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PROCEDURE

SURFACE WATER SAMPLING

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Manager, Surface Water

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ADMIN RECORD

1. PURPOSE

The purpose of this procedure is to describe the techniques and methods used for the collection of water quality samples from surface water data collection sites at the Rocky Flats Environmental Technology Site (RFETS). More than one sampling method is required because flow conditions vary from site to site, and the method used is based on the site-specific flow conditions. Proper sampling is necessary to ensure that the collection of representative samples meets applicable regulations and appropriate sampling protocols.

Included in this procedure are personnel responsibilities and qualifications, quality assurance/quality control (QA/QC), and documentation requirements that will be used for collection activities in order to attain acceptable standards of accuracy, comparability, precision, representativeness, and completeness.

2. SCOPE

This procedure is applicable to the collection of all surface water samples at RFETS. Included are samples from industrial effluent discharges, ponds, ditches and trenches, pipes, flowing, channelized streams, and seep areas.

3. RESPONSIBILITIES AND QUALIFICATIONS

The project manager or task leader is responsible for assigning project staff to complete surface water data collection activities at RFETS. The task leader is also responsible for ensuring that this and other appropriate procedures are followed by project personnel.

Personnel sampling surface water will be geologists, hydrologists, engineers, or field technicians with an appropriate amount of applicable field experience or on-the-job training under supervision of another qualified person.

4. REFERENCES

4.1 Source References

The following is a list of references reviewed prior to the writing of this procedure:

Kister, L. R. and W. B. Garrett. Field Guidelines for Collection, Treatment, and Analysis of Water Samples-Arizona District. U.S. Geological Survey, Water Resources Division. November 1984.

Test Methods for Evaluating Solid Waste. Physical/Chemical Methods, SW-846. EPA. September 1986.

U.S. Department of Energy. The Environmental Survey Manual. DOE/EH-0053, Washington, D.C. August 1987.

U.S. Department of the Interior. National Handbook for Recommended Methods for Water-Data Acquisition. Office of Water Data Coordination, Geological Survey. Reston, VA. 1977.

U.S. Environmental Protection Agency. Standard Operating Procedures and Quality Assurance Manual. Environmental Services Division, Region VIII. Athens, GA. January, 1988.

4.2 INTERNAL REFERENCES

Related procedures cross-referenced by this procedure are as follows:

- SOP FO.3, *General Equipment Decontamination*
- SOP FO.13, *Containerizing, Preserving, Handling, and Shipping of Soil and Water Samples*
- 5-21000-OPS-SW.01, *Surface Water Data Collection Activities*
- 5-21000-OPS-SW.02, *Field Measurements of Surface Water Parameters*
- 5-21000-OPS-SW.04, *Discharge Measurements*
- 5-21000-OPS-SW.08, *Pond Sampling*
- 5-21000-OPS-SW.09, *Industrial Effluent Discharge Sampling*
- 2-547-ER-ADM-06.14, *Use of Field Logbooks and Forms*

5. PROCEDURE

Surface water flow conditions vary geographically and seasonally. Therefore, the following list will be used as a guideline in identifying techniques of sampling which will correspond to the sample site flow conditions. This list is based upon the most often observed flow conditions at RFETS surface water sites. If field sampling crews encounter flow conditions not described under any of the listed categories, they will use their best judgment in varying one of the approved techniques in order to obtain samples. The technicians will carefully document the site conditions which necessitated deviation from the approved methods and will also carefully note the method used to obtain the samples.

The flow conditions which have been most frequently encountered, and sections of this procedure containing methods to be used at these sites, are:

1. Flowing, channelized streams:

   The sampler will use methods described in Subsection 5.3.2, Samples Collected by Container Immersion.

2. Pipes:

   Depending on site conditions, use Subsection 5.3.3, Sampling of Standing Water, Subsection 5.3.4, Remote Sampling; or Subsection 5.3.5, Sampling Under Low Flow Conditions. If the pipe discharges sufficient volume into a channelized stream, use Subsection 5.3.2, Samples Collected by Container Immersion or as described in 5-21000-OPS-SW.09, *Industrial Effluent Discharge Sampling*. The sample container should not contact the pipe in order to avoid mobilizing materials which may be loosely attached to the pipe causing these materials to contaminate the sample.

