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MULTI-CITY STUDY

STUDY SPECIFIC SOPS

For

Project Number
N100672-01

Submitted to

May 2, 2001

Prepared by

Battelle Memorial Institute
505 King Avenue
Columbus, OH 43201

Battelle Duxbury Operations
397 Washington Street
Duxbury, MA 02332

Battelle Marine Sciences Laboratory
1529 West Sequim Bay Road
Sequim, WA 98382

Effective Date: 5-13-99

Battelle
Atmospheric Science and Applied Technology (ASAT) Department
Standard Operating Procedure

For

Collection of Air Samples for the Multi-Cities Project

Author: Kim Andrews — Kim Andrews — 5-13-99 — Date

APPROVALS

Technical Reviewer: Anthony L. Wisbith — 5-13-99

Quality Assurance Officer: Susan J. Arnold — 5-13-99

ASAT Manager: Karen Riggs — Name — 5/13/99 — Date

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1.0 APPLICATION

The high volume (~250 lpm) polyurethane foam (PUF) sampling method based on U. S. EPA's Method TO-13 is applicable to measuring ambient air concentrations of organic components at concentrations from 0.001-50 $\mu g/m^3$ over a 4-24 hour sampling period. The procedure allows for the collection of the semi-volatile organic chemicals present in the air on a glass-fiber filter (particulate) and PUF (vapor phase). The limits of detection are specific to the nature of the analyte and the length of the sampling period.

2.0 EQUIPMENT

Sampler: Samples for SVOC analysis will be collected using General Metals Model PS-1 sampling system, which consists of a timer with voltage variator, magnahelic gauge, and vacuum pump. The PS-1 sampling head (shown in Attachment 1), which is contained within the sampler, consists of a 4" diameter inlet filter (made of Teflon coated glass fiber filter medium) and a 2.3" diameter x 5" glass cartridge containing a PUF, which is 3" in length and fits snugly into the cartridge.

PUF and Filter Preparation:

1. Clean the PUF (Graesby Inc.) by soxhlet extraction with dichloromethane (DCM, pesticide residue grade) for 16 hours.
2. Dry the PUF with a nitrogen gas stream.
3. Assign a lot number to the cleaned PUFs.
4. Rinse the PS-1 glass cartridges and aluminum foil (to be used as a protective wrapper for the glass cartridge and filter) with dichloromethane (pesticide residue grade).
5. Place in a muffle oven at 450°C overnight.
6. Place the PUF in the glass cartridge and wrap in foil, then package in bubble-wrap and a zip-lock bag. Label the bag with the PUF lot number.
7. Rinse the filters with dichloromethane (pesticide residue grade) and air-dry.
8. Wrap the filter in foil and place in a zip-lock bag.
9. Assign a lot number to the cleaned filter. Label the zip-lock bag with the filter lot number.
10. The glass cartridge containing the PUF and the filter will be sent to the field site. Documentation concerning shipping and lot numbers will be maintained in the project records.

General Metals G40 Calibrator Kit: The calibrator kit consists of manometer, calibration head, and rubber tubing.

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3.0 EXPENDABLE FIELD SAMPLING SUPPLIES

Methanol, reagent grade
ChemWipes
Disposable gloves
Ziplock bags

4.0 CALIBRATION

The PS-1 air sampler will be calibrated immediately prior to use in the field using a General Metals G40 Calibration kit, consisting of a calibration orifice and a manometer. The sample head will contain a PUF and filter during the calibration process. A multiple point calibration curve, which brackets the targeted air flow of 250 liter per minute (lpm), will be generated using the lpm from the calibration orifice graph versus the inches of water from the magnahelic gauge on the sampler. The calibration orifice will be removed from the sampler after calibration is completed.

The PS-1 air sampler will be calibrated as follows:

1. Unwrap the manometer and hang it on the front of the air sampler housing.
2. Open the inlet valves on the top of the manometer. In the open position, the handles on the ports will face away from the air sampler. When the valves are open, the liquid level in the two arms should be equal. If the liquid is not at the same level in both arms, force air into one of the inlet valves.
3. Adjust the ruler on the manometer so the "0" is close to the top of the liquid.
4. Connect the tubing from one of the inlet ports to the side port on the calibration orifice.
5. Connect the calibration orifice to the sampling head containing a PUF and a filter to the vacuum pump.
6. Adjust the air flow on the air sampler using the voltage variator on the air sampler timer unit, which alters the blower motor speed to achieve the desired flow rate. The calibration points should be between 20 and 90 inches of water on the air sampler magnahelic gauge.
7. Record the reading on the air sampler magnahelic gauge. Allow the system to run for approximately 1 minute at this speed. Record the difference in the inches of water on the calibrator orifice on the data sheet. (This is achieved by adding the liquid level on the two arms of the manometer together.)
8. Determine the air flow (lpm) through the orifice by graphing the inches of water on the calibration curve included with the calibrator kit. Record the airflow on the data sheet.
9. Repeat steps 5-8 at least two times to obtain additional points.
10. Remove and discard the PUF and filter.
11. Close the inlet values.

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The calibration is considered acceptable if the calibration points are within 10% of expected. If a point is not within this range, the outlying point or points should be repeated.

5.0 OPERATION

Sample Collection:

1. The air sampler unit will be placed at a location which has been pre-determined. The location of the air sampler, such as that obtained from a Geographical Position System (GPS), will be described on the Air Sample Collection Data Sheet.
2. While wearing disposable gloves, carefully remove the packaging from the glass cartridge to be used for sample collection. Retain the foil, zip-lock bag and bubble wrap.
3. Inspect the sampling head to insure there is a gasket at the top and bottom of the adsorbent support. Insert the glass cartridge into the adsorbent support.
4. Screw the filter support base onto the adsorbent support. Do not over-tighten.
5. Place a rubber gasket on top of the filter support base. Place the filter on top of the gasket and place a second rubber gasket on top of the filter. Retain the foil and zip-lock bag. The gaskets are not shown in Attachment 1. Place the filter retaining ring on the top gasket and attach it to the filter support base with the three wing nuts.

   CAUTION: If the sampling head is assembled away from the sampling site, place the protective cover plate on the sampling head. The cover plate must be removed immediately prior to the start of sample collection.

6. Connect the sample head to the vacuum pump by securing it with the ring clips on top of the vacuum pump.
7. Plug the vacuum pump into a timer. Start the vacuum pump and allow to run for at least one minute. Adjust the air flow to approximately 250 lpm (based on the calibration) using the variator. Record the start parameters, such as date, time, magnahelic reading, and running time meter reading from the air sampler on the data sheet. An example data sheet is shown in Attachment 2.
8. Set the timer to shut off after 12 hours.
9. Prior to disassembling the sampling head after the sampling is complete, turn the vacuum pump on and allow to run for at least 1 minute. Record the reading from the air sampler magnahelic gauge on the data sheet. Shut the vacuum pump off. Record the date and the reading on the air sampler running time meter on the data sheet. Determine the ending lpm from the graph based on the magnahelic gauge in the same manner as during air sampler calibration (Section 5.8).
9. Calculate the total time and average flow rate and record on the data sheet. Attach the calibration graph to the data sheet.

