SOP-18

Surface Water Sampling

Yerington Mine Site
Standard Operating Procedure

Revision 0
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SURFACE WATER SAMPLING

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1.0 OBJECTIVES

The purpose of this procedure is to describe the methods for surface water sampling. It describes the procedures and equipment to be used to obtain representative surface water samples that are capable of producing accurate quantification of water quality.

2.0 SCOPE AND APPLICABILITY

This procedure is intended for the collection of surface water samples to support site investigations as required by the RI/FS or other requirements. Surface water samples may be collected from a variety of situations including on-site lined or unlined ponds, pit lake, drainage ditches, or the Walker River. Surface water sample locations may be man-made or naturally occurring, flowing or static, and the water body may be shallow or deep.

3.0 RESPONSIBILITES

The *Project Manager* is responsible for ensuring that groundwater measurements are implemented in accordance with this SOP and any other site-specific or project specific planning documents.

The *Field Personnel* are responsible for understanding and implementing this SOP during all field activities, as well as obtaining the appropriate field logbooks, forms and records necessary to complete the field activities.

The *Site Safety Officer (SSO)*, typically the supervising field manager, is responsible for overseeing the health and safety of employees and for stopping work if necessary to fix unsafe conditions observed in the field.

4.0 DEFINITIONS

Surface water samples: Samples of water collected from streams, ponds, rivers, lakes, or other impoundments open to the atmosphere.

5.0 REQUIRED MATERIALS

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

- Maps/plot plan
- Safety equipment and personal protective equipment
- Tape Measure
- Paper towels
- Global positioning system (GPS)
- Cooler(s) and ice
- Clean latex or nitrile gloves
- Waders/Hip Waders

- Sampling device (e.g. bottle sampler, dip sampler, peristaltic pump)
- Tubing
- Decontamination equipment/supplies
- Water quality monitoring equipment (e.g. pH/conductivity/dissolved oxygen meter)
- Sample Containers/preservatives
- Sample Labels
- Field Notebooks/logbooks
- Chain of Custody Forms

6.0 PROCEDURES

A variety of sampling methods and equipment are available for the collection of surface water samples because of the varied conditions and locations where samples may be collected. Refer to the work plan and field sampling plan to determine which sampling method is appropriate for the project.

6.1 Sampling Equipment

The objective of surface water sampling is to evaluate the surface water quality. There is a variety of equipment available for surface water sampling. Because each site may contain varied surface water conditions, collection of a representative sample may be difficult. In general, a sampling device will include the following characteristics:

- Be constructed of disposable or non-reactive material (e.g. Teflon7, glass or stainless steel); and
- Be designed to maintain sample integrity and to provide the desired level of quality in achieving desired analytical results.

6.2 Decontamination

Prior to and after each sampling event, all sampling equipment must be thoroughly decontaminated following the methods outlined below and in SOP-05 *Equipment Decontamination*. The primary purpose of equipment decontamination is to prevent the potential of cross-contamination within the samples collected.

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 required as shared sampling 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) Non-phosphate detergent wash (e.g. Liquinox)

2) Tap water rinse
3) 2% nitric acid rinse (diluted with deionized water)
4) Deionized water triple rinse
5) Air Dry

6.3 Sampling Methods

6.3.1 General

The specific sampling method utilized will depend on the accessibility to, the size, and the depth of the water body, as well as the type of samples being collected. In most ambient water quality studies, grab samples will be collected. However, the objectives of the study will dictate the sampling method. General cautions for sampling are as follows:

- When using water craft, take samples near the bow, away and upwind from any gasoline outboard engine. Orient watercraft so that bow is positioned in the upstream direction.
- When wading, collect samples upstream from the body.
- Avoid disturbing sediments in immediate area of sample location.
- Collect water samples prior to taking sediment samples when obtaining both from the same site.
- Sampling near structures may not provide representative data because of unnatural flow patterns.
- Collect surface water samples from downstream towards upstream.
- An additional sample should be collected or extra quantity of the collected sample should be poured off to a separate container for determination of field parameters such as pH, conductivity, dissolved oxygen, temperature, turbidity, odor, or other significant characteristics.

6.3.2 Direct Grab 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.

1) Use an unpreserved sample container to collect the sample.
2) Slowly remove the container cap and slowly submerge the container, opening first, into the water.

3) Invert the bottle so the opening is upright and pointing towards the direction of water flow (if applicable). Allow water to run slowly into the container until filled.
4) Return the filled container quickly to the surface.
5) Pour out a small volume of sample away from and downstream of the sampling location. This procedure allows for addition of preservatives and sample expansion. Do not use this step for volatile organics or other analytes where headspace is not allowed in the sample container.
6) Add preservatives, if required, securely cap container, label and complete field notes.
7) If preservatives have been added, invert the container several times to ensure sufficient mixing of sample and preservatives.
8) Check preservation of the sample and adjust pH with additional preservative, if necessary.

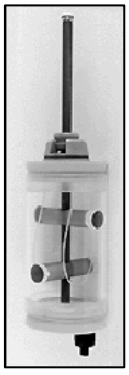
For shallow stream stations, collect the sample under the water surface while pointing the sample container upstream; the container must be upstream of the collector. When possible, collect samples in a downstream to upstream direction. Avoid disturbing the substrate.