3. Small ponds:

   The sampler will use Subsection 5.3.3, Sampling of Standing Water or Subsection 5.3.4, Remote Sampling.

4. Interceptor ditches:

   Samples may be obtained by methods described in Subsection 5.3.3, Sampling of Standing Water, Subsection 5.3.4, Remote Sampling or Subsection 5.3.5, Sampling Under Low Flow Conditions, or Subsection 5.3.2, Samples Collected by Container Immersion, depending on conditions.

5. Sumps or Standpipes:

These will typically contain low volumes of water, and are sampled by methods detailed in Subsection 5.3.3, Sampling of Standing Water or Subsection 5.3.4, Remote Sampling.

6. Low Flow Conditions:

   Samples will be obtained in accordance with Subsection 5.3.5, Sampling Under Low Flow Conditions.

7. Seep Areas:

   Samples are to be collected in accordance with Subsection 5.3.5, Sampling of Standing Water.

5.1 OVERVIEW

Surface water samples are to be collected as grab samples. Grab samples characterize a medium at a particular point in space and time. Grab water samples are collected by sample container immersion or by using a transfer device, such as a beaker or dipper as described in Subsection 5.3.2, Samples Collected by Container Immersion and Subsection 5.2.2, Sample Transfer Devices, respectively.

5.2 EQUIPMENT FOR COLLECTING SAMPLES

Equipment used for collecting surface water samples will include:

- Laboratory-provided sample containers
- Sample transfer devices

5.2.1 Laboratory-Provided Sample Containers

Wherever possible, laboratory-provided sample containers will be used to collect water quality samples. Alternatively, the containers may be purchased from a supplier who certifies that bottles have been pre-cleaned to EPA specifications. Records of container certification will be kept for these containers.

5.2.2 Sample Transfer Devices

Beakers or dippers, composed of Teflon®, stainless steel or glass, may be used if site conditions prevent sampling by sample container immersion. The selected type of transfer device, the composition of this device, and the volume of the device will be recorded in the field notes.

The device is placed with the opening upstream at the midpoint of the stream flow. The sample will be poured directly from the beaker or dipper into the sample container. The sampler will attempt to minimize the disturbance of bottom materials.

5.3 Sampling

Samples will be collected from the same cross-section of the stream as that used for the discharge measurement. Always collect samples prior to making discharge measurements.

5.3.1 Sample Order of Collection

The sample for total residual chlorine (TRC) will be collected and the measurement performed prior to the collection of any other samples or measurement of any other parameters. Preservation requirements for VOCs, cyanide, and BNA samples are determined by TRC concentration.

The following list represents many of the sample types routinely collected at surface water sites, and generally guides the order of collection of the samples. The Project Work Plan may require different combinations of sample types and containers.

Priority	Analytes
1	TCL, VOCs
1a	Rad Screen (when required)
2	Oil and Grease
3	Gross Alpha/Beta, U-(233, 234, 235/238)
4	TCL BNAs
5	Pesticides/PCBs
6	TAL Metals-Dissolved
7	Major Ions: Cl, F, SO_4, Si, CO_3, HCO_3; TDS, TSS, NVSS, other water-quality parameters
8	TAL Metals-Total
9	Nitrate/Nitrite (as N)
10	Tritium
11	Total Radionuclides
12	Pu-239/240, Am-241
13	Sr-89/90, Cs-137, Ra-(226, 228)

Priority	Analytes
14	Cyanide
15	Sulfide (H_2S)
16	Remaining field parameters

Preferred methods of surface water sample collection are as follows:

1. Volatile organic compounds (VOCs) will be collected as described in Subsection 5.3.2.1; Collection of Samples for Analysis of Volatile Organic Compounds.
2. Oil and grease will be collected as described in Subsection 5.3.2.2; Collection of Samples for Oil and Grease.
3. The remaining samples, depending on surface water flow conditions and location, will be collected as described in Subsection 5.3.2, Samples Collected by Container Immersion or Subsection 5.2.2, Sample Transfer Devices.

5.3.2 Sample Collected by Container Immersion

Collection of samples will be performed as follows:

1. Submerge the sample bottle below the water surface with the opening pointed upstream at the midpoint of the stream flow.
2. The sampler will attempt to minimize the disturbance of bottom materials.
3. Allow container to fill to desired volume.
4. Remove the container from the water.
5. Preserve the sample, if necessary, and place the cap on the container and tighten.
6. Decontaminate the container's outside surface.
7. Check pH of preserved samples.