Sample Handling:

1. Remove the filter retaining ring from the sampling head. While wearing disposable gloves, remove the filter from the sampling head. Fold the filter in half so the dirt particles are turned in. Fold the filter in half again. Wrap the filter

in the foil and place in the labeled filter zip-lock bag. Record the city and date information on the label on the bag.

2. Remove the filter support base from the adsorbent support. Carefully remove the glass cartridge containing the PUF from the adsorbent support. Wrap the glass cartridge containing the PUF in foil and place in the labeled zip-lock bag.
3. Record the city and date information on the label on the bag. Wrap the zip-lock bag in bubble-wrap.
4. Immediately, store the filter and PUF on ice (blue ice is preferred). Place the Air Sample Collection Data Sheet in a zip-lock bag and place in the container with the sample.
5. Ship the sample and data sheet via over-night delivery to:

Kim Andrews
Battelle
505 King Avenue
Room 11-1-060
Columbus, OH 43201

6.0 MAINTENANCE

Cleaning:

1. Disassemble the sampling head prior to sample collection.
2. Wipe out the sampling head with a Chem-wipe wetted with methanol prior to installing the glass cartridge. Check to make sure the gaskets are inside the sampling head at the top and bottom of where the glass cartridge will sit.

7.0 TRAINING

Trainees must read this SOP. A trained operator will demonstrate the use of the equipment. The instructor will guide the trainee through the instrument calibration and operation. The instructor will provide a memo documenting the training. The original copy will be kept in the trainee's training file.

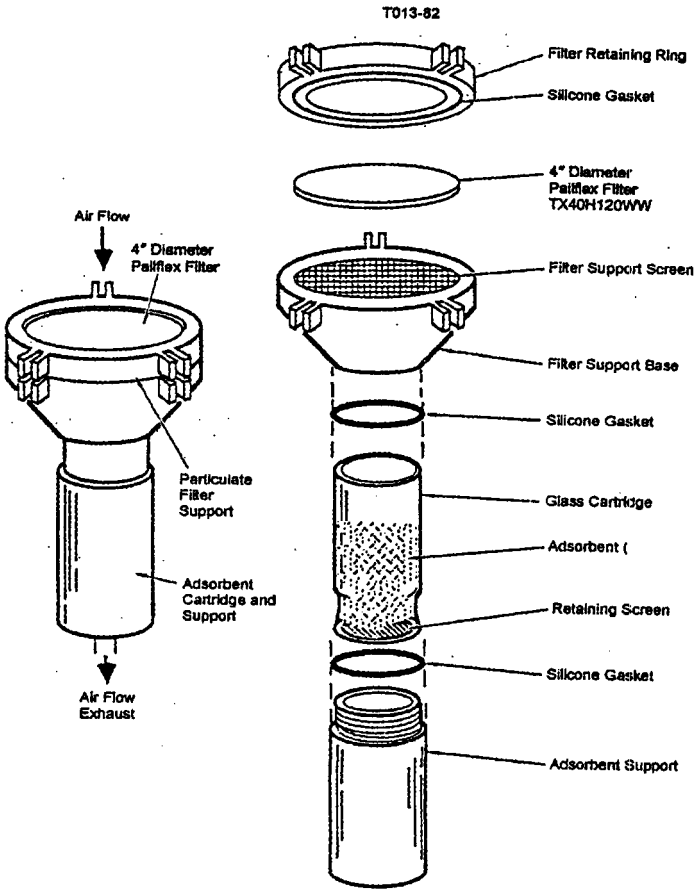
8.0 REFERENCE

EPA Method TO13, *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Supplement*, US EPA, Research Triangle Park, NC, EPA-600/4-90-010, May, 1990.

9.0 ATTACHMENTS

Attachment 1. PS-1 Sampling Head

Attachment 2. Air Sample Collection Data Sheet



Attachment 1. PS-1 SAMPLING HEAD

ATTACHMENT 2

AIR SAMPLE COLLECTION DATA SHEET

Project: Multi-Cities

City: _____ Sampling Site: _____

Description of Location: _____

Collected By: _____ Air Sampler ID: _____

PUF Cleaning Lot No.: _____ Filter Cleaning Lot No.: _____

Calibration: Calibration Orifice No.: _____

Reading from Magnahelic Gauge on Sampler	Inches of Water on Calibrator Orifice	lpm[a]

Manually graph the calibration curve (Magnahelic reading on the x-axis; calculated lpm on the y-axis). Attach the graph to this sheet.

Sample Collection:

Parameter	Start	Stop
Date		
Time		-------
Magnahelic Reading		
Running Time Meter		
Determined lpm (from graph)		

Total Sample Time, min = Stop running time meter value–Start running time meter value

= _____

Average Flow Rate = (Determined lpm at Start + Determined lpm at Stop)/2

= _____

[a] Liter/min (lpm) is determined from the calibration curve.

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Battelle Duxbury Operations
Standard Operating Procedure

for

COLLECTION AND HANDLING OF WATER SAMPLES FOR THE MULTI-CITIES PROJECT

1.0 OBJECTIVE

The purpose of this standard operating procedure (SOP) is to describe the procedures that will be used to collect, store, and ship water samples collected for the Multi-Cities project. This SOP describes sample collection methods for three types of water sources: drinking water supplies, publicly-owned treatment plants (POTW), and land fills.

2.0 PREPARATION

2.1 SUPPLIES AND EQUIPMENT

- Polyethylene jar - 1 Liter, pre-cleaned, certified
- Polyethylene jar - 250 g, pre-cleaned, certified
- Stainless steel scoop or spoon
- Garmin 12XL hand-held GPS
- HPLC-grade Methanol
- Chem wipes
- Ice
- Cooler
- Safety glasses
- Nitrile gloves
- Zip-sealed bags (sealed immediately upon purchase)

2.2 APPLICABLE DOCUMENTS

- Quality Assurance Project Plan (QAPP)
- Project Survey Plan
- SOP M3-F-2.n
- Labels
- Chain-of-custody forms
- Letters of permission from public facilities

2.3 DECONTAMINATION PROCEDURES

Any sampling equipment that is re-used (e.g., sludge scoops) must be thorough cleaned between each sample. To clean the sampling equipment:

1. Wipe off any residual sludge or water with a Chem wipe.
2. Rinse the equipment with deionized water.
3. Rinse the equipment with methanol.
4. Place in zip-sealed bag until next use.

2.4 SAMPLING LOCATIONS

Water samples will be collected at the following locations:

- Drinking water samples will be collected at a source or supply, at the drinking water facility intake, after treatment at the drinking water facility outflow, and at the point of public consumption - tap water.
- Landfill leachate samples will be collected (using a valve withdrawal system). Only municipal landfills (not industrial landfills) will be considered sampling sites.
- Publicly-owned treatment plant water samples will be collected as post-chlorination influent and effluent. A sludge sample will also be collected.

General Instructions:

- Water sample bottles will not be pre-rinsed with site water prior to sample collection.
- The number and type of field and quality control samples to be collected are defined in the QAPP. it is extremely important that this document be referenced prior to any sampling activity.
- Gloves should be worn during sampling activities and replaced between samples.
- If municipal authorities do not grant permission for Battelle staff to collect the water samples but are willing to perform the collection themselves then the precleaning procedures described in Section 3 should be performed, and the sampling equipment and instructions (Attachment 1) should be provided to the municipal employees.
- All samples will be held chilled (~4°C) form collection to shipping. Shipping procedures are defined in SOP 5-210.

