Minor administrative findings that can be resolved to the satisfaction of the auditor during an audit need not be cited as items requiring corrective action. Findings that are not resolved during the course of the audit and findings affecting the overall quality of the project will be included in the audit report.

The designated responsible individual of the audited group will prepare and submit to the QAO a reply to the audit. This reply will include, at a minimum, a plan for implementing the corrective action to be taken on nonconformances indicated in the audit report, the date by which such corrective action will be completed, and actions taken to prevent reoccurrence. If the corrective action has been completed, supporting documentation should be attached to the reply. The auditor will ascertain (by re-audit or other means) if appropriate and timely corrective action has been implemented.

Records of audits will be maintained in the project files. Audit files will include, as a minimum, the audit report, the reply to the audit, and any supporting documents. It is the responsibility of the designated responsible individual of the audited group to conform to the established procedures, particularly as to development and implementation of such corrective action.

10.2.4.5 Laboratory Documentation

To confirm that the previously defined scope of the individual audits is accomplished and that the audits follow established procedures, a checklist will be completed during each audit. The

checklist will detail the activities to be executed and ensure that the auditing plan is accurate. Audit checklists will be prepared in advance and will be available for review.

AUDIT CHECKLIST (AT MINIMUM)
Date and type of audit
Name and title of auditor
Description of group, task, or facility being audited
Names of lead technical personnel present at audit
Checklist of audit items according to scope of audit
Deficiencies or non-conformances

Following each system, performance, and data audit, the QAO or his designee will prepare a report to document the findings of the specific audit. The report will be submitted to the designated individual of the audited group to ensure that objectives of the QA program are met.

MINIMUM CONTENT OF AUDIT REPORT
Description and date of audit
Name of auditor
Copies of completed, signed, and dated audit form and/or checklist
Summary of findings including any nonconformance or deficiencies
Date of report and appropriate signatures
Description of corrective actions

The QAO will maintain a copy of the signed and dated report for each audit. If necessary, a second copy will be placed in project files.

10.3 CORRECTIVE ACTIONS

Corrective action procedures have been established to ensure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated, documented, evaluated, and corrected. Corrective action enables significant conditions adverse to quality to be noted promptly at the site, laboratory, or subcontractor location. Additionally, it allows for the cause of the condition to be identified and corrective action to be taken to rectify the problem and to minimize the effect on the data set. Further, corrective action is intended to minimize the possibility of repetition.

Condition identification, cause, reference documents, and corrective action planned to be taken will be documented and reported to the QAO, PM, FTL, and involved subcontractor management, at a minimum. Implementation of corrective action is verified by documented follow-up action. Any project personnel may identify noncompliance issues; however, the designated QA personnel are responsible for documenting, numbering, logging, and verifying the close out action. The designated responsible individual of the audited group will be responsible for ensuring that all recommended corrective actions are implemented, documented, and approved.

Events that trigger corrective actions
When predetermined acceptance standards are not attained
When a deviation from SOP is required or observed
When procedure or data compiled are determined to be deficient
When equipment or instrumentation is found to be faulty
When samples and analytical test results are not clearly traceable
When QA requirements have been violated
When designated approvals have been circumvented
As a result of system and performance audits
As a result of a management assessment
As a result of laboratory/field comparison studies
As required by analytical method

All project personnel have the responsibility, as part of normal work duties, to promptly identify, solicit approved correction, and report conditions adverse to quality. Specifically, the laboratory must designate the assigned individual to act as the primary laboratory contact responsible for timely identification and resolution of any and all issues including contract and administrative issues. Any phone calls initiated by personnel or designated representatives to the laboratory with respect to corrective actions must be returned in a timely manner on a normal business day if the designate individual (or alternate) is not available at the initiation of the phone call.