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.

6.3.3 Weighted Bottle/Kemmerer/Van Dorn Sampler

Collecting a representative sample from a larger body of water may require the gathering of samples from various depths and locations. For this type of sampling a weighted bottle sampler, Kemmerer bottle or Van Dorn sampler may be used. The sampler typically consists of a sample bottle, a weighted sinker, a bottle stopper and a wire cord used to raise, lower and open the samples. The following procedures will be followed when sampling with a weighted bottle sampler:



Kemmerer Sampler

9) Decontaminate all equipment.
10) Assemble the weighted bottle sampler in accordance with the sampler instruction manual.
11) Gently lower the sampler to the desired depth so as not to remove the stopper prematurely. Do not let sampler disturb bottom sediments.
12) Pull out the stopper to open the container if not already open.
13) Allow the bottle to fill completely, as evidenced by the cessation of air bubbles.

14) Send a weighted messenger down the suspension line to close the container and seal the sample in.

Van Dorn Sampler

15) Retrieve the sampler and discharge the first 10-20 ml from the drain to clear any potential contamination.

6.3.4 Dip Sampler

The dip sampler consists of a scoop or container attached to the end of a telescoping or solid pole. The sampler shall be constructed of non-reactive material such as wood, plastic, or metal. The sample will be collected in a jar or beaker made of stainless steel or Teflon7. Preferably, a disposable beaker that can be replaced prior to each sampling will be used at each station. Liquid wastes from water courses, ponds, pits, lagoons or open vessels will be ladled into a sample container.

Dip Sampler

Perform the following procedures when sampling with a dip sampler:

1) Decontaminate all sampling equipment.
2) Assemble the dip sampler in accordance with manufacturer's instructions.
3) Extend pole to length that will allow safe access to desired sample location.
4) Submerge the dip sampler to the desired sample depth, doing so very slowly to minimize surface disturbance.
5) Allow the sampler to fill very slowly.
6) Retrieve the sampling device with minimal surface water disturbance.
7) Remove the cap from the sample bottle and slightly tilt the mouth of the bottle below the sampler edge.
8) Empty the sampler slowly, allowing the sample stream to flow gently down the side of the bottle with minimal entry turbulence. Fill sample bottle to appropriate head space, if any.

6.3.5 Manual Hand Pumps

Manual pumps are available in various sizes and configurations. Manual hand pumps are commonly operated by bellows or diaphragm and should not be used to collect samples that will be analyzed for volatile organics.

Perform the following procedures when collecting surface water samples with a manual hand pump:

1) Assemble and operate the pump in accordance with the manufacturer's instructions.

2) The inlet hose and any surface of the pump used for sampling will be constructed of materials that are operable and non-reactive.
3) To avoid agitation, insert the sampling tube into the liquid sample prior to pump activation.
4) Insert a liquid trap (preferably the sample container) into the sample inlet hose to collect the sample and to prevent pump contamination.

6.3.6 Peristaltic Pump

Gathering surface water samples with the assistance of a peristaltic pump is another commonly used sampling technique. In this method the sample is drawn through heavy-walled tubing and pumped directly into the sample container. This system allows the operator to extend the sample tubing into the liquid body to sample from depth, or sweep the width of narrow streams. Medical-grade silicon tubing is often used in the peristaltic pump and the system is suitable for sampling almost any parameter, including most organics.

Peristaltic Pump

Peristaltic pumps are available with a range of power sources. For field use, the battery operated units have proven most convenient and very reliable.

Perform the following procedures when sampling with a peristaltic pump:

1) Prepare the peristaltic pump in accordance with manufacturer's instructions. When using a battery-operated pump, be sure battery is fully charged prior to entering the field.
2) In most situations, it is necessary to change the suction line and the silicon pump tubing between sample locations to avoid cross-contamination. This action requires maintaining a sufficiently large stock of tubing material to avoid having to decontaminate the tubing in the field.
3) Gently lower the pump intake tube to the desired sample depth. Avoid unnecessary agitation (aeration) of the liquid to be sampled and bottom sediments.
4) Prior to activating the pump, note in which direction the pump will be rotating. (Most peristaltic pumps are capable of rotating in two directions.) Accidental reverse rotation of the pump will cause aeration of the liquid to be sampled.
5) Run the pump until no air bubbles are noted in the discharge.
6) Discharge water shall be released down stream from sampling area during sampling event.

7) To prevent excess agitation and/or aeration of the sampler, fill the sample containers by tilting the container and flow the sample water down the side of sampling container.

7.0 QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance activities which apply to the implementation of these procedures are located in the site QAPP, including the collection of required quality control samples such as field duplicates, field blanks and equipment blanks. In addition, the following general 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.

Descriptions of any deviations and the reason for deviations from the site QAPP or this SOP should be noted in the field notebook, as necessary. In addition, the logbook should track pertinent sample collection information such as:

- Sample date/time;
- Personnel;
- Weather conditions;
- Sample identification information; and
- Visible staining or other indications of non-homogeneous conditions.

8.0 REFERENCES

None

9.0 ATTACHMENTS

None