2.4.1 Drinking Water

Drinking Water Source Samples. The drinking water source will be open water or well water.

- If the source of municipal drinking water is open water then samples will be collected from the source water using the procedures in Section 3.1. These designated sources could include lakes/ponds, rivers/streams, or reservoirs. One sample at open water locations will be collected at three sites: the samples to be collected form three different sites should be spaced at least 500 feet apart.
- If the source of municipal drinking water is ground water then any open water supply is acceptable.
- If a valve withdrawal system is available then follow the sampling procedures described in Section 3.2.

- If the municipal drinking water supply is well water then the "source" water sample will be the intake sample and will be sampled using either Section 3.1 or 3.2.

A description of the sample location should be documented on the Station Log. The water body should be identified with the access location (e.g., name of pond or reservoir) and should indicate if the sample was collected from shore, a boat, pier, etc. The station log should indicate if water was collected from a valve rather than open water and whether the valve was adjacent to the open water source or within the plant. The approximate distance from the drinking water facility should be estimated.

Drinking Water Facility Intake. The intake water samples should represent drinking water from the source location just prior to treatment. Thus the drinking water plant influent sampling location must be within the facility itself. Follow procedures in Section 3.2 for collection from a water tap. If the intake source is a reservoir or pool then follow Section 3.1 for collection from open water.

Drinking Water Facility Outflow. The outflow sampling location should provide treated water that has not been exposed to "outside" air. Thus the drinking water plant outflow sampling location must be within the facility itself. Follow procedures in Section 3.2 for collection from a water tap. If the outflow source is a reservoir or pool then follow Section 3.1 for collection from open water.

End-Use Drinking Water Supply: Tap Water. Tap water will be collected at three retail establishments in the same city in which the drinking water facility is located. It is important that the water sample be untreated, therefore samples from rest rooms or outside faucets rather than drinking fountains are required.

2.4.2 Landfill Leachate Sampling

Leachate samples will be collected from municipal land fills according to the procedures defined in Sections 3.1 or 3.2.

2.4.3 Publicly-Owned Treatment Plant Sampling (POTW)

Post-chlorination influent, effluent, and sludge samples will be collected at publicly-owned treatment plants. Influent and effluent samples will be collected according to Sections 3.1, 3.2, or Attachment 1, depending on whether or not a valve withdrawal system is available and whether Battelle or POTW staff will perform the collection.

One sludge sample is collected at each POTW. Sludge samples are collected according to procedures identified in Section 3.3.

3.0 PROCEDURES

The following procedures will be used to collect water samples. Sludge procedures are included in this description because they will be collected as part of the POTW sampling activity.

3.1 OPEN WATER COLLECTION PROCEDURES

1. Locate the water source and a point of access.

2. Complete the Station Log and take a GPS reading (SOP 3-164) as close as possible to the sampling location.
3. Wipe the exterior of the sampling bottle with methanol.
4. Submerge the sample bottle below the water surface and unscrew the bottle cap.
5. Fill the water bottle by turning the bottle parallel to the water surface and slowing rotating so that the mouth of the bottle is up-right. This procedure will ensure that water form the surface microlayer is not pulled into the sample bottle.
6. Recap the sample bottle under water.
7. Wipe the bottle with methanol and affix a sample label.
8. Place the sample in a cooler of ice.
9. Complete the chain-of-custody form.

Pre-cleaning procedures: If municipal employees will collect these samples the following procedures should be performed by Battelle staff prior to providing sampling containers to public employees.

1. Wipe the exterior of the sampling bottle with methanol.
2. Remove the bottle cap, wipe the bottle lip with methanol, and replace the bottle cap.
3. Place the cleaned bottle in a zip-sealed bag.

Provide the employees with the sample bottle in a zip-sealed bag, the instructions, and sampling gloves.

3.2 VALVE SYSTEM (FAUCET) WATER COLLECTION PROCEDURES

1. Locate an appropriate tap water source.
2. Complete the Station Log and take a GPS reading (SOP 3-164) as close as possible to the sampling location.
3. Wipe the tap water faucet and the exterior of the sampling bottle with methanol.
4. Open the valve and allow water to run for at least two minutes to flush the valve system and supply lines.
5. Remove the bottle cap, wipe the bottle lip with methanol, place the bottle under the tap, and fill the bottle. If the bottle will not fit under the tap faucet then look for another appropriate source. Do not fill with a cup or secondary bottle.
6. Recap the sample bottle.
7. Wipe the bottle with methanol and affix a sample label.
8. Place the sample in a cooler of ice.
9. Complete the chain-of custody form.

Pre-cleaning procedures: If municipal employees will collect these samples the following procedures should be performed by Battelle staff prior to providing sampling containers to public employees.

1. Wipe the exterior of the sampling bottle with methanol.
2. Remove the bottle cap, wipe the bottle lip with methanol, and replace the bottle cap.
3. Place the cleaned bottle in a zip-sealed bag.

Provide the employees with the sample bottle in a zip-sealed bag, the instructions, and sampling gloves.

3.3 SLUDGE SAMPLE COLLECTION PROCEDURES

1. Locate the sludge pool.
2. Complete the Station Log and take a GPS reading (SOP 3-164) as close as possible to the sampling location.
3. Wipe the exterior of the sample jar and the sampling scoop or spoon with methanol.
4. Remove the jar cap and wipe the jar lip with methanol.
5. Fill the sample jar using a stainless steel spoon or scoop.
6. Recap the sample jar.
7. Wipe the jar with methanol and affix a sample label.
8. Place the sample in a cooler of ice.
9. Complete the chain-of-custody form
10. Place the dirty spoon in a zip sealed bag.
11. Decontaminate the spoon according to Section 2.3.

Pre-cleaning procedures: If municipal employees will collect these samples the following procedures should be performed by Battelle staff prior to providing sampling containers to public employees.

1. Wipe the exterior of the sampling jar and the sampling scoop or spoon with methanol.
2. Remove the jar cap, wipe the jar lip with methanol, and replace the jar cap.
3. Place the cleaned jar and stainless steel scoop in a zip-sealed bag.

Provide the employees with the sample jar and sampling scoop in a zip-sealed bag, the instructions, and sampling gloves.

4.0 CALCULATIONS

No calculations are required for this procedure.

5.0 QUALITY CONTROL

The quality control (QC) samples collected for this project are defined in the QAPP and are related to the type of water sample being collected. General sample collection instructions are provided below.

- Field Replicates will allow the analysts to measure the variability of results between two "identical" samples. Field replicates should be collected and handled exactly like the authentic field sample.

- Field Spikes will allow the analysts to measure the matrix effects of the sample on the recovery of the compounds of interest. Field spike samples should be collected and handled exactly like the authentic field sample and should be spiked according to the procedures defined in SOP M3-F-4.

- Field Blanks will allow the analysts to assess contamination introduced by the sampling conditions. Field blanks will be empty sample containers that are handled as if they were filled with a sample but are actually left capped throughout the sampling process and are not filled with sample.

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- Trip Blanks will allow the analysts to assess contamination introduced by sample treatment. Sample containers (one per city) will be filled with deionized water prior to shipment to the sampling site. One container per city is shipped from the field to the laboratory with the field samples and will remain unopened until analysis.