Project management and related staff, including field investigation teams, remedial design planning personnel, and laboratory groups will monitor on-going work performance as part of daily responsibilities. Work may be audited at the site, the laboratories, or subcontractor locations. Activities or documents ascertained to be noncompliant with QA requirements will be documented. Corrective actions will be mandated through audit finding sheets attached to the audit report. Audit findings are logged, maintained, and controlled by the QAO, PM, or designated personnel.

Personnel assigned to QA functions will have the responsibility to issue and control CAR forms (Figure 10.1). The CAR identifies the out-of-compliance condition, reference document(s), and recommended corrective action(s) to be administered.

Similar to the CAR, the laboratory will record and report nonconformances internally using the laboratory's nonconformance documentation tracking system in the form of an NCM. Each NCM is traceable so that it can be cross-referenced with its resolution to the associated project records. The laboratory QA manager summarizes critical nonconformances, such as reissued reports and client complaints, in a monthly report to the laboratory management staff. Management of the NCM is described in Section 6.3. Corrective action procedures applicable to QC requirements that do not meet the criteria of this QAPP are described in the following sections.

Consistent, frequent contacts between laboratory personnel, the QAO, or designated personnel are required.

TYPICAL CONTENT OF NCM FORMS
Problem description and root cause
Corrective action
Client notification summary
QA verification
Approval history action

FIGURE 10.1

CORRECTIVE ACTION REQUEST FORM

CORRECTIVE ACTION REQUEST

Number _____ Date:_____

TO: _____

You are hereby requested to take corrective actions indicated below and as otherwise determined by you (a) to resolve the noted conditions and (b) to prevent it from recurring. Your written response is to be returned to the Project quality assurance manager by _____.

Condition:

Reference Documents:

_____ _____ _____ _____ _____ __

Originator Date Approval Date Approval Date

Response

Cause of Condition:

Corrective Action

(A) Resolution:

(B) Prevention

(B2) Affected Documents

Signature_____ Date_____

CA Follow-up

Corrective Action verified by:_____ Date _____

SECTION 11

REPORTS TO MANAGEMENT

11.1 QA REPORTS

Management personnel receive QA reports appropriate to their level of responsibility. The PM receives copies of all QA documentation. QC documentation is retained within the department that generated the product or service except where this documentation is a deliverable for a specific contract. QC documentation is also submitted to the project QAO for review and approval. Previous sections detailed the QA activities and the reports, which they generate. Among other QA audit reports that may be generated during the conduct of activities, a final audit report for this project will be prepared by the QAO. The report will include:

- Periodic assessment of measurement data accuracy, precision, and completeness
- Results of performance audits and/or system audits
- Significant QA problems and recommended solutions for future projects
- Status of solutions to any problems previously identified.

Additionally, any incidents requiring corrective action will be fully documented.

SECTION 12

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ATTACHMENT 1

SUMMARY OF ANALYTICAL DATA PACKAGE (DQO LEVEL IV)

1.0 INTRODUCTION

In order for data to be used for decision-making purposes it is essential that it be of known and documented quality. Verification and validation of data requires that appropriate quality assurance and quality control (QA/QC) procedures be followed, and that adequate documentation be included for all data generated both in the laboratory and in the field.

The QA/QC documentation provided by any laboratory, in conjunction with sample results, allows for evaluation of the following indicators of data quality:

- Integrity and stability of samples;
- Instrument performance during sample analysis;
- Possibility of sample contamination;
- Identification and quantitation of analytes;
- Analytical precision; and
- Analytical accuracy.

General laboratory documentation requirements discussed in this document are formatted into two sections, organic and inorganic analyses. These specifications are intended to establish general, analytical documentation requirements that laboratories should meet when generating data for this project.

2.0 GENERAL DOCUMENTATION REQUIREMENTS

2.1 Data Package Format

Each data package for Level IV data submitted will consist of five sections:

- Case narrative;
- Chain-of-custody documentation
- Summary of results for environmental samples;
- Summary of QA/QC results; and
- Raw data.

Level II data packages will not contain the raw data.