5.3.2.1 Collection of Samples for Analysis of Volatile Organic Compounds (VOCs)

Samples collected for analysis of VOCs must be collected with minimal disturbance to limit aeration. The preferred method of sampling for VOCs is the collection of a grab sample directly into the sample container. The container used for the collection of VOC's is a 40-ml

glass vial with a cap containing a Teflon®-coated septum. The following method will be strictly followed:

1. At the approximate center of the discharge stream, submerge the container just below the surface and collect a single sample. Minimize disturbance as much as possible in order to protect the integrity of the sample's volatile constituents.

2. Allow the vial to fill and form a meniscus at the top. Place the cap over the vial so that the Teflon®-coated side of the septum is in contact with the sample.

3. Firmly tighten the cap.

4. Invert and gently tap the vial to verify that there are no entrapped air bubbles. If air bubbles are present, dispose of the sample and vial, then select another container and resample.

5. Decontaminate the outside surface of the container.

6. If conditions preclude the collection of surface water directly into the sample container, VOC samples shall be collected by the use of a transfer device. The beaker or dipper should be partially submerged, filled, and retrieved with minimal disturbance and delay. After retrieval, the sample container should be tilted at a slight angle against the edge of the beaker or dipper allowing the water in the beaker or dipper to slowly empty into the container. The sample stream should flow gently down the side of the container to ensure minimal sample aeration, then handle the sample as described in Steps 2-5 listed above.

5.3.2.2 Collection of Samples for Oil and Grease

Because oil and grease are relatively insoluble in water and tend to float on the surface of the water, samples for oil and grease analysis will be collected, whenever possible, by partial container immersion. Samples will be collected in the following manner:

1. Lower the bottle into the water so that the open mouth of the bottle faces upstream.

2. Partially submerge the sample container so that the mouth of the bottle collects the sample at the water surface.

3. The bottle will not be held around the top of the open mouth, as this may result in oil and grease attaching to the holder instead of entering the bottle.

4. Allow the container to fill to within about 1.5 inch from the top of the bottle when practical (if the bottles are not pre-preserved, allow enough remaining room for addition of the H_2SO_4 preservative). Once the sample is collected, water may not be poured off the top of

the containers because this will probably result in the loss of a significant portion of any oil and grease in the sample.

5. Remove the container from the water, add the preservative, and screw on the cap tightly.

6. Decontaminate the container's outside surface.

While this method tends to collect a worst-case oil and grease sample, it is the only method that will ensure consistent sample collection and eliminate the possibility of underestimating the oil and grease concentration. Areas where oil and grease levels are a concern may be sampled later by collection of samples at the surface and at additional depths if an estimate of average concentrations is desired.

If low flow conditions prohibit collection of oil and grease as described above, samples may be collected by partial immersion in cooperation with the low flow collation method described in Subsection 5.3.5, Sampling Under Low Flow Conditions.

5.3.3 Sampling of Standing Water

Special considerations must be taken when sampling pools of standing water which are often found as detention storage or on saturated ground surfaces. Because there is no measurable discharge at these locations, the volume of water present will be measured by estimating the depth of water and the surface area covered by the water.

Due to the possibility of small volumes of water in areas of standing water, the priority of sampling collection discussed in Subsection 5.3.1 Sample Order of Collection will be followed. The method of collection for the sampling of an area of standing water with a small volume of water will follow guidelines set forth in Subsection 5.3.5, Sampling Under Low Flow Conditions.

Only small pools, sumps, or ditches containing stagnant water that allow sampling from the approximate center of the pool will be sampled. Such a pool will generally be less than 4 feet in diameter or width and less than 1 foot deep. The procedure for the sampling of pools larger than 4 feet in diameter is covered in 5-21000-OPS-SW.08, *Pond Sampling.*

5.3.4 Remote Sampling

Standpipes or sumps typically contain small, relatively nonstratified volumes of standing water. In general, the volumes of these bodies of water are sufficiently small so that the action of lowering a sample container into the standing water will produce adequate mixing to eliminate any stratification which may exist.