6.0 TRAINING

Staff being trained in the sampling techniques required for this project must first read this SOP and the QAPP. Next proper sampling and documentation techniques are demonstrated to the staff member. Finally the staff member demonstrates proper sampling procedures and completion of the associated documentation. Completed training is documented on a Certificate of Training (Attachment 1) and provided to Battelle's quality assurance unit.

7.0 SAFETY

There are no safety hazards associated with sampling a drinking water sites. However, sampling at POTW and landfill sites requires the use of Nitrile gloves and safely glasses.

ATTACHMENTS

1. Instructions for municipal workers.
2. Certificate of Training

APPROVALS

Author	Diana J Burke	5-11-99
Technical Reviewer	Scott C. Macon	5/11/99
Quality Systems Manager		
Project Manager	Marcia P. Nishkian	5/12/99
	Name	Date

Attachment 1

Instructions for Municipal Workers

Thank you for your willingness to assist us in our study! Your help in following these steps when collecting samples will help us to collect good samples.

SAMPLING LOCATIONS We would like samples from the following locations:

Drinking water samples
_____Source or supply
_____At the drinking water facility intake
_____After treatment at the drinking water facility outflow

Landfill
_____Leachate sample

Publicly-owned treatment plant (POTW)
_____Post-chlorination influent
_____Effluent
_____Sludge sample

OPEN WATER COLLECTION PROCEDURES

1. Put on the sampling gloves.
2. Remove the sample bottle from the zip-sealed bag.
3. Submerge the sample bottle below the water surface using the gloves provided and open the bottle.
4. Hold the bottle so that water from the surface in not pulled down into it.
5. Fill the bottle.
6. Place the bottle back into the zip-sealed bag.

VALVE SYSTEM (FAUCET) WATER COLLECTION PROCEDURES

1. Put on the sampling gloves.
2. Wipe the tap water faucet and the wet wipe provided.
3. Open the faucet and allow water to run for at least two minutes to flush the valve system.
4. Remove the bottle from the zip-sealed bag and place it under the tap.
5. Fill the bottle. If the bottle will not fit under the faucet then try another faucet. Do not fill with a cup or second bottle.
6. Recap the sample bottle.
7. Place the bottle back into the zip-sealed bag.

SLUDGE SAMPLE COLLECTION PROCEDURES

1. Put on the sampling gloves.
2. Remove the jar and sampling scoop from the zip-sealed bag.
3. Fill the sample jar using the stainless steel scoop.
4. Recap the sample jar.
5. Place the jar back into the zip-sealed bag.

Attachment 2

CERTIFICATE OF TRAINING
for

SOP M3-F-2.0

COLLECTION AND HANDLING OF WATER SAMPLES FOR THE MULI-CITIES PROJECT

Name of Trainee_____

Name of Certified Instructor_____

Date SOP read_____*(To be completed by trainee)*

Date Training completed_____*(To be completed by instructor)*

Description of Training:

APPROVED BY _____ DATE: _____
Instructor

BACK TO MAIN

Battelle Duxbury Operations
Standard Operating Procedure

for

SPIKING FIELD SAMPLES FOR THE MULTI-CITIES PROJECT

1.0 OBJECTIVE

The purpose of this standard operating procedure is to describe the method that will be used in the field to prepare matrix spike samples. The matrices that will be spiked in the field are defined in the Quality Assurance Project Plan.

2.0 PREPARATION

2.1 Supplies and Equipment

The following supplies should be readily available in the field in order to perform this procedure.

- Sealed vials of pre-measured spiking material
- Pre-spiked air filter
- Bag containing the pre-spiked PUF
- Air sampling equipment (SOP M3-F-1)
- Zip-sealed plastic bags
- 1-L sample bottles marked at the 1 L level
- HPLC-grade Methanol
- Chem wipes
- Ice
- Cooler
- Safety glasses
- Nitrile gloves

2.2 Spiking Solutions

In order to avoid cross-contamination, spiking solutions will be prepared in the laboratory under the supervision of the project manager. Aliquots of spiking solution at the appropriate dose concentrations will be sealed in individual ampoules and individually labeled with the following information:

- Name
- CAS number or code number
- Concentration
- Batch number or preparation date
- Expiration date
- Storage requirements

Spiking solution will be shipped to Duxbury and packaged for travel so that any risk of breakage is minimized. Spiking solutions must be held on ice at all times.

3.0 PROCEDURES

Nitrile gloves should be worn throughout these procedure. Gloves should be replaced between samples and should be changed whenever contamination is suspected.

3.1 Urban Air Matrix Spike Samples

Two types of matrix "spikes" will be collected in the field: filter spikes and PUF spikes. In both cases the samples will be prepared at Battelle under the supervision of the project manager and shipped to the field location. Once routine air sample collection is completed at a site, the air sampler should be cleaned according to the routine procedures described in SOP M3-F-1 prior to the "collection" of the field spike sample.

Air filter spike samples are "collected" using the following procedures:

1. Remove the spiked filter from the Zip-sealed bag.
2. Place the spiked filter in a sampler head as if a new filter was being installed to collect a routine field sample.
3. Remove the spiked filter, fold in quarters, and return it to the original Zip-sealed storage bag
4. Place samples in coolers with ice to maintain a cool temperature. Fresh ice should be added to the cooler in preparation for shipping.

PUF spike samples are collected adjacent to the location of the air sampler using the following procedures:

1. Open the bag containing the spiked PUF for about 15 seconds.
2. Reseal the bag and place it on ice in the storage cooler.
3. Place samples in coolers with ice to maintain a cool temperature. Fresh ice should be added to the cooler in preparation for shipping.

3.2 Water Matrix Spike Samples

A separate field sample is collected for the matrix spike water samples using routine collection procedures. (Routine collection procedures are described in SOP M3-F-2 *Collection and Handling of Water Samples for the Multi-Cities Project)*. Once the water sampling at a site is complete and the field samples have been packed in an ice-filled cooler the following procedure will be used to prepare the matrix spike sample.

1. Rinse the outside of the spike solution vial with high purity methanol (HPLC grade) and wiped dry with a Chem wipe.
2. Unscrew the cap of the sample container and place the container on a clean surface, protected from the wind.
3. Unscrew the cap of the spiking solution vial and pour the contents of the vial into the sample container. (In possible, the field sample team should estimate the approximate 1-L fill-line and attempt to fill bottles to this level in the field).

4. Drop the vial that contained the spiking solution into the field spike sample bottle.
5. Cap the bottle and shake and invert gently several times to assure mixing and dispersion of the spike solution.
6. Place the matrix spike sample in a cooler with ice to maintain a cool temperature. Fresh ice should be added to the cooler in preparation for shipping.

3.3 Sample Labeling, Handling, and Storage

Place one of the appropriate preprinted labels on each sample container and the other in the field log book. Samples will be shipped at the end of each collection day for next-day delivery. Environmental samples will be packed in coolers with ice and bubble wrap sufficient to ensure that damage will not occur during shipping.

4.0 CALCULATIONS

No calculations are required for this procedure.

5.0 QUALITY CONTROL

This SOP describes preparation of quality control samples. There are no additional QC procedures required.

6.0 TRAINING

All field team members must read this SOP. The Field Team leader will then demonstrate spiking procedures. Finally, each team member will demonstrate proper handling of spiking solutions and spiking techniques. Spiking proficiency will be documented on the training certificate (Attachment 2).