Data packages will be consistent with, and will supply the data and documentation required for NYSDEC ASP-defined deliverables (i.e. Category B and Category A). Summaries of data and results may be presented in a Contract Laboratory Program (CLP) type format or an equivalent format that supplies the required information as stated below. All laboratory data qualifiers shall be defined in the deliverable.

In cases where the laboratory has varied from established methodologies, they will be required to provide the Standard Operating Procedures (SOPs) for those methods and added as an

attachment to the Work Assignment Scoping Documents or as variances to this QAPP. Inclusion of these SOPs will aid in final review of the data by data reviewers and users.

2.2 Case Narrative

The case narrative will be written on laboratory letterhead and the release of data will be authorized by the laboratory manager or their designee. The Case Narrative will consist of the following information:

- Client's sample identification and the corresponding laboratory identification;
- Parameters analyzed for each sample and the methodology used. EPA method numbers should be cited when applicable;
- Whether the holding times were met or exceeded;
- Detailed description of all analytical and/or sample receipt problems encountered;
- Discussion of reasons for any QA/QC sample result exceedances; and
- Observations regarding any occurrences which may adversely impact sample integrity or data quality.

2.3 Chain-of-Custody

Legible copies of all Chain-of-Custody forms for each sample shall be submitted in the data package. Copies of any internal laboratory tracking documents should also be included. It is anticipated that Chain-of-Custody forms and/or internal laboratory tracking documents will include the following information:

- Date and time of sampling and shipping;
- Sampler and shipper names and signatures;
- Type of sample (grab or composite);
- Analyses requested;
- Project, site, and sampling station names;
- Date and time of sample receipt;
- Laboratory sample receiver name and signature;
- Observed sample condition at time of receipt;
- Sample and/or cooler temperatures at time of receipt;
- Air bill numbers;
- Custody seal; and
- Sample numbers.

3.0 ORGANIC ANALYSES DOCUMENTATION REQUIREMENTS

These requirements are applicable to organic methods (e.g., VOCs, SVOCs, PFAS).

3.1 Summary of Environmental Sample Results

The following information is to be included in the summary of sample results for each environmental sample.

- Client's sample identifications and corresponding laboratory identifications;
- Sample collection dates;
- Dates and times of sample extraction and/or analysis;
- Weights or volumes of sample used for extraction and/or analysis;
- Identification of instruments used for analysis;
- Gas Chromatography (GC) column and detector specifications;
- Dilution or concentration factor for the sample;
- Percent Difference between columns, if applicable;
- Percent Moisture or Percent Solids for soil samples;
- Method Detection Limits (MDLs) or sample Reporting Limits (RLs);
- Analytical results and associated units;
- Discussion of any manual integrations; and
- Definitions for any laboratory data qualifiers used.

3.2 Summary of QA/QC Sample Results (as applicable)

The following QA/QC sample results shall be presented on QC summary forms. They shall also include the date and time of analysis. Additional summary forms may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

All summary forms should, at a minimum, include in the header:

- Form Title;
- Project Identifier (e.g., Batch QC ID, Site Name, Case Number, Sample Delivery Group);
- Laboratory Name; and
- Sample Matrix.

3.2.1 Instrument Calibration (for each instrument used)

- **GC/MS Tuning**. Report mass listings, ion abundance criteria, and percent relative abundances. List the instrument identification (ID) and the date and time of analysis. Ensure that all ion abundances have been appropriately normalized.
- **Initial Calibration**. Report analyte concentrations of initial calibration standards and the date and time of analysis. List the instrument identification (ID), response factors (RF), relative response factors (RRF), or calibration factors (CF), percent relative

standard deviation (%RSD), and retention time (RT) for each analyte. The initial calibration (IC) report must also include a sample identifier (ID), associated injection volume or quantity of sample analyzed, the acceptance criteria, such as minimum RF values, and associated maximum %RSD values.

