SOP #EH-01
Surface Water Collection

(Adapted from ERT/REAC SOP 2013 Rev 1.0)

TABLE OF CONTENTS

TECHNICAL STANDARD OPERATING PROCEDURE
SURFACE WATER SAMPLING

1.0 PURPOSE

This standard operating procedure (SOP) is applicable to the collection of representative surface water samples from streams, rivers, lakes, ponds, lagoons, and surface impoundments. It includes samples collected from depth, as well as samples collected from the surface. These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final report. Mention of trade names or commercial products does not constitute United States Environmental Protection Agency (U.S. EPA) endorsement or recommendation for us.

2.0 RESPONSIBILITIES

The Field Project Leader (FPL) may be an USEPA employee or contractor who is responsible for overseeing the surface water sampling activities. The FPL is also responsible for checking all work performed and verifying that the work satisfies the specific tasks outlined by this SOP and the Quality Assurance Project Plan (QAPP). It is the responsibility of the FPL to communicate with the Field Personnel regarding specific collection objectives and anticipated situations that require any deviation from the Project Plan. It is also the responsibility of the FPL to communicate the need for any deviations from the Project Plan with the appropriate USEPA Region 8 personnel (Remedial Project Manager, Regional Toxicologist or On-Scene Coordinator).

Field personnel performing sediment sampling are responsible for adhering to the applicable tasks outlined in this procedure while collecting samples.

3.0 METHOD SUMMARY

Sampling situations vary widely; therefore, no universal sampling procedure can be recommended. However, surface water sampling is generally accomplished through the use of one of the following samplers or techniques:

- Kemmerer bottle
- Van Dorn sampler
- Bacon bomb sampler
- Dip sampler
- Direct method

These samplers and sampling techniques will result in the collection of representative samples from the majority of surface waters and impoundments encountered.

4.0 EQUIPMENT

Equipment needed for collection of surface water samples may include (depending on technique chosen):

Kemmerer bottles
Van Dorn sampler
Bacon bomb sampler
Dip sampler
Line and messengers
Peristalic pump
Tygon tubing
0.45 micron (um) filters
Sample bottles/preservatives
pH paper
Resealable plastic bags
Ice
Coolers, packing material
Chain of Custody records, custody seals
Field data sheets
Decontamination equipment/supplies
Maps/plot plan
Safety equipment
Compass
Tape measure
Survey stakes, flags, or buoys and anchors
Camera and film
Logbook/waterproof pen
Sample bottle labels
Paper towels
Disposable pipets
Hydrolab
Personal protection equipment (PPE)
Global positioning system (GPS)

5.0 INTERFERENCES AND POTENTIAL PROBLEMS

There are two primary interferences or potential problems associated with surface water sampling. These include cross contamination of samples and improper sample collection.

> Cross contamination problems can be eliminated or minimized through the use of dedicated or disposable sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary.
>
> Improper sample collection can involve using contaminated equipment, equipment that is potentially not compatible with the contaminants of concern, disturbance of the stream or impoundment substrate, and sampling in an obviously disturbed or non-representative area. Be sure to use sampling equipment of an appropriate composition based upon the suspected contaminants and analyses to be performed.

Following proper decontamination procedures, minimizing disturbance of the sample site, and careful selection of sampling locations will eliminate these problems. Proper timing for the collection of samples must be taken into consideration due to tidal influences and low or fast-flowing streams or rivers.

6.0 SAMPLE COLLECTION PROCEDURE

6.1 Preparation

A. Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies needed (as established in the QAPP).
B. Obtain the necessary sampling and monitoring equipment.
C. Decontaminate or pre-clean equipment, and ensure that it is in working order.
D. Prepare scheduling and coordinate with staff, clients, and regulatory agency, if appropriate.
E. Perform a general site survey prior to site entry, in accordance with health and safety requirements specific to the parent organization for the field collection crew.
F. Use a GPS unit to identify and record sample location coordinates. If required, the proposed locations may be adjusted based on site access, property boundaries, and obstructions.