The preferred method for sampling in standpipes or sumps is by container immersion. A stainless steel clamp or Teflon® attached to a stainless steel or aluminum extending rod will be used to hold the sample container. Only stainless steel or aluminum rods will be used for remote sampling. The material (stainless steel or aluminum) composition of the rod will be recorded on the field notes.

The container will be carefully lowered into the standing water and allowed to fill. The field crew member will not allow the extension rod or the sample container to make contact with the sides or bottom of the standpipe or sump, nor with any pumps or other structures inside the standpipe or sump. Such contact may dislodge materials loosely attached to these surfaces and create a potential to contaminate the sample.

If a sample container cannot be filled by container immersion, then a stainless steel, Teflon®, or glass beaker or dipper attached to a remote sampling extension rod will be used to obtain a dip sample. The sample will be poured directly from the beaker or dipper into the sample container. The sampling personnel will record in the field note the type of container used and the material of which the container is made.

5.3.5 Sampling Under Low Flow Conditions

Flow conditions at surface water sampling sites vary seasonally. Some of the sites may possess low discharges with depth of flow being less than 0.5 inch. The field sampling crew will attempt to obtain samples of water at these sites by use of a transfer device. The sampler will attempt to minimize the disturbance of bottom materials.

Sample containers will be filled as long as it is possible to dip water from the small stream into a beaker without disturbing bed materials. If flow is so low that all sample bottles cannot be filled, collect as many samples as possible while following the order of collection described in Subsection 5.3.1 and record the site flow conditions.

Surface water sites possessing flow depth of less than 0.5 inch, and having no defined channel (i.e. seeps), are known to exist at RFETS. Field crews may attempt to obtain water samples at such sites as follows:

1. Dig a small depression in the soil within the path of flow.
2. Place a stainless steel bowl in this depression, with the rim of the bowl below the water surface.
3. Allow the bowl to become full of water, to overflow, and to continue to overflow for several minutes until sample clarity is achieved.

4. Obtain samples from the bowl by container immersion or by the dip and transfer method.

6. QUALITY ASSURANCE/QUALITY CONTROL

Quality Assurance (QA) and Quality Control (QC) activities will be accomplished according to applicable project plans as well as quality requirements presented in this procedure.

QC samples for surface water sampling fall into three categories:

- Duplicate
- Equipment rinsate
- Field blank

SOP FO.13, *Containerizing, Preserving, Handling, and Shipping of Soil and Water Samples* describes the general handling of samples, including QC samples. Applicable Workplan/Quality Assurance Addenda specify QC sample frequencies.

Sample collection procedures for duplicate samples will be the same as those described for real sample collection in Section 5.0. Duplicate samples will be collected immediately after the suite of regular analytes have been collected. These samples are to be taken in the same location as the original samples. Duplicate samples are collected and analyzed to provide an indication of overall sampling and analytical precision.

An equipment rinsate sample is intended to check for potential contamination of the sample by the sampling equipment. For the surface water sampling operation, a rinsate sample will be collected from sampling equipment before the sampling equipment is used. Approximately 3 liters of distilled water will be rinsed over a decontaminated sampler and collected in a large decontaminated stainless steel bowl. A decontaminated glass or stainless steel beaker will be used to dip the water from the bowl and fill the sample bottles. The rinsate samples will usually be analyzed for the same parameters as the surface water samples. Equipment rinsates provide an indication of the effectiveness of decontamination procedures.

Field blank samples are containers filled at the sampling station with distilled or deionized water that are handled and transported the same as the other samples to check for potential cross-contamination resulting from sample collection, preparation and transportation procedures.

7. DOCUMENTATION

Information required by this procedure will be documented on most current version of the Surface Water Field Collection Forms found in procedure 5-21000-OPS-SW.01, *Surface Water Data Collection Activities*. Any information regarding sampling activities, such as sampling times, deviation from procedures, or other items for which there is no designated space on form SW.7A, should be recorded in project field logbooks. Field logbook usage shall be in accordance with 2-S47-ER-ADM-05.14, *Use of Field Logbooks and Forms.*

8. RECORDS

The following documents generated during the performance of this procedure must be controlled as follows:

Document	Record Type	Disposition
Chain of Custody	QA	• Original to analyzing lab • Copy to project manager • Copy to RMRS Record Center
Surface Water Field Collection Forms	QA	• Original to project manager • Copy to be retained by sample collection staff • Copy to RMRS Record Center