- **Continuing Calibration**. Report the concentration of the calibration standard used for the continuing calibration and for the mid-level standard, and the date and time of analysis. List the ID, RF, RRF, CF, percent difference (%D), and RT for each analyte.
- **Quantitation Limit** or Project Required Reporting Limit (PRRL) Verification (if applicable). Report results for standards that are used to verify instrument sensitivity. Report the source for the verification standards. Report the concentration for the true value, the concentration found, the percent recovery, and control limits for each analyte analyzed. The date and time of analysis must also be reported.

3.2.2 Method Blank Analysis

List environmental samples and QC analyses associated with each method blank. Report concentrations of any analytes found in method blanks above the instrument detection limit.

3.2.3 Surrogate Standard Recovery

Report the name and concentration of each surrogate compound added. List percent recoveries of all surrogates in the samples, method blanks, matrix spike/matrix spike duplicates and other QC analyses. Also include acceptance ranges that the laboratory used for the analysis.

3.2.4 Internal Standard Summary

Report internal standard area counts of the associated calibration standard and retention times, include upper and lower acceptance limits. List internal standard area counts and retention times for all samples, method blanks, matrix spike/matrix spike duplicates and other QC analyses. Include the ID and the date and time of analysis.

3.2.5 Compound Confirmation

Report retention times of each compound on both columns as well as retention time windows of the associated standard. In addition, report determined concentrations from each column and percent differences between results. List the ID and the date and time of analysis. A summary should be generated for each sample, including dilutions and reanalyses, blanks, MSs, and MSDs.

3.2.6 Peak Resolution Summary

For primary and secondary columns report retention times of any target compounds and/or surrogates that coelute in the standards (ie. the Performance Evaluation Mixture for Contract Laboratory Program pesticides). Calculate and report the percent resolution between each pair of compounds which coelute. Include the ID, column ID, and the date and time of analysis.

3.2.7 Matrix Spike/Matrix Spike Duplicate (MS/MSD) Analysis

Report the name and concentration of each spiking compound. Samples are to be spiked with specified compounds of potential concern. List sample results, spiked sample results, duplicate spiked sample results, percent recovery (%R) and the relative percent difference (RPD) between the MS and MSD (if applicable). Acceptance criteria that the laboratory used for the analysis must also be presented.

3.2.8 Laboratory Duplicate Analysis

When performed, report the RPD between duplicate analyses, along with the associated acceptance criteria.

3.2.9 Laboratory QC Check Sample Analysis

Also known as the Laboratory Control Sample (LCS) or Matrix Spike Blank (MSB). Report the name and concentration of each spiking compound. List the QC check sample and duplicate (if applicable) results, %R, and RPD, if performed in duplicate. The acceptance criteria that the laboratory used for the analysis must also be presented.

3.2.10 Other QC Criteria

- **Retention time windows determination**. Report the retention time window for each analyte, for both primary and confirmation analyses.
- **Compound identification**. Report retention times and concentrations of each analyte detected in samples.
- **MDL determination**. List most recent method detection limits, with dates determined maintained in laboratory file. MDL summary forms may be submitted at start of project and not included in individual data packages.
- **Additional method suggested QC parameters, if required**.
- **Any Performance Evaluation (PE) samples** (if identified) associated with the environmental samples.

3.3 Raw Data

Legible copies of the raw data shall be organized systematically, each page shall be numbered, and a table of contents must be included with each package. Raw data for compound identification and quantitation must be sufficient to verify each result.

3.3.1 Gas Chromatographic (GC) Analyses

This section shall include legible copies of raw data for the following:

- Environmental samples arranged in sequential order by laboratory sample number, include dilutions and reanalyses;
- Instrument calibrations; and
- QC analyses (i.e., method blanks, LCS, etc.).