7.0 SAFETY

ATTACHMENTS

1. Certificate of Training

APPROVALS

Author	Donna A Burke	5-11-99
Technical Reviewer	Scott C Mace	5/11/99
Quality Systems Manager	Donna A Burke	5-11-99
Project Manager	Marcia B. Mishuta	5/12/99
	Name	Date

Attachment 1

CERTIFICATE OF TRAINING
for

SPIKING FIELD SAMPLES FOR THE MULTI-CITIES PROJECT

Name of Trainee_____

Name of Certified Instructor_____

Date SOP read_____ *(To be completed by trainee)*

Date Training completed_____ *(To be completed by instructor)*

Description of Training:

APPROVED BY _____ DATE: _____
Instructor

BACK TO MAIN

Battelle Duxbury Operations
Standard Operating Procedure

for

ASSIGNING SAMPLE IDENTIFICATION NUMBERS TO SAMPLES COLLECTED FOR THE MULTI-CITIES PROJECT

1.0 OBJECTIVE

The purpose of this standard operating procedure (SOP) is to describe the procedures that will be used to assign sample identification numbers to samples collected for the Multi-Cities project.

2.0 PROCEDURES

2.1 SAMPLE IDENTIFICATION NUMBERS

Sample identification numbers (IDs) for water, sediment, sludge, and food samples collected for the Multi-cities project are pre-assigned by the project manager. Sample labels and custody forms containing the sample IDs will be provided to the sampling teams. The sample ID format is

MC-nnn

where,
MC is the client designation and
nnn is a non-repeating consecutive number

2.2 RECOLLECTION OF SAMPLES

There may be times when a sampling site or a specific sample for a site must be re-collected. This may occur if the sample is lost, the sample container breaks, or the sample becomes contaminated. In these cases the original sample must be saved if available, but a new sample should be collected. In order to maintain a unique sample ID and a full record of collection the following procedure will be followed.

1. Mark the sample collection log to indicate which sample is being recollected. Document the date that the decision is made, the reason for the decision to re-sample, and the initials of the sampler.
2. Document the date of re-sampling and initial.
3. Label the sample as

MC-nnn-A

where,
MC is the client designation,
nnn is a non-repeating consecutive number, and

A indicates that the sample was re-collected.

In the unfortunate case where a sample must be recollected again then a "B" designation is used to indicate that it is the second *recollection* of the sample.

2.3 SAMPLE DESCRIPTIONS

Each sample label will include a sample description. There descriptions are pre-printed on the sample labels for water, sediment, sludge, and food samples to assist the field team in collecting the correct number and types of samples at each site.

The sample description format for field samples is

Matrix - City - Location - Target Analysis

The sample description format for quality control samples is

Matrix - City - (Location) - QC Type - Target Analysis

The table in Attachment 1 defines the acceptable matrix, location, and QC types. The cities to be sampled and target analyses are defined in the quality assurance project plan.

2.4 FINFISH LABELING AND DESCRIPTIONS

Sample identification numbers for finfish will be created prior to the surveys but will not be designated on the sample custody forms because the availability of the sites, the locations, and the number of fish to be collected may not be predicted with accuracy.

The sample IDs for finfish will follow the format

MC-Fish - nnn

where,
MC is the client designation
Fish is the sample type and
nnn is a non-repeating consecutive number

The sample labels will prompt for required sample description information that must be completed by the sample collector. The sample description format for finfish samples is

Finfish - City - Location - Species

where,
Finfish is the matrix
City is the sampling city
Location is the collection point water body, and
species is the fish species

Because unique sample IDs are not preassigned to finfish samples if a sample is lost then the next consecutive number should be used for the recollected sample.

3.0 DOCUMENTATION

Sample IDs will be documented on each sampling container, each sample collection log, and the sample custody forms. If pre-printed labels are lost then blank labels will be used to record all information provided on the *example* label that is part of each sampling log.

4.0 QUALITY CONTROL

No specific quality control procedures are required for the assignment of sample IDs. However, quality assurance activities will include an audit of survey reports vs. survey logs to ensure that sample IDs are compliant with this SOP and that a paper trail is traceable for each reported sample.

5.0 TRAINING

All field team members must read this SOP and be familiar with the sample ID and description formats. This "training" is recorded on Attachment 2.

6.0 SAFETY

There are no safety issues related to the assignment of sample IDs.

ATTACHMENTS

1. Sample ID codes
2. Certificate of Training

APPROVALS

Author	Laura A Burke	5-11-99
Technical Reviewer	Scott C. Macy	5/11/99
Quality Systems Manager	Laura A Burke	5-11-99
Project Manager	Name: Marie J Nishida	Date: 5/12/99

Attachment 1

Sample Description Codes

Field sample format: Matrix - City - Location - Target Analysis

Quality control sample format: Matrix - City - (Location) - QC Type - Target Analysis

MATRIX	LOCATION	QUALITY CONTROL
Surface water	Site 1	Field/Lap Dup
Sediment	Site 2	Field Spike
Drinking Water - Intake	Site 3	Lab Spike
Drinking Water - Outflow	PUF	Field Blank
Tap Water	Filter	Trip Blank
Landfill Leachate	Store 1	
POTW Influent	Store 2	
POTW Effluent	Store 3	
POTW Sludge		
Urban Air		
Ground beef		
Pport Chops		
Chicken breast		
Hot dogs		
fish		
Eggs		
Whole milk		
Bread		
Green beans		
Apples		
Organic flour		
Organic bread		

Attachment 2

CERTIFICATE OF TRAINING
for

ASSIGNING SAMPLE IDENTIFICATION NUMBERS TO SAMPLES COLLECTED FOR THE MULI-CITIES PROJECT

Name of Trainee_____

Name of Certified Instructor_____

Date SOP read_____*(To be completed by trainee)*

Date Training completed_____*(To be completed by instructor)*

Description of Training:

APPROVED BY _____ DATE: _____
Instructor

BACK TO MAIN

Battelle Duxbury Operations
Standard Operating Procedure

for

COLLECTION AND HANDLING OF SEDIMENT SAMPLES FOR THE MULTI-CITIES PROJECT

1.0 OBJECTIVE

The purpose of this standard operating procedure (SOP) is to describe the procedures that will be used to collect, store, and ship sediment samples collected for the Multi-Cities project. This SOP describes sample collection methods using both a Young grab sampler and a hand scoop.

2.0 PREPARATION

2.1 SUPPLIES AND EQUIPMENT

- Polyethylene jar - 250 g, precleaned, certified
- Stainless steel scoop or spoon
- 0.04 m^2 Young grab sampler
- Wide-mouth funnel
- Garmin 12XL hand-held GPS
- HPLC-grade Methanol
- Chem wipes
- Ice
- Cooler
- Safety glasses
- Nitrile gloves
- Zip-sealed bags (sealed immediately upon purchase)

2.2 APPLICABLE DOCUMENTS

- Quality Assurance Project Plan (QAPP)
- Project Survey Plan
- SOP M3-F-7.n
- Labels
- Chain-of-custody forms
- Permission slips

2.3 SAMPLING LOGISTICS

Sediment samples will be collected only if the source of municipal drinking water is open water. In these cases each sediment sample will be collected from the same spot as the water sample immediately after the water sample is collected. Sediment samples will be collected synoptically with the drinking water surface samples. As with the surface water samples, sediment samples will be collected at three sites that are at least 500 feet apart.

