

GROUND WATER: PUMPED AND BAILED SAMPLES 5.1.2

Steps for filling bottles with raw sample pumped from water-supply wells and monitoring wells are described in this section (refer also to section 5.6 and Appendixes A5-A, A5-B, and A5-C). The equipment needed and the procedures required to purge a well and withdraw the sample are described in NFM 2 and NFM 4, respectively, and are only briefly described below.

The recommended method for withdrawing ground-water samples from conventional supply or monitoring wells is to use a submersible or peristaltic pump and to pump the sample directly to a processing chamber (or to a glove box filled with inert gas).⁶ Ground-water samples collected using a bailer or other discrete sampling device can be processed either as described under 5.1.1 (composites and subsamples) or within a processing chamber (or glove box), as described later in this section.

Only the Clean Hands person fills the sample bottle inside of the sample-processing chamber (NFM 4).

Collect/process equipment blanks, field blanks, replicates, and other types of quality-control (QC) samples periodically (NFM 4.3 and Appendix A4-B of NFM 4). The frequency, number, types, and distribution of QC samples are determined ahead of time according to the study workplan. Nevertheless, in the event of unforeseeable field conditions (for example, dust storms, new point source(s) of contamination, or application of agricultural or other chemicals), **field personnel must judge whether to process additional QC samples.**

- ▶ Replicates of environmental samples—Fill bottles one after the other (NFM 4.3).
- ▶ Field blanks—Process according to the study quality-assurance plan or as needed (NFM 4.3).

⁶Wells or devices constructed to obtain samples under natural flow gradient (passive) conditions are not addressed in this report.

Processing of samples

The steps listed below for processing raw ground-water samples are based on the assumption that both organic-compound and inorganic-constituent samples will be collected. Before proceeding, check section 5.6 for analyte requirements.

- ▶ Prelabel bottles with site identification, sample designation, date, and time (section 5.5 and NFM 1).
- ▶ Process samples in the order recommended for sample collection listed on table 5-1. This helps to limit overpurging of volatile compounds, reduce airborne contamination and cross contamination among samples and sites, and minimize discrepancies in the ionic mass balance.
- ▶ When pumping the sample, do not stop the pump or interrupt flow to the processing chamber during sampling. The rate of flow during sampling should remain constant throughout processing and be the same as the rate of flow while making final field measurements at the end of purging (NFM 4, NFM 6).

To process ground-water samples for organic-compound analyses:

1. Put on appropriate (latex or nitrile), disposable, powderless gloves (gloves). Cover bench or table with a sheet of aluminum foil to make a clean work surface.
2. Assemble necessary equipment and supplies on the clean work surface, and remove aluminum foil wrapping from precleaned equipment. Attach processing chamber cover. (Processing of organic-compound samples within a chamber is not mandatory but is recommended.)
3. Check requirements for treatment of the sample(s) collected.
 - If collecting a VOC sample that will be acidified—Test for the number of drops of HCl needed to lower sample pH to ≤ 2 using 40 mL of the final purge water. Dispense the HCl from a dropper bottle.
 - All samples processed for organic-compound analysis are to be chilled to 4°C or below without freezing.
4. Place bottles and other equipment needed for processing raw samples into processing chamber. If collecting samples for VOCs, place only VOC vials and VOC equipment in the chamber.

5. Withdraw samples from the well.

If using a pump—

- a. Purge wells first, preferably with the same pump to be used for withdrawing the samples. Consult NFM 4.2 for purging procedures.
- b. Check that the discharge end of sample line from the pump or manifold is secured in the processing chamber.
- c. Direct sample flow through the sample line into the processing chamber (NFM 4.2).
 - Waste initial sample through chamber drain for the sample-line rinse; do not let sample spray onto chamber cover—change chamber cover if this happens.
 - Check for air bubbles in the sample line; tap the line or make adjustments to remove any air from the line.
 - Flow should appear smooth and uniform (with no splashing) and should not exceed 150 mL/min when filling 40-mL VOC vials or 500 mL/min for larger bottles.

