U.S.EPA REGION 9 LABORATORY

RICHMOND, CALIFORNIA

FIELD SAMPLING GUIDANCE DOCUMENT #1225

SURFACE WATER SAMPLING

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1.0 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) is applicable to the collection of representative liquid samples, both aqueous and nonaqueous from streams, rivers, lakes, ponds, lagoons, embayments, and surface impoundments. It includes samples collected from depth, as well as samples collected at the surface.

2.0 METHOD SUMMARY

Sampling situations vary widely, and, therefore, no universal sampling procedure can be recommended.

However, sampling of both aqueous and non-aqueous liquids from the above mentioned sources is generally accomplished through the use of one of the following samplers or techniques:

- Dip sampler
- Direct method
- Discrete Depth samplers; e.g., Kemmerer or Van Dorn bottles
- Peristaltic pumps
- Stormwater collection devices

These sampling techniques will allow for the collection of representative samples from the majority of surface waters and impoundments encountered.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Once samples have been collected, follow these procedures:

1. Transfer the sample(s) into suitable labeled sample containers.
2. Preserve the sample if appropriate, or use pre-preserved sample bottles.
3. Cap the container, put it in a Ziploc plastic bag and place it on ice in a cooler.
4. Record all pertinent data in the site logbook and on a field data sheet.
5. Complete the chain of custody form.
6. Attach custody seals to the cooler prior to shipment.
7. Decontaminate all sampling equipment prior to the collection of additional samples.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

There are two primary interferences or potential problems 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 sampling equipment. Another suitable method can be to work collecting samples from low to high concentration, should this information be available. If this is not possible or practical, then decontamination of sampling equipment is necessary. Refer to SOP (#109), Sampling Equipment Decontamination.

- Improper sample collection can involve using contaminated equipment, disturbance of the stream or impoundment substrate, and sampling in an obviously disturbed area.

Following proper decontamination procedures and minimizing disturbance of the sample site will eliminate these problems.

5.0 EQUIPMENT/APPARATUS

Equipment needed for collection of surface water samples includes:

- Dip sampler
- Kemmerer or Van Dorn bottles
- Line and messengers
- Peristaltic pumps
- Stormwater samplers
- Sample collection bottles
- Sample bottle preservatives
- Ziploc bags
- Ice
- Cooler(s)
- Chain of custody forms, field data sheets
- Decontamination equipment
- Maps/plot plan
- Safety equipment
- Compass
- Tape measure
- Survey stakes, flags, or buoys and anchors
- Camera and film
- Logbook/waterproof pen
- Sample bottle labels

6.0 REAGENTS

Reagents will be utilized for preservation of samples and for decontamination of sampling equipment. Required preservatives are specified by the analysis to be performed. Decontamination solutions are specified in SOP#109, Sampling Equipment Decontamination.

7.0 PROCEDURES

7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and which equipment and supplies are needed.
2. Obtain necessary sampling and monitoring equipment.
3. Decontaminate or preclean equipment, and ensure that it is in working order.
4. Prepare scheduling and coordinate with staff, clients, and regulatory agency, if appropriate.
5. Perform a general site survey prior to site entry in accordance with the site-specific health and safety plan.
6. Use stakes, flags, or buoys to identify and mark all sampling locations. If required, the proposed locations may be adjusted based onsite access, property boundaries, and surface obstructions.

7.2 Sampling Considerations

The physical location of the investigator when collecting a sample may dictate the equipment to be used. If surface water samples are required, direct dipping of the sample container into the stream is desirable. This is possible, however, only from a small boat, a pier, etc., or by wading in the stream. Wading, however, may cause the re-suspension of bottom deposits and bias the sample. Wading is acceptable if the stream has a noticeable current (is not impounded), and the samples are collected while facing upstream. If the stream is too deep to wade, or if the sample must be collected from more than one water depth, or the sample must be collected from a bridge, etc., supplemental sampling equipment must be used.

Representative Samples

In order to collect a representative sample, the hydrology and morphometrics (e.g., measurements of volume, depth, etc.) of a stream 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 impoundments to determine if stratification is present. Measurements of dissolved oxygen, pH, and temperature can indicate if strata exist

which would effect analytical results. Conductivity and oxidation-reduction potential can also assist in the interpretation of analytical data and the selection of sampling sites and depths anytime surface water samples are collected. Measurements should be collected at 1-meter (maximum) intervals from the substrate to the surface using an appropriate instrument, such as a Hydrolab (or equivalent).

Generally, the deciding factors in the selection of a sampling device for sampling liquids in streams, rivers, lakes, ponds, lagoons, and surface impoundments are:

- Will the sample be collected from the shore or from a boat on the impoundment?
- What is the desired depth at which the sample is to be collected?
- What is the overall depth and flow direction of river or stream?
- What is the chemical nature of the analyte(s) of concern? Do they float on the water surface (collect by skimming the surface) or are they miscible (soluble) and are more likely to be present at depths (collect sub-surface)?

Sampler Composition

The appropriate sampling device must be of a proper composition. Samplers constructed of glass, stainless steel, PVC of PFTE (Teflon®) should be used based upon the analyses to be performed. For example, devices which are free of metal surfaces should be used for collecting samples for metal analyses.