A description of the sample location should be documented on the Station Log. The water body should be identified with the access location (e.g., name of pond or reservoir) and should indicate if the sample was collected from shore, a boat, pier, etc. The approximate distance from the drinking water facility should be estimated.

2.3.1 Sediment Sample Collection Options

The sediment sampling technique (grab or scoop) will depend on the water body and whether it is possible to use a grab sampler. Prerequisites for use of the grab sampler include a boat, pier, or some other sampling platform.

- If the use of a grab sampler is possible then the top 2 cm of sediment will be collected from each grab sample; a total of approximately 200 hundred grams of sample should be collected per site. This equates to filling the 250 mL jar 3/4 full.

- If the grab sampler cannot be used then a long-handled stainless steel scoop will be used to collect a shallow "skim" of sediment from the benthic sediment layer. To the extent possible the sediment should be drained prior to filling the sample jar.

2.3.2 General Instructions

- Sediment sample jars will not be pre-rinsed with site water prior to sample collection.
- The number and type of field and quality control samples to be collected are defined in the QAPP. It is extremely important that this document be referenced prior to any sampling activity.
- Sediment samples will not be homogenized in the field.
- Gloves should be worn during sampling activities and replaced between samples.
- The sampling equipment should be cleaned using the decontamination procedures defined in Section 2.3.3.
- All samples will be held chilled (~ 4°C) from collection to shipping. Shipping procedures are defined in SOP 5-210.

2.3.3 Decontamination Procedures

All sampling equipment must be thorough cleaned between each sample. To clean the sampling equipment:

1. Wipe off sand and water with a Chem wipe.
2. Rinse the equipment with deionized water.

3. Rinse the equipment with methanol.
4. Place in zip-sealed bag until next use.

3.0 PROCEDURES

The following procedures will be used to collect sediment samples.

3.1 YOUNG GRAB SAMPLER COLLECTION PROCEDURES

1. Locate the water source and a point of access.
2. Initiate the Station Log and take a GPS reading (SOP 3-164) as close as possible to the sampling location.
3. Perform the decontamination procedures defined in Section 2.3.3.
4. Wipe the exterior of the sample jar with methanol.
5. Lower the grab sampler to the bottom.
6. Slowly recovery the grab until it is free of the bottom

    a. Review the penetration level and adjust the depth as needed by adding or removing weights to the frame and by adjusting the applied downward pressure.
    b. Inspect the grab for signs of leaks;
    c. Secure the grab on the frame or other solid surface before opening

7. Assess the acceptability of the grab using the criteria defined in Section 3.3 and repeat Steps 5 and 6 as needed to collect a good grab at each site.
8. If the grab is successful then open the jar lid and wipe the lip with methanol.
9. Scoop the top 2 cm of sediment from the open grab and place into the jar. it is estimated that 200 grams of sediment will fill the 250 mL jar about 3/4 full.
10. Recap the sample bottle once filled.
11. Wipe the bottle with methanol and affix a sample label.
12. Place the sample in a cooler of ice.
13. Complete the chain-of-custody form

3.2 MANUAL SCOOP COLLECTION PROCEDURES

1. Initiate the Station Log and take a GPS reading (SOP 3-164) as close as possible to the surface water sediment source.
2. Wipe the exterior of the sample jar and the sampling scoop with methanol.
3. Extend the sampling scoop down into the water so that a thin "skim" of top sediment approximately 2 cm deep is scooped from the benthic layer.
4. Gently retrieve the sediment, pouring off excess water once the surface is broken.
5. Remove the jar cap and wipe the jar lip with methanol.
6. Fill the sample jar using a stainless steel spoon to scoop sediment into the jar. A wide-mouth, metal funnel may be useful.
7. Recap the sample jar.
8. Wipe the jar with methanol and affix a sample label.
9. Place the sample in a cooler of ice.
10. Complete the chain-of-custody form

3.3 DETERMINING THE ACCEPTABILITY OF A GRAB SAMPLE

Each grab sample will be inspected for signs of disturbance. The following criteria identify ideal characteristics for an acceptable grab sample.

- Sampler is not overfilled with sediment; the jaws must be fully closed and the top of the sediment below the level of the opening doors.
- Overlying water is present and not excessively turbid.
- Sampler is at least half full, indicating that the desired penetration was achieved.

In certain locations, however, slight over-penetration may be accepted at the discretion of the sampling scientist. Mild over-penetration may be accepted according to the following standards:

- the sediment surface is intact on at least one side of the grab and
- there is little or no evidence that the surface sediment has pushed through the grid surface of the grab, i.e. no visible imprint from the screening outside of that grid
- No evidence that sediment has squirted out through the hinge or the edges.

If the grab sample meets the acceptability criteria, the water overlying the sample will be siphoned from the grab and the (top 2 cm) sediment will be collected with a stainless steel scoop and transferred to a certified, pre-cleaned sample container. To minimize exposure to airborne contaminants, the sediment will be not be homogenized in the field before being transferred to the precleaned, certified containers.

Given the difficulty of obtaining undisturbed sediment in areas with exceptionally fine sediments, these standards may have to be relaxed further. The field team leader will make the final decision regarding acceptability of all grabs, and the overall condition of the grab (i.e. "slight overpenetration on one side") will be documented on the sampling log.

3.4 DETERMINING THE ACCEPTABILITY OF A SCOOP SAMPLE

Samples collected using a long-handled scoop will be considered acceptable if the scoop retains 50% of the original sediment sample once the sampler breaks the water surface.

4.0 CALCULATIONS

No calculations are required for this procedure.

5.0 QUALITY CONTROL

The quality control (QC) samples collected for this project are defined in the QAPP; no sediment quality control samples will be prepared in the field.

BACK TO MAIN

6.0 TRAINING

Staff being trained in the sampling techniques required for this project must first read this SOP and the QAPP. Next proper sampling and documentation techniques are demonstrated to the staff member. Finally the staff member demonstrates proper sampling procedures and completion of the associated documentation. Completed training is documented on a Certificate of Training (Attachment 1) and provided to Battelle's quality assurance unit.

7.0 SAFETY

There are no safety hazards associated with sampling a drinking water sites. However, sampling at POTW and landfill sites requires the use of nitrile gloves and safely glasses.

ATTACHMENTS

1. Certificate of Training

APPROVALS

Author	Joanna B. Wilde	5-11-99
Technical Reviewer	Scott C. Mason	5/11/99
Quality Systems Manager	Joanna B. Wilde	5-11-99
Project Manager	Maria J. Nishikawa	5/17/99
	Name	Date

BACK TO MAIN

Attachment 2

CERTIFICATE OF TRAINING
for

SOP M3-F-7.0

COLLECTION AND HANDLING OF WATER SAMPLES FOR THE MULI-CITIES PROJECT

Name of Trainee_____

Name of Certified Instructor_____

Date SOP read_____*(To be completed by trainee)*

Date Training completed_____*(To be completed by instructor)*

Description of Training:

APPROVED BY _____ DATE: _____
Instructor

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Marine Sciences Laboratory

EFFECTIVE DATE: _____

Battelle Pacific Northwest National Laboratories
Marine Sciences Laboratory

STANDARD OPERATING PROCEDURE
MSL-T-022-00

COLLECTION AND HANDLING OF AQUATIC SURFACE MICROLAYER SAMPLES

Approvals:	
AUTHOR	DATE
REVIEWER	DATE
QUALITY ASSURANCE	DATE
TECHNICAL GROUP MANAGER	DATE

COLLECTION AND HANDLING OF AQUATIC SURFACE MICROLAYER SAMPLES

1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the methods for collection, storage, and shipment of aquatic surface microlayer (microlayer) samples.