Raw data for both primary and confirmation analyses are to be included. Raw data for each analysis shall include the following:

- Appropriately scaled chromatograms (label all analyte peaks, internal standards and surrogate standards with chemical names). All chromatograms shall be scaled such that individual peaks can be readily resolved from any neighboring peaks;
- Appropriately scaled before and after manual integrations;
- Area print-outs or quantitation reports;
- Instrument analysis logs for each instrument used;
- Sample extraction and cleanup logs;
- Standards preparation logs and manufacturer certificates of analyses for standards, if applicable, sufficient to document traceability of all standards (including surrogates, internal standards, and spike solutions) maintained in "job file" in laboratory, unless otherwise requested;
- Percent Moisture or Percent Solids for soil samples; and
- GC/MS confirmation, as applicable.

Note: Additional raw data may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

3.3.2 Gas Chromatographic / Mass Spectrometric (GC/MS) Analyses

This section shall include legible copies of raw data for the following:

- Environmental samples arranged in sequential order by laboratory sample number, include dilutions and reanalyses;
- Mass spectrometer tuning and mass calibration (BFB, DFTPP);
- Initial and continuing instrument calibrations; and
- QC analyses (i.e., method blanks, LCS, etc.).

Raw data for each analysis shall include the following:

- Appropriately scaled chromatograms (label all analyte peaks, internal standards and surrogate standards with chemical names). All chromatograms shall be scaled such that individual peaks can be readily resolved from any neighboring peaks;
- Appropriately scaled before and after manual integrations;
- Ion scans and enhanced spectra of target analytes and tentatively identified compounds (TICs), with the associated best-match spectra;
- Area print-outs and quantitation reports;
- Instrument analysis logs for each instrument used;
- Sample extraction and cleanup logs;

- Standards preparation logs and manufacturer certificates of analyses for standards, if applicable, sufficient to document traceability of all standards (including surrogates, internal standards, and spike solutions) maintained in "job file" in laboratory, unless otherwise requested; and
- Moisture Content (Percent Moisture) for sediment samples.

Note: Additional raw data may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

4.0 INORGANIC ANALYSES DOCUMENTATION REQUIREMENTS

4.1 Summary of Environmental Sample Results

The following information is to be included in the summary of sample results for each environmental sample:

- Client's sample identifications and corresponding laboratory identifications;
- Sample collection dates;
- Dates and times of sample digestion and/or analysis;
- Weights or volumes of sample used for digestion and/or analysis;
- Identification of instruments and analytical techniques used for analysis;
- Instrument specifications;
- Dilution or concentration factor for the sample;
- Percent Moisture or Percent Solids for soil samples;
- Detection Limits: MDLs, RLs;
- Analytical results and associated units; and
- Definitions for any laboratory data qualifiers used.

4.2 Summary of QA/QC Results

The following QA/QC sample results shall be presented on QC summary forms. They shall also include the date and time of analysis. Additional summary forms may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

All summary forms shall, at a minimum, include in the header:

- Form Title;
- Project Identifier (e.g., Batch QC ID, Site Name, Case Number, Sample Delivery Group);
- Laboratory Name; and
- Sample Matrix.

4.2.1 Instrument Calibration Verification (if applicable)

The order for reporting of calibration verifications for each analyte must follow the chronological order in which the standards were analyzed.

- **Initial Calibration Verification.** Report the source for the calibration verification standards. Report the concentration for the true value, the concentration found, the percent recovery, and control limits for each element analyzed. The date and time of analysis must also be reported.
- **Continuing Calibration Verification**. Report the source for calibration verification standards. Report the concentration for the true value, the concentration found, the percent recovery, and control limits for each element analyzed. The date and time of analysis must also be reported.
- **Quantitation Limit** or PRRL Verification (if applicable). Report results for standards that are used to verify instrument sensitivity. Report the source for the verification standards. Report the concentration for the true value, the concentration found, the percent recovery, and control limits for each element analyzed. The date and time of analysis must also be reported.

4.2.2 Blank Analysis

Report analyte concentrations above the instrument detection limits found in the initial calibration blanks (ICBs), continuing calibration blanks (CCBs), and in method/ preparation blanks. The date and time of analysis must also be reported. The order for reporting ICB and CCB results for each analyte must follow the chronological order in which the blanks were analyzed.