6.2 Representative Sampling Considerations

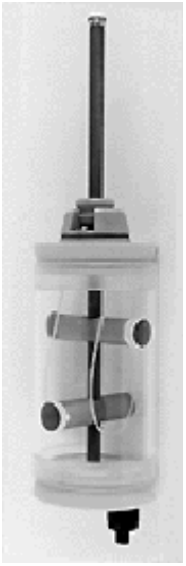
In order to collect a representative sample, the hydrology and morphometrics of a stream, river, pond, lake or impoundment should be determined prior to sampling. This will aid in determining the presence of phases or layers in lagoons or impoundments, flow patterns in streams, and appropriate sample locations and depths. Water quality data should be collected in ponds, lakes and impoundments to determine if stratification is present. Measurements of dissolved oxygen, pH, conductivity, oxidation-potential, temperature and turbidity can indicate if strata exist that would affect analytical results. Measurements should be collected at one-meter intervals from the surface to the bottom using the appropriate instrument (i.e., a Hydrolab or equivalent). These water quality measurements can assist in the interpretation of analytical data, and the selection of sampling sites and depths when surface water samples are collected. Factors that contribute to the selection of a sampling device used for sampling surface waters in streams, rivers, lakes, ponds, lagoons, and surface impoundments are:

- Width, depth, flow and accessibility of the location being sampled
- Whether the sample will be collected onshore or offshore

The appropriate sampling device must be of a proper composition. Selection of samplers constructed of glass, stainless steel, polyvinyl chloride (PVC) or PFTE (Teflon®) should be based upon the suspected contaminants and the analyses to be performed.

6.3 Sample Collection

6.3.1 Kemmerer Bottle



A Kemmerer bottle may be used in most situations where site access is from a boat or structure, such as a bridge or pier, and where samples at specific depths are required. Sampling procedures are as follows:

A. Use a properly decontaminated Kemmerer bottle. Set the sampling device so that the upper and lower stoppers are pulled away from the body, allowing the surface water to enter tube.
B. Lower the pre-set sampling device to the predetermined depth. Avoid disturbance of the bottom.
C. When the Kemmerer bottle is at the required depth, send the weighted messenger down the suspension line, closing the sampling device.
D. Retrieve the sampler and discharge the first 10-20 milliliters (mL) from the drain to clear potential contamination from the valve. This procedure may be repeated if additional sample volume is needed to fulfill analytical requirements. Subsequent grabs may be composited or transferred directly to appropriate sample containers.

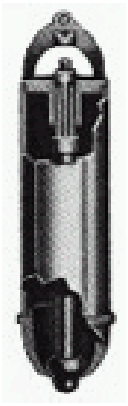
6.3.2 Van Dorn Sampler

A Van Dorn sampler is used to collect a surface water from a very specific sampling depth or from a shallow water body. Since the sampler is suspended horizontally, the depth interval sampled is the diameter of the sampling tube. The sampling procedure is as follows:

A. Use a properly decontaminated Van Dorn sampler. Set the device so that the end stoppers are pulled away from the body allowing surface water to enter the tube.
B. Lower the pre-set sampling device to the predetermined depth. Avoid disturbance of the bottom.
C. When the Van Dorn is at the required depth, send the weighted messenger down the suspension line, closing the sampling device.

D. Retrieve the sampler and discharge the first 10-20 milliliters (mL) from the drain to clear potential contamination from the valve. This procedure may be repeated if additional sample volume is needed to fulfill analytical requirements. Subsequent grabs may be composited or transferred directly to appropriate sample containers.

6.3.3 Bacon Bomb Sampler



A bacon bomb sampler may be used in situations similar to those outlined for the Kemmerer bottle. Sampling procedures are as follows:

A. Lower the bacon bomb sampler carefully to the desired depth, allowing the line for the trigger to remain slack at all times. When the desired depth is reached, pull the trigger line until taut. This will allow the sampler to fill.
B. Release the trigger line and retrieve the sampler.
C. Discharge the first 10-20 milliliters (mL) from the drain to clear potential contamination from the valve. This procedure may be repeated if additional sample volume is needed to fulfill analytical requirements. Subsequent grabs may be composited or transferred directly to appropriate sample containers.