2.0 DEFINITIONS

- Custody – custody of a sample requires assuming control of the sample in one or more of the following manners: 1) physical possession; 2) in his/her view after taking possession; 3) secured by him/her in a manner that prevents tampering of sample; and/or 4) secured by him/her in an area restricted to authorized personnel.
- Sample Custodian – responsible person in custody of sample.

3.0 RESPONSIBLE STAFF

- Technical staff collecting samples
- Sample custodian
- Sample recipient
- Reviewer (Project manager or designee)

4.0 SUPPLIES AND EQUIPMENT

- Sample jar – glass or polyethylene, certified as pre-cleaned. The sample custodian is responsible for receiving certified bottles, relinquishing custody to the survey chief scientist, and maintaining records of certification and custody.
- Sampler frame (Plexiglas) with wiper (nitrile [Buna-N] rubber and PVC) and funnel (polyethylene)
- Glass plates with handle (Plexiglas)
- Soap (laboratory grade; e.g.
- Sponge (artificial material with no abrasive side)
- HPLC-grade methanol
- Chem wipes
- Ice
- Cooler
- Safety glasses
- Safety gloves (e.g., Nitrile)
- Spare parts – extra glass plates, handles, nylon bolts, wiper material, plexiglas glue

5.0 PROCEDURES

Check the project specific work plan to obtain the number and/or frequency of samples required, the quantity of water to be sampled, and the location of sampling sites. The glass plate sampler is appropriate and efficient for collection of microlayer samples of ≤4-L volume. Samples of 2 L or more normally will require significant time to collect.

5.1 Decontamination Procedures

Prior to collection of each sample, sampling equipment (e.g., sample frame, wiper, funnel, glass plates) must be thoroughly cleaned. To clean the microlayer sampling equipment:

1. Wipe off any residual solid material or water with Chem wipes.
2. Disassemble parts of equipment, as appropriate for cleaning. Remove wiper blades and glass plate handles for cleaning.
3. Wash equipment with soapy water and sponge.
4. Rinse equipment with freshwater.
5. Rinse equipment with deionized water; air dry or wipe dry with Chem wipes. Rinse equipment with methanol.
6. Place equipment in plastic bags until next use. Label bags as "clean" to designate that the equipment is ready for use.
7. If the samples are collected from a boat, the hull of the boat should be washed with soap and rinsed before use at a site distant from the sampling location.

5.2 Microlayer Sampling

5.2.1 Care must be taken to avoid contamination of the aquatic microlayer with fuels, oils, and other materials originating from the boat. Samples should be taken off the bow of the boat or another location distant from motors. The boat motors must be off during sample collection, although an electric motor can be used to position the boat during sampling.

5.2.2 Label all sample jars for a site before collecting samples. Labels should provide space for the following information:

- Sample site identification
- Matrix and nature (e.g., Microlayer and water)
- Any preservative, solvent, or chemical included with the sample (e.g., 10% ethanol in seawater)
- Initials of sampler
- Sampling date and start time
- Unique sample identification number/code
- Study/Project number

5.2.2 Locate the water source and a point of access.

5.2.3 Record site information, as appropriate, on field log forms or a field log book (e.g., weather conditions, site location by GPS, observations of the water body and visible surface accumulations, adjacent site features that could be of significance) on the Aquatic Microlayer Sampling Data Sheet

5.2.4 Set up the microlayer sampler frame at a stable and level location. Install wiper and funnel.

5.2.5 Rinse equipment by collecting microlayer sample (approximately 20 repeated dips with the glass plate) and allowing it to drain through funnel without collecting in a sample bottle.

5.2.6 To collect aquatic microlayer, dip the glass plate vertically into the water gently, with minimal horizontal movement, and withdraw it slowly. Push the

glass plate through the wiper and allow liquid to drain through the funnel. The sampler frame will require support with one hand.

5.2.7 Record sampling start time and initials of sampler.

5.2.8 Start collection of microlayer sample by removing the sample bottle cap and placing the bottle under the funnel in a position to catch liquid. Continue to dip the glass plate into the water to be sampled and push the plate through the sampler wiper.

5.2.9 Repeat until the sample bottle is filled. Minimal air space is allowed.

5.2.10 Recap the sample bottle securely and check that sample bottle is labeled properly with sample time and sampler identification.

5.2.11 Check with project-specific work plan for guidance for storage and shipment of samples. Samples are held in an insulated container (e.g., cooler) with ice or under refrigeration at approximately 4°C. Packing for shipment requires use of bubble wrap or other material to prevent physical damage to and breakage of sample containers and use of a sturdy, insulated container.

5.2.12 Complete the chain-of-custody form (see SOP MSL-A-002 and other project-specific guidance) and attach to the inside of the lid of each shipped cooler/container.

5.3 Transport, Maintenance, and Storage of the Sampler

The sampler and its components should be transported and shipped in a protective container to prevent damage (e.g., cooler or box). Plastic bags should be used to cover the sampler to prevent contamination from the atmosphere and splash if the sampler is outside of a protective container. Field personnel must ensure that the sampler and component parts are cleaned after use, dried, wrapped in plastic bags, labeled as clean, and stored in a secure location. No routine maintenance of the sampler is required.

6.0 DATA ANALYSIS AND CALCULATIONS

Not applicable. No analysis or calculations are required for this procedure.

7.0 QUALITY CONTROL

Each project's quality assurance or work plan should be consulted for individual project requirements. Nitrile or silicon gloves should be worn to avoid sample contamination. Microlayer sampling will be performed only by staff who have completed and documented training in procedures outlined in this SOP. A general list of quality control samples is provided below.

- Field Replicates will allow the analysts to measure the variability of results between two "identical" samples. Field replicates should be collected and handled exactly like the authentic field sample.

- Field Spikes will allow the analysts to measure the matrix effects of the sample on the recovery of the compounds of interest. Field spike samples should be collected and handled exactly like the authentic field sample.

- Field Blanks will allow the analysts to assess contamination introduced by the sampling conditions. Field blanks are empty sample containers that are handled as if they were filled with a sample but are actually left capped throughout the sampling process and are not filled with sample.

- Trip Blanks will allow the analysts to assess contamination introduced by sample treatment. Sample containers (one per city) are filled with deionized water prior to shipment to the sampling site. One container per city is shipped from the field to the laboratory with the field samples and remains unopened until analysis.

- Equipment Blanks will allow the analysts to assess residual contamination between sites that is not removed by cleaning techniques or that is related to environmental (air) contamination. Deionized water is poured onto the glass plate, and the plate pushed through the wiper, drained into the funnel, and collected in a sample bottle as described in Sections 5.2.6 and 5.2.7.

8.0 SAFETY

There are no safety hazards associated with collection of sampling aquatic microlayers from land-based locations. If samples are collected from a boat, safety procedures for boat operations must comply with boating safety requirements contained in PNL-MA-43, OS 7.2.