4.2.3 Matrix Spike (MS) Analysis

Report concentrations of the unspiked sample result, the spiked sample result and the concentration of the spiking solution added to the pre-digestion spike for each analyte. Calculate and report the %R and list control limits. If performed in duplicate, provide the %R for the MSD and the RPD.

4.2.4 Post Digestion Spike Analysis (if applicable)

In addition to matrix spikes, post-digestion spikes are often required by the method. Report concentrations of the unspiked sample results, spiked sample results, and the concentration of the spiking solution added. Calculate and report the %R and list control limits.

4.2.5 Laboratory Duplicate Analysis

Report concentrations of original and duplicate sample results. Calculate and report the RPD and list control limits.

4.2.6 Laboratory Control Sample

Identify the source for the LCS. Report the found concentration of the laboratory control sample and the true concentration for all analytes. Calculate and report the %R and list control limits.

4.2.7 Other QC Criteria (if applicable)

- **Method of Standard Additions (MSA)**. This summary must be included if MSA analyses are performed. Report absorbance values with corresponding concentration values. Report the final analyte concentration and list the associated correlation coefficient and control limits.
- **ICP-AES Serial Dilution**. Report initial and serial dilution results, associated %D, and control limits.
- **ICP-AES Linear Dynamic Ranges.** For each instrument and wavelength used, report the date on which linear ranges were established, the integration time, and the upper limit concentration.
- **MDL Determination**. List most recent method detection limits as determined using the September 2017 promulgation of the 40CFR136, with dates determined maintained in laboratory file. MDL summary forms may be submitted at start of project and not included in individual data packages.
- **Any Performance Evaluation (PE) Samples** (if identified) associated with the environmental samples.

4.3 Raw Data

Legible copies of the raw data shall be organized systematically, each page shall be numbered, and a table of contents must be included with each package. Data should be organized sequentially by method and analysis date. Raw data for compound identification and quantitation must be sufficient to verify each result.

4.3.1 Atomic Absorption (AA) and Atomic Emission (AE) Spectrometric Analyses

This section shall include legible copies of raw data for the following:

- Environmental sample results, include dilutions and reanalyses;
- Instrument calibrations; and
- QC analyses (i.e., method blanks, LCS, etc.).
- Measurement print-outs for all instruments used or copies of logbook pages for analyses that do not provide instrument print-outs;
- Absorbance units, emission intensities, or other measurements for all analyses;
- Sample preparation and digestion logs that include reagents used, standards referenced to standards preparation logs, volumes of reagents, digestion times, etc.;
- Instrument analysis logs for each instrument used or summary of sample analyses;

- Standards preparation logs and manufacturer certificates of analyses for standards, if applicable, sufficient to document traceability of all standards (including spike solutions) maintained in "job file" in laboratory, unless otherwise requested;
- Wavelengths used for the analyses; and
- Percent Moisture or Percent Solids for soil samples.

Note: Additional raw data may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

4.3.2 Titrimetric and Colorimetric Analyses

This section shall include legible copies of raw data for the following:

- Environmental sample results, include dilutions and reanalyses;
- Calibrations; and
- QC analyses (i.e., method blanks, LCS, etc.).

Raw data for each analysis shall include the following:

- Copies of logbook pages for analyses that do not provide instrument print-outs and calculations used to derive reported sample concentrations;
- Titrant volumes, titration end-points, absorbance units, or other measurements for all analyses;
- Sample preparation and digestion logs that include reagents used, standards referenced to standards preparation logs, volumes of reagents, digestion times, sample volumes, solution normalities, etc.;
- Standards preparation logs and manufacturer certificates of analyses for standards, if applicable, sufficient to document traceability of all standards (including spike solutions) maintained in "job file" in laboratory, unless otherwise requested; and
- Wavelengths used for the analyses.