6.3.4 Dip Sampler

A dip sampler is useful in situations where a sample is to be recovered from an outfall pipe or along a lagoon bank where direct access is limited. The long handle on such a device allows access from a discrete location. Sampling procedures are as follows:

A. Assemble the device in accordance with the manufacturer's instructions.
B. Extend the device to the sample location and collect the sample by dipping the sampler into the water.
C. Retrieve the sampler and transfer the sample to the appropriate sample container(s).

6.3.5 Direct Method

For streams, rivers, lakes, and other surface waters, the direct method may be utilized to collect water samples directly into the sample container(s). Health and safety considerations must be addressed when sampling lagoons or other impoundments where specific conditions may exist that warrant the use of additional safety equipment. Using adequate protective clothing, access the sampling station by appropriate means.

For shallow stream stations, collect the sample under the water surface while pointing the sample container upstream; the container must be upstream of the collector. When possible, collect samples in a downstream to upstream direction. Avoid disturbing the substrate.

For lakes and other impoundments, collect the sample under the water surface while avoiding surface debris and the boat wake.

When using the direct method, do not use pre-preserved sample bottles as the collection method may dilute the concentration of preservative necessary for proper sample preservation.

7.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Once samples have been collected, the following procedures should be followed:

A. Transfer the sample(s) into suitable, labeled sample containers specific for the analyses to be performed.
B. Preserve the sample, if appropriate, or use pre-preserved sample bottles. Do not overfill bottles if they are pre-preserved.
C. Cap the container securely, place in a resealable plastic bag, and cool to 4°C.
D. Record all pertinent data in the site logbook and/or on field data sheets.
E. Complete the Chain of Custody record.
F. Attach custody seals to cooler prior to shipment.
G. Decontaminate all non-dedicated sampling equipment prior to the collection of additional samples.

8.0 DECONTAMINATION

Because decontamination procedures are time consuming, having a quantity of sampling tools available is recommended. If surface water samples are collected using the direct method, decontamination is not warranted as equipment does not come into contact with the water sample and new sampling containers are used at each sampling location. For other collection techniques, all sampling equipment must be decontaminated prior to reuse. Equipment decontamination will consist of the following 5 steps:

1) Detergent Wash
2) Tap water rinse
3) Acetone rinse
4) Deionized water rinse
5) Air Dry

9.0 SITE CLEAN-UP

Excess surface water not included in the sample should be washed into the stream, pond, lake, or surface impoundment at the sampling location from which it was collected. Disposable personal protective equipment and other non-hazardous waste generated during sampling and decontamination activities will be placed in a trash bag and taken to a waste receptacle at the field office to prevent disturbance by animals and dispersion by wind. All non-hazardous waste will be disposed of in municipal waste bins.

10.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA and Occupational Health and Safety(OSHA) health and safety procedures. More specifically, when sampling lagoons or surface impoundments containing known or suspected hazardous substances, adequate health and safety and boating precautions must be taken to ensure the safety of sampling personnel.

11.0 RECORD KEEPING AND QUALITY CONTROL

There are no specific quality control (QC) activities which apply to the implementation of these procedures. However, the following general record keeping and QC procedures apply:

- ✓ All data must be documented on field data sheets or within site logbooks.
- ✓ All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment calibration activities must occur prior to sampling/operation and they must be documented.
- ✓ To avoid the incidental inclusion of disturbed sediment in the sample, surface water should be collected from a downstream to upstream direction and upstream of any activity that may disturb the sediment (i.e., wading).
- ✓ While collecting surface water using the direct method, the sample container should be held below the surface to avoid the collection of floating debris.
- ✓ Water quality data should be collected to detect the presence of stratified layers or other site-specific characteristics that would affect the sample.

12.0 REFERENCES

Wilde, F.D., D.B. Radtke, J. Gibs and R.T. Iwatsubo. 1998. National Field Manual for the Collection of Water-Quality Data - Selection of Equipment for Water Sampling. U.S. Geological Survey Techniques of Water -Resources Investigations, Book 9, Chap. A2, variously paged.
http://water.usgs.gov/owq/FieldManual/index.html
http://water.usgs.gov/owq/FieldManual/mastererrat.html

U.S. Environmental Protection Agency. 1984. Characterization of Hazardous Waste Sites - A Methods Manual: Volume II. Available Sampling Methods, Second Edition. EPA/600/4-84-076.