If using a bailer—

- a. Purge wells first, using a pump (NFM 4.2). Do not purge wells with a bailer unless absolutely necessary.
- b. Set up holding stand, as appropriate.
- c. Lower the sampler (after field rinse) smoothly into the well; cause as little disturbance to the water column as possible. Follow analogous directions as those for sampler field rinsing (NFM 4.0.2.A).
- d. After reaching the sampling depth within the screened or open interval, collect sample by raising the sampler smoothly (minimizing disturbance to water column). Keep the deployment line clean and untangled as sampler is lowered and raised.
- e. Place sampler into holding stand and insert sample-delivery tube/device.

TECHNICAL NOTE: Sampling from wells with a bailer or other discrete sampling device is not recommended if target analytes (such as trace elements and hydrophobic organic compounds) are those that typically associate or partition to particulates because deployment of bailers or other point-source samplers usually stirs up or otherwise mobilizes particulates. Fine-grained and colloidal-sized particulates can persist in the water column, causing a potential for bias.

6. Collect all raw organic-compound samples into designated bottles.
 - a. Fill VOC vial from bottom of vial to overflowing without entraining air bubbles. Leave a convex meniscus. If sample will not be acidified, cap vial securely, invert, and check for air bubbles. **Follow directions in section 5.6.1.A.**
 - b. If acidification of the sample is required,
 - The preservative can be added to VOC samples while samples are inside the processing chamber as long as the chemical treatment will not affect any subsequent samples to be collected for analysis of organic compounds. Otherwise, acidify VOC samples in a preservation chamber.
 - Add 1 to 5 drops of HCl to the sample (sections 5.4 and 5.6). Usually two drops of HCl are sufficient to lower the pH of the VOC sample to ≤ 2 . Cap vial securely, invert, and check for air bubbles. If air bubbles are present, discard the vial and start again.
 - Change cover of processing chamber and change gloves.
 - c. Place remaining raw organic-compound sample bottles into processing chamber. Fill bottles directly from the sample line to the shoulder of each bottle (section 5.6.1.B).
7. For filtered organic-compound samples:
 - a. Place aluminum plate-filter assembly into chamber for pesticides and other filtered organic-compound samples. Change gloves.
 - b. Load the filter, connect the plate-filter assembly, and field rinse the filter as directed in section 5.2.2.A.
 - c. After following filtration directions in section 5.2.2.A, pass bottles out of chamber for DH handling.
8. After processing raw and filtered organic-compound samples:
 - a. Fill sample bottle with DIW and label "temperature-check sample" to accompany chilled organic-compound samples.
 - b. Remove the equipment used to process the samples and pass to DH.
 - c. Discard chamber cover.
 - d. Remove aluminum foil covering from work bench.
9. **Sample preservation → Go to section 5.4.**

Process ground-water samples for inorganic-constituent and remaining analyses:

1. Direct flow of pumped sample away from the processing chamber. Change to vinyl or latex, disposable, powderless gloves (gloves).
2. Cover bench or table with a plastic sheet to make a clean work surface. Change processing chamber cover. Assemble equipment and supplies needed on the clean work surface. Remove plastic wrapping from precleaned equipment. Change gloves.
3. **For filtered inorganic-constituent, nutrient, radiochemical, and isotope samples:**
 - a. Place filtration equipment, sample bottles (prelabeled), and other supplies and equipment for filtered inorganic-constituent samples into processing chamber. Change gloves.
 - b. Connect filtration equipment as directed in section 5.2.1.
 - c. Resume sample flow to the chamber.
 - Check for air bubbles in the sample line; tap line or make adjustments to remove air from the line.
 - Flow should be smooth and uniform—about 500 mL/min to fill sample bottles without splashing.
 - d. Collect all filtered inorganic-constituent samples first, as directed in section 5.2.1.
4. Disconnect the filter assembly. Change gloves.
5. **Raw inorganic-constituent, nutrient, radiochemical, and isotope samples:**
 - a. Place prelabeled bottles for raw samples into the processing chamber. Change gloves.
 - b. Field rinse bottles with raw sample (section 5.1, table 5-1).
 - c. Collect samples into designated bottles.
 - d. Place bottles outside of chamber. Change gloves.
6. Remove equipment, discarding chamber cover appropriately.
7. **Sample preservation → Go to section 5.4.**
8. **Radon and CFC samples → Go to section 5.6.**