Note: Additional raw data may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

4.3.3 Gravimetric Analyses

This section shall include legible copies of raw data for the following:

- Environmental sample results, include dilutions and reanalyses;
- Calibrations; and
- QC analyses (i.e., method blanks, LCS, etc.).

Raw data for each analysis shall include the following:

- Copies of logbook pages for analyses that do not provide instrument print-outs and calculations used to derive reported sample concentrations;

- Weights, sample volumes, or other measurements for all analyses;
- Sample preparation and digestion logs that include reagents used, standards referenced to standards preparation logs, volumes of reagents, drying times, drying temperatures, etc.; and
- Standards preparation logs and manufacturer certificates of analyses for standards, if applicable, sufficient to document traceability of all standards maintained in "job file" in laboratory, unless otherwise requested.

Note: Additional raw data may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

SUMMARY OF REQUIRED LABORATORY DELIVERABLES FOR LEVEL IV DQO DATA PACKAGE (REQUIREMENTS WILL VARY BY METHOD)

Method Requirements	Laboratory Deliverables
Requirements for all methods:	
Parsons project identification number	Case narrative
Discussion of unusual circumstances or problems	Case narrative
Analytical method description and reference citation	Case narrative
Field sample identification	Signed chain-of-custody forms and sample results form
Laboratory assigned sample number	Signed chain-of-custody forms and sample results form
Sample matrix description	Signed chain-of-custody forms and sample results form
Date of sample collection	Signed chain-of-custody forms and sample results form
Date of sample receipt at laboratory	Signed chain-of-custody forms
Analytical method description and reference citation	Signed chain-of-custody forms and case narrative
Sample analysis results	USEPA CLP form or equivalent sample analysis results summary form (e.g., ASP Form I-VOA)
Dates of sample preparation and analysis (including first run and any subsequent runs)	Specific deliverable depends on type of analysis
Laboratory analytical QC batch info and sample analysis associations	Specific deliverable depends on type of analysis
Instrument analysis sequence log	Specific deliverable depends on type of analysis
Analytical holding times compliance	USEPA CLP form or equivalent holding time summary form
Method detection limit (MDL) determination	USEPA CLP form or equivalent MDL summary form
Method reporting limits (RLs) achieved	Specific deliverable depends on type of analysis (see below)
Dilution or concentration factors	Specific deliverable depends on type of analysis
Discussion of unusual circumstances or problems	Case narrative
Laboratory Control Sample (LCS) results	USEPA CLP form or equivalent LCS results summary form
"Raw" analytical data sufficient to recreate and check analysis results for all calibrations, QC sample results, and sample results	Sequentially numbered pages with tabulated index

REQUIRED LABORATORY DELIVERABLES (Continued)

Method Requirements	Laboratory Deliverables
Matrix spike / matrix spike duplicate	USEPA CLP form or equivalent MS/MSD summary form (e.g., NYSDEC ASP Form III-SV
Method blank analysis	USEPA CLP form or equivalent method blank summary form (e.g., NYSDEC ASP Form IV-SV)
GC/MS instrument performance check. Tuning and mass calibration (abundance) using 4-bromofluorobenzene (BFB) for method SW8260C and decafluoro-triphenyphosphene (DFTPP) for method SW8270CD	USEPA CLP form or equivalent instrument tuning/performance check summary form
Internal Standard Area Counts and Retention Time, as applicable	USEPA CLP form or equivalent internal standard summary form (e.g., NYSDEC ASP Form VIII-SV)
GC/MS initial calibration data	USEPA CLP form or equivalent initial calibration summary form (e.g., NYSDEC ASP Form VI-SV)
GC/MS continuing calibration data.	USEPA CLP form or equivalent continuing calibration summary form (e.g., NYSDEC ASP Form VII-SV)
GC/MS calibration verification (initial and continuing)/2nd source calibration verification (ICV/CCV)	USEPA CLP form or equivalent calibration verification summary form
GC continuing calibration data for volatile and semivolatile analyses. If calibration factors are used, calibration factors and their percent differences from the initial calibration must be reported. Retention time windows and analyte retention times must be included in this form	USEPA CLP form or equivalent calibration verification summary form
GC/MS internal standard area and retention time summary data	USEPA CLP form or equivalent internal standard summary form
GC second column confirmation, as applicable. To be done for all compounds that are detected above method detection limits	Chromatograms of all confirmations of all samples and the standard laboratory form for all positive results
Surrogate Compound percent recovery summary	USEPA form or equipment percent recovery summary form (e.g., NYSDEC ASP Form II-SV)
"Raw" analytical data sufficient to recreate and check analysis results for all calibrations, QC sample results, and sample results	Sequentially numbered pages with tabulated index
Requirements for inorganic analytical methods:	
Initial and Continuing Calibration Verification	USEPA CLP form or equivalent calibration verification summary form(s) (e.g., NYSDEC ASP Form II-IN)