9.0 TRAINING REQUIREMENTS

Staff being trained in the sampling techniques required for aquatic microlayer sampling must first read this SOP. The work or quality assurance plan for the project should also be reviewed. Next, proper sampling and documentation techniques are demonstrated to the staff member. Finally, the staff member demonstrates proper sampling procedures. Once proficiency has been verified, documentation of training is recorded on a Group Training Documentation Form (Attachment 1) and provided to Battelle's quality assurance officer.

9.0 REFERENCES

- MSL-A-002 Sample Chain of Custody

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Marine Sciences Laboratory

EFFECTIVE DATE: _____

Battelle Pacific Northwest National Laboratories
Marine Sciences Laboratory

STANDARD OPERATING PROCEDURE
MSL-T-023-00

COLLECTION AND HANDLING OF FISH SAMPLES USING A BACKPACK ELECTROSHOCKER

Approvals:	
AUTHOR	DATE
REVIEWER	DATE
QUALITY ASSURANCE	DATE
TECHNICAL GROUP MANAGER	DATE

COLLECTION AND HANDLING OF FISH SAMPLES USING A BACKPACK ELECTROSHOCKER

1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the methods for collection, storage, and shipment of fish samples collected with a backpack electroshocker.

2.0 DEFINITIONS

- Custody – custody of a sample requires assuming control of the sample in one or more of the following manners: 1) physical possession; 2) in his/her view after taking possession; 3) secured by him/her in a manner that prevents tampering of sample; and/or 4) secured by him/her in an area restricted to authorized personnel.
- Sample Custodian – responsible person in custody of sample.

3.0 RESPONSIBLE STAFF

- Electrofisher unit operator
- Technical staff collecting samples
- Sample custodian
- Sample recipient
- Reviewer (Project manager)

4.0 SUPPLIES AND EQUIPMENT

- Backpack electroshocker (Smith-Root Model #12)
- 24-volt batteries (2)
- battery charger
- long-handled dipnets
- Block nets
- HPLC-grade methanol
- Chem wipes
- Methanol rinsed Aluminum foil
- Ziplock bags
- Ice
- Cooler
- Safety glasses
- Heavy gloves to prevent snake bites and for hand protection
- Safety gloves (e.g., Nitrile)
- Chest waders
- Spare parts for electroshocker
- First-aid kit

5.0 PROCEDURES

Check the project specific work plan to obtain the number and/or frequency of samples required, the quantity of fish to be sampled, and the location of sampling sites. The backpack electroshocker is appropriate and efficient for collection of fish samples in water that is approximately 1.5m deep or less. The electroshocker is appropriate for collecting both juveniles and adults, but requires different charge settings for different sizes of fish.

5.2 Fish Sampling

5.2.1 Obtain appropriate scientific collecting permits and/or licenses for the State(s) in which fish will be collected.

5.2.2 Locate the water source and a point of access. The stream reach or water body should include habitat appropriate for the target fish species.

5.2.3 Record site information, as appropriate, (e.g., sampling location, photo #, GPS coordinates, water temperature, air temperature, water depth, water visibility, water flow, maximum and minimum stream widths) on the Finfish Data Sheet.

5.2.4 Set up backpack electroshocker at a stable and level location. Install fully-charged batteries.

5.2.5 In the absence of physical barriers, block nets should be set up at the upstream and downstream ends of the sampling reach prior to the initiation of any sampling activities.

5.2.6 The electrofisher unit operator carries the backpack unit and manipulates the anode and cathode poles.

5.2.7 The electrofisher unit operator begins electrofishing at the downstream limit of the sampling reach and moves upstream. A side to side or bank to bank sweeping technique should be used to maximize area coverage.

5.2.8 The remaining crew member(s) should follow the operator and net the shocked fish with dip nets.

5.2.9 All netted fish should be placed in buckets of water for further examination and identification.

5.2.10 Upon completion of sampling at a given stream reach, each fish collected should be identified to species and all species except the target species should be returned alive to the stream.

5.2.11 Each fish of a target species will be killed by cervical dislocation and wiped dry with a paper towel. Cervical dislocation will be performed by striking the fish on the top of the head just above the eyes with a hard object (e.g., rock, dip net handle, seine net pole).

5.2.12 Each fish will then be examined for external anomalies (i.e., deformities, eroded fins, lesions, and tumors). All anomalies will be documented on the Finfish Data Sheet form.

5.2.13 Individual fish specimens of the same species will be placed in methanol rinsed aluminum foil and then double bagged in Ziploc bags and sealed with tape.

5.2.14 Identical labels will be placed on the outside of the aluminum foil and between the double Ziploc bags. Labels should include the following information:

- City
- Sample site identification
- Matrix and nature (Fish electroshocked)

- Date and initials of sampler
- Sampling date and time
- Unique sample identification number/code
- Study/Project number

5.2.15 Packaged fish will be placed on ice in a cooler for shipment on the day of sampling or stored on ice overnight for shipment as early as possible on the day following sampling. Fresh ice will be placed in the cooler prior to shipping.

5.2.16 A chain of custody form will be completed and taped to the inside of the lid of each shipped cooler.

5.3 Transport of Sampler

The electroshocker and its components must be transported and shipped in a protective container to prevent damage.

6.0 DATA ANALYSIS AND CALCULATIONS

Not applicable. No analysis or calculations are required for this procedure.

7.0 QUALITY CONTROL

No field replicates, field spikes, field blanks, or trip blanks are required under this SOP.

8.0 SAFETY

Safety hazards associated with collection of fish samples from land-based locations are outlined below, and listed in the Job Safety Analysis for Operation of Electrofisher (2/1/96). If samples are collected from a boat, safety procedures for boat operations must comply with Boating Safety requirements contained in PNL-MA-43, OS 7.2.

- Drowning: A minimum of two people are required to use this equipment
- Electrical shock, scratches, snake bites: Gloves and chest waders must be worn at all times while operating this equipment to avoid electrical shock and provide protection from scratches or snake bites. Gloves and chest waders should always be inspected for holes prior to use. Gloves and waders should be kept dry inside. The electrofisher unit operator should avoid touching the anode or cathode. Operator should ensure that battery terminals are protected and do not contact any metal objects; ensure that batteries are secure and in an upright position and that the caps are securely in place. People (other than equipment operators) and animals should be at least 100 meters from the area before energizing the equipment. The electroshocker should not be operated with protective covers or shields detached.
- Back strain: Proper lifting and handling of batteries and electroshocker must be performed to avoid back strain. Team members should assist the backpack wearer with donning and removing the electroshocker.
- Tripping, falling: Operators must watch for holes, uneven terrain, wires, tree branches, or other tripping hazards, both above water and submerged.
- Weather conditions: Avoid days with high possibility of electric storms or high winds.

9.0 TRAINING REQUIREMENTS

Staff being trained in the sampling techniques required for backpack electroshocker sampling must first read this SOP. The work or quality assurance plan for the project should also be reviewed. Next, proper sampling and documentation techniques are demonstrated to the staff member. Finally, the staff member demonstrates proper sampling procedures. Once proficiency has been verified, documentation of training is recorded on a Group Training Document Form (Attachment 1) and provided to Battelle's quality assurance officer.

10.0 REFERENCES

- MSL-A-002 Sample Chain of Custody