



**STANDARD OPERATING PROCEDURE FOR:
POREWATER COLLECTION FROM SEDIMENT AND ASH**

TVA-KIF-SOP-43

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for
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1.0 PURPOSE

This standard operating procedure (SOP) provides the general technical requirements and operational guidelines for collecting porewater samples from sediment and ash (sediment/ash) samples at Kingston Fossil Plant (KIF) Ash Recovery Project that are representative of the environment that the samples are intended to characterize.

The requirements of this SOP are applicable to sampling of porewater from sediment/ash collected in streams, rivers, lakes, ponds, swamps, wetlands and drainage ditches at KIF and surrounding areas.

2.0 GENERAL CONSIDERATIONS

Potential hazards associated with the planned tasks shall be thoroughly evaluated prior to conducting field activities. The *Site-Wide Safety and Health Plan (SWSHP)* provides a description of potential hazards and associated safety and control measures.

Sampling personnel must wear powder-free nitrile gloves while performing the procedures described in this SOP. Specifically, powder-free nitrile gloves must be worn while preparing sample bottleware, preparing and decontaminating sampling equipment, collecting samples, and packing samples. At a minimum, nitrile gloves must be changed prior to the collection of each sample, or as necessary to prevent the possibility of cross-contamination with the sample, the sample bottleware, or the sampling equipment.

Sediment/ash samples used for porewater extraction shall be collected in accordance with the *Sediment Sampling SOP (TVA-KIF-05)*. Field sampling equipment shall be decontaminated in accordance with the *Decontamination of Equipment SOP (TVA-KIF-SOP-08)* prior to use.

Water safety hazards and associated precautions shall be thoroughly considered and understood prior to conducting sampling activities in the vicinity of surface water. Additionally, a Float Plan shall be completed prior to traveling anywhere on a water vessel. A Float Plan includes a description of the water vessel, specifies who is on board, provides a description of the safety equipment being carried, and indicates destination, departure time, and expected time of return.

3.0 POREWATER COLLECTION PROCEDURES

This section documents general operating procedures and methods associated with porewater sampling activities. Any variation in these procedures is approved by the Project Manager and Quality Assurance (QA) Officer and must be fully documented. Field work cannot progress until deviations are approved or resolved.

This SOP addresses two different methods of *ex-situ* porewater extraction. Although *in situ* methods are available, the *in situ* methods are not feasible due to river currents and water depths. This SOP assumes that sediment/ash has been collected according to the *Sediment Sampling* SOP (TVA-KIF-SOP-05). The sediment/ash can be collected according to any one of the available methods described in TVA-KIF-SOP-05. Therefore, this SOP does not address collection of sediment/ ash samples and assumes these samples have already been collected.

3.1 Pre-Job Preparation

The Field Team Leader ensures that the following activities have been completed prior to mobilizing to the sampling site.

- a. Obtain equipment necessary for completing the porewater sampling activities (see Table 1 for an example checklist of porewater sampling equipment and materials).
- b. Verify appropriate laboratory-provided bottleware is available for both the required analyses and for quality control (QC) samples and that there has been thorough coordination with the analytical laboratory.
- c. Review project work control documents such as the *Quality Assurance Project Plan* (TVA-KIF-QAPP) and applicable SOPs in an effort to determine the project-specific sampling requirements, procedures, and goals.
- d. Verify that legal right-of-entry has been obtained and site access has been granted, where required.
- e. Instruct the field team that no project information is discussed with the public and questions are to be referred to the TVA Outreach Center.

3.2 Vacuum Extraction Method

The vacuum extraction method of porewater sample collection entails placing the sediment/ash sample into the top of a Nalgene[®] or similar filtration unit with a 0.45 micron filter and using a vacuum to extract porewater into the bottom half of the filtration unit. The filtration units are available in different volumes. A volume of 150 milliliters (ml) or greater is recommended, depending on sample volume requirements. The general procedure for the vacuum extraction method is listed below.

- a. Upon collection of the sediment/ash sample, drain the excess water off the top of the sample.
- b. Thoroughly homogenize the sediment/ash sample in a decontaminated, plastic container using a disposable plastic mixing tool.

- c. Fill the top half of the filtration approximately three-quarters full with sediment/ash and cover with the supplied lid. Depending on the volume of porewater required, it may be necessary to simultaneously use several filters per sample.
Note: The vacuum extraction procedure may not be appropriate for fine-grained, clay type sediment/ash.
- d. Attach a vacuum hose to the vacuum port on the filter.
- e. Apply a vacuum to the vacuum hose with a hand vacuum pump or electrical vacuum pump.
- f. Allow the porewater to drain (under vacuum) into the bottom half of the filtration unit.
- g. Once the porewater has been extracted from the sediment/ash sample, turn off the vacuum pump or stop vacuuming, and pour the collected porewater into the appropriate, laboratory-provided bottleware.

3.3 Centrifugation Method

The second option for porewater collection is with centrifugation. Centrifugation is typically a laboratory process, whereby the sediment/ash sample is placed in a centrifuge and the sample is spun to separate the porewater from the solids. The porewater is then collected and filtered through a 0.45-micron filter and placed in appropriate bottleware for analysis. The following centrifuge method is provided by TestAmerica (2009).

Sample Processing

1. The sediment sample will be collected in laboratory-provided bottleware (four 500-ml Teflon-lined bottles). Standard bottleware will be used if sediment analysis is required.

Porewater Centrifugation

1. The Teflon sample vessels containing sediment will be loaded into the centrifuge. These vessels will be one-time use containers and will be discarded after this procedure. **Note:** a porewater preparation blank will be processed through all of the steps in this procedures using laboratory DI water as the sample matrix.
2. Centrifuges used for the generation of porewater are 2 Beckman J-6M Centrifuges (or equivalent) set to 2000 rpm and 4°C. These settings have been determined to be adequate to generate maximum porewater from samples. The samples will be spun on the centrifuge 30 min. All samples will be centrifuged for the same period of time to ensure consistency.