REQUIRED LABORATORY DELIVERABLES (Continued)

Method Requirements	Laboratory Deliverables
ICP Interference Check Sample (ICS), as applicable	USEPA CLP form or equivalent ICS standard summary form (e.g., NYSDEC ASP Form IV-IN)
ICP Interelement Correction Factors, as applicable	USEPA CLP form or equivalent internal standard summary form (e.g., NYSDEC ASP Form XII-IN
Instrument Detection Limit (IDL) or MDL determination	USEPA CLP form or equivalent IDL or MDL summary form(s)
Post-digestion spike, as applicable	USEPA CLP form or equivalent post-digestion spike summary form(s) (e.g., NYSDEC ASP Form V-IN)
ICP linear range	USEPA CLP form or equivalent linear range summary form(s) (e.g., NYSDEC ASP Form XII-IN)
ICP serial dilution, as applicable	USEPA CLP form or equivalent serial dilution summary form(s) (e.g., NYSDEC ASP Form IX-IN)
Method of standard addition (MSA), as applicable	USEPA CLP form or equivalent MSA summary form(s)
Laboratory duplicate results, as applicable	USEPA CLP form or equivalent duplicate analysis summary form(s) (e.g., NYSDEC ASP Form VI-IN)
Requirements for other methods:	
Preparation and analysis logs	No format
Sample results	No format
MS/MSD results	No format
Lab duplicate sample results	No format
Laboratory control sample	Control limits
Method blank results	No format
Initial calibration results	No format
Continuing calibration check (calibration verification)	No format. Report percent relative standard deviation or percent difference from initial calibration

Appendix B

1,4 Dioxane and PFAS Sampling Checklist

1,4 DIOXANE AND PFAS SAMPLING CHECKLIST

Site Name: _____ Task: _____

Weather (temp/precip): _____ 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 PFASs 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

If any applicable boxes cannot be checked, the field team leader shall describe the deviations on the back and work with field personnel to address issues prior to commencement work. See additional information on the back of this form.

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: _____

Field Team Names: _____

Field Team Leader Signature: _____

Deviation Summary:

If possible, materials identified as potentially containing PFASs should be relocated 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.

Field Team Leader Name: _____

Field Team Leader Signature: _____ Time: _____

Appendix C

Standard 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.	*Measurements taken from:	
Depth to Water	ft.		Top of Well Casing
H_{wc}	ft.		Top of Protective Casing
Depth to Intake	ft.		(Other, Specify)

Start Purge Time:

		10%	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: _____ (gallons)

Physical appearance at start:		Physical appearance at stop:	
Color		Color	
Odor		Odor	
Sheen/Free Product		Sheen/Free Product	

Field Test Results:

Dissolved ferrous iron: _____

Dissolved total iron: _____

Dissolved total manganese: _____

Sample	Container Type	# Collected	Field Filtered	Preservative	Container pH
VOCs - 8260	40mL Voa			HCL	-
PAH +1,4 Dx - 8270	1000mL Amber			None	-
Metals/Hg	500mL Plastic			HNO3	-
PFC Mod 537	250mL Plastic			None	-