7.3 SAMPLE COLLECTION

7.3.1 Dip Sampler

A dip sampler (Figure 1) is useful for 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:

1. Assemble the device in accordance with the manufacturer's instructions.
2. Extend the device to the sample location and collect the sample.
3. Retrieve the sampler and transfer the sample to the appropriate sample container.

7.3.2 Direct Method

For streams, rivers, lakes, and other surface waters, the direct method may be utilized to collect water samples from the surface. This method is not to be used for sampling lagoons or other impoundments where contact with contaminants are a concern.

Using adequate protective clothing, access the sampling station by appropriate means. For shallow stream stations, **the sampler should face upstream and collect the sample without disturbing the sediment**. Surface water samples should always be collected prior to a sediment sample at the same location. The collector submerses the closed sample container, opens the bottle to collect the sample and then caps the bottle while sub-surface. The collection bottle may be rinsed two times by the sample water. For lakes and other impoundments, collect the sample under the water surface 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.

7.3.3 Discrete Depth Samplers

When discrete samples are desired from a specific depth, and the parameters to be measured do not require a Teflon® coated sampler, a standard Kemmerer or Van Dorn sampler may be used. The Kemmerer sampler is a brass cylinder with rubber stoppers that leave the ends of the sampler open while being lowered in a vertical position, thus allowing free passage of water through the cylinder. The Van Dorn sampler is plastic and is lowered in a horizontal position. In each case, a messenger is sent down a rope when the sampler is at the designated depth, to cause the stoppers to close the cylinder, which is then raised. Water is removed through a valve to fill respective sample containers. With a rubber tube attached to the valve, dissolved oxygen sample bottles can be properly filled by allowing an overflow of the water being collected. With multiple depth samples, care should be taken not to stir up the bottom sediment and thus bias the sample.

1. Using a properly decontaminated Kemmerer or Van Dorn bottle, set the sampling device so that the sampling end pieces are pulled away from the sampling tube, allowing the water to be sampled to pass through this tube.
2. Lower the pre-set sampling device to the predetermined depth. Avoid bottom disturbance.
3. When the discrete sampler bottle is at the required depth, send down the messenger, closing the sampling device.
4. Retrieve the sampler and discharge the first 10 to 20 mL to clear any potential contamination on the valve. Transfer the sample to the appropriate sample container.
5. Be sure to use special attachments available on some discrete samplers to distribute small volumes at low flow rates; e.g., VOCs at 100 to 200 mL/ min.

7.3.4 Peristaltic Pump Samplers

Another device that can be effectively used to sample a water column is the peristaltic pump/vacuum jug system. The use of a metal conduit to which the tubing is attached, allows for the collection of a vertical sample (down to about a 25 foot depth) which is representative of the water column. Commercially available pumps vary in size and capability, with some being designed specifically for the simultaneous collection of multiple water samples.

The battery-powered "ISCO" sampler is one such peristaltic pump. It is designed to collect discreet samples into 24 polyethylene or glass bottles at preset intervals. Some ISCO models can be configured to collect samples into a single container. To operate the compositor:

1. Place collection jars in appropriate positions in compositor. Add ice.
2. Connect sample hose and strainer and position in waste stream.
3. Adjust bottle position to '1'.
4. Adjust head, tube lengths and width to appropriate settings.
5. Set sample volume; e.g., approx. 300 mL.
6. Set time interval to 60 minutes.
7. Check that pump is functioning in 'forward' position.
8. Turn switch to auto.
9. After first sample is collected, check to see that an adequate volume was collected.
10. Place lid on ISCO and place custody seals over the closures so that no tampering occurs.
11. If the sampler is not in a secure area, secure the sampler with lock and chain.

7.3.5 Stormwater Samplers

Recently, commercial stormwater samplers have become available. These samplers collect a "first flush" sample in one bottle and a "time weighted" composite sample in the second bottle. Typically the composite sampler is set (by the user) to take a 200 mL sample every 10 minutes until the composite sample bottle is full. Thus it is actually two separate samplers in one; designed to meet the regulatory guidelines. It can be triggered (by sensor) to begin collecting samples by either rainfall or water level increase.

1.
Set the Sampler in an upright position.
2. Be sure the water sensor is plugged into the jack on the lower right side of the control panel.
3. Check to be sure the two float switches in the bottle cap are properly connected. Plug the lead from the bottle cap into the socket on the bottom of the controller housing.
4. Remove the battery charger from the sampler enclosure.
5. Turn on the sampler with the toggle switch on the right side of the controller enclosure.

6. Press the right side sampler button to activate the right side sample pump.
7. Press the left side sampler button to activate the left side sample pump.
8. Check to be sure the sample pumps af fully charged.
9. Verify the sample size to be collected once the storm sampler has been set up. It is dependent upon the vertical distance between the water and the sampler.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

There are no specific quality assurance activities which apply to the implementation of these procedures. However, the following general QA/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 checkout and calibration activities must occur prior to sampling/operation and they must be documented.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA and specific health and safety procedures.

More specifically, when sampling lagoons or surface impoundments containing know or suspected hazardous substances, take adequate precautions. The sampling team member collecting the sample should not get too close to the edge of the impoundment, where bank failure may cause him or her to lose their balance. The person performing the sampling should be on a lifeline and be wearing adequate protective equipment. When conducting sampling from a boat in an impoundment or flowing waters, follow appropriate boating safety procedures.