3. To the degree that it can be done without disturbance of the sediment, the samples will be gently moved to a counter top where the supernatant porewater will be separated and collected into a pre-cleaned wide mouth jar.
4. The dissolved samples are generated by passing the porewater through a 0.45-micron glass fiber filter at the time of aliquotting. The inorganic parameters for dissolved analysis shall be identified ahead of time and provided to the laboratory.

If this method of porewater extraction is used, the sample team should communicate with the laboratory to ensure the proper sample volumes have been supplied to the laboratory.

3.4 Decantation Method (Gravity Separation)

A third option for porewater collection is by means of gravity separation. One of the unique properties of fly ash is that porewater rises to the surface of a containerized fly ash sample with time through gravity separation. This method of porewater collection is not appropriate for sediments unaffected by the released fly ash and is restricted to fly ash or sediment/fly ash mixtures. The general procedure for gravity separation is listed below.

- a. Collect samples of released fly ash or fly ash/sediment mixture and place in a new, decontaminated 5-gallon bucket.
- b. Fill the bucket approximately 80% full.
- c. Immediately decant excess, freestanding water generated during sample collection.
- d. Seal the buckets with lids and store the buckets on ice for 24 to 48 hours.
- e. After 24 to 48 hours, gently remove the buckets from ice taking care not to agitate the buckets.
- f. Remove the lids of the buckets and check for free-standing water on top of the fly ash or sediment/fly ash mixture.
- g. Decant the free-standing water from the top of the bucket by means of pouring or use of a peristaltic pump. Be careful to avoid agitating the fly ash.
- h. Transfer the free-standing water to laboratory-provided bottleware.
- i. Label and custody seal the bottleware and place the bottleware on ice in a cooler for shipment to the laboratory.

3.5 Sample Handling, Packing, and Shipping

Samples are containerized, labeled, packaged, and shipped in accordance with the *Sample Labeling, Packing, and Shipping* SOP (TVA-KIF-SOP-07).

3.6 Field Quality Control Samples

Field QC samples may include trip blanks, equipment rinsate blanks, field duplicate samples, and matrix spike and matrix spike duplicate samples. A description of common field QC samples and the associated collection method are provided in the project-wide QAPP and the *Field Quality Control Sampling SOP* (TVA-KIF-SOP-11).

3.7 Field Logbook Documentation

Field logbooks are maintained by the Field Team Leader or designee and used to record daily activities. In addition to the minimum requirements discussed in the *Field Documentation SOP* (TVA-KIF-SOP-06), the field logbooks document those sampling characteristics specific to this SOP and as defined in the applicable project work control documents.

The Field Team Leader and/or designee reviews the field logbook entries for completeness and accuracy and indicates this review by initialing each page of the logbook. The Field Team Leader is responsible for completion of the required data collection forms.

3.8 Decontamination and Waste Management

Sampling equipment decontamination is performed in a manner consistent with the *Decontamination of Equipment SOP* (TVA-KIF-SOP-08). Investigation-derived wastes produced during sampling or decontamination are managed in accordance with *Management of Investigation-Derived Waste SOP* (TVA-KIF-SOP-12).

4.0 REFERENCES

- Tennessee Valley Authority (TVA). *Decontamination of Equipment SOP* (TVA-KIF-SOP-08), 2010.
- TVA *Field Documentation SOP* (TVA-KIF-SOP-06), 2009.
- TVA. *Field Quality Control Sampling SOP* (TVA-KIF-SOP-11), 2009
- TVA. *Management of Investigation-Derived Waste SOP* (TVA-KIF-SOP-12), 2010.
- TVA. *Quality Assurance Project Plan for the Tennessee Valley Authority Kingston Ash Recovery Project* (TVA-KIF-QAPP), December 18, 2009.
- TVA. *Sampling Labeling, Packing, and Shipping SOP* (TVA-KIF-SOP-07), 2009.
- TVA. *Sediment Sampling SOP* (TVA-KIF-SOP-05), 2009.
- TVA. *Site-Wide Safety and Health Plan for the TVA Kingston Fossil Plant Ash Release Response* (SWSHP), 2010.
- TestAmerica. *Project Specific Procedure Note: Pore Water Generation*, 2009.
- U.S. Environmental Protection Agency (EPA). *Test Methods for Evaluating Solid Waste Physical/Chemical Analysis* (SW-846), most recent version.

Table 1: Suggested Porewater Sampling Equipment and Material Checklist	
Item Description	Check
Health & Safety	
Nitrile gloves	
Hard hat	
Steel-toed boots	
Hearing protection	
Field first-aid kit	
Eyewash	
Safety glasses	
Respirator and cartridges (if necessary)	
Saranex™/Tyvek® suits and booties (if necessary)	
Sampling Equipment	
Portable table	
Plastic sheeting	
Knife/ plastic liner opening tool	
Digital camera	
Disposable filter ware with 0.45 micron filters	
Vacuum tubing	
Vacuum pump (electric or hand operated)	
Plastic mixing bowl	
Disposable plastic sampling scoops	
Laboratory-supplied bottleware	
Chain-of-custody forms and custody seals	
Packing tape	
Field logbook	
Permanent marker	
Decontamination and Waste Management Equipment	
DOT-approved 55-gallon drums or other appropriate containers	
Drum wrench	
Duct tape	
Rinse bottle	
Potable water	
Non-phosphate detergent	
Decontamination fluids (deionized water, nitric acid)	
Buckets or tubs	
Brushes	
Trash bags	
Paper towels	

End of Procedure