

Ground Water Sampling Using a Peristaltic Pump

FSOP 2.2.9 (August 31, 2016)

Ohio EPA Division of Environmental Response and Revitalization

1.0 Scope and Applicability

- 1.1 Peristaltic pumps operate by creating a vacuum in the pump discharge line which draws ground water upwards to the ground surface. The vacuum is created by a series of rotating cams or rollers that compress and relax a flexible discharge line. Air or ground water in front of the rollers is pushed forward through the discharge line, and the portion of the discharge line behind the rollers rebounds to create a vacuum that continuously purges ground water from the well. Typically, these pumps are powered using an internal rechargeable 12-volt battery.
- 1.2 Limitations of peristaltic pumps for ground water sampling include the following:
 - 1.2.1 Because the peristaltic pumps operate by creating a vacuum, these devices can only be used to purge ground water from depths below ground surface (bgs) or approximately 25 feet or less (the vacuum limit).
 - 1.2.2 The application of a vacuum (strong negative pressure) to groundwater promotes degassing and associated changes in ground water chemistry. Therefore, Ohio EPA does not recommend these devices for the collection of ground water compliance samples [FSOP 2.2.4, Ground Water Sampling (General Practices)] for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pH, oxidation-reduction potential, dissolved metals, dissolved gasses or other vacuum-sensitive constituents. However, depending on site-specific work plan (SSWP) project objectives and data quality objectives (DQOs), these devices may be suitable for collecting ground water screening samples or for collecting compliance samples for constituents that are not vacuum sensitive (e.g., pesticides/herbicides, PCBs, nitrate, chloride, sulfate etc.)
 - 1.2.3 Peristaltic pumps are small and are not recommended for purging large volumes of ground water.
- 1.3 Peristaltic pumps offer the following advantages:
 - 1.3.1 Peristaltic pumps are easily portable, relatively simple to operate compared to other ground water sampling devices and are self-priming.
 - 1.3.2 The only pump components that contact ground water are the disposable discharge line and pump-head tubing, so minimal equipment decontamination is needed. No moving pump parts need to be decontaminated.
 - 1.3.3 Sampler exposure to contaminated ground water is reduced compared to other ground water sampling techniques.
 - 1.3.4 Peristaltic pumps may be used to sample wells with inside diameters as small as 0.5 inches.

- 1.3.5 Peristaltic pumps may be used to perform low-flow ground water sampling at very low rates, i.e., < 100 ml/min (FSOP 2.2.6, Low-Flow Ground Water Sampling).
- 1.4 All ground water sampling techniques and associated procedures should be consistent with Ohio EPA's [Technical Guidance Manual \(TGM\) for Hydrogeologic Investigations and Ground Water Monitoring](#), specifically [Chapter 10, Ground Water Sampling](#). In addition, [U.S. EPA 2002 \(Yeskis and Zavala\)](#) provides ground water sampling guidance for RCRA and CERCLA sites. The SSWP will provide project objectives and DQOs. In the event there appears to be inconsistency between the TGM and project objectives or DQOs, please contact the DERR SIFU supervisor and DERR site coordinator for clarification.

2.0 Definitions

None

3.0 Health and Safety Considerations

- 3.1 Always review the site-specific health and safety plan (HASP) for site-specific hazards before performing work.
- 3.2 Refer to FSOP 2.2.4, Ground Water Sampling (General Practices) for general ground water sampling and health and safety considerations.
- 3.3 If the pump does not include an internal rechargeable 12-volt battery, be aware of the following health and safety considerations:
 - 3.3.1 When carrying a 12-volt battery, lift the battery properly. Bend your hips and knees to squat down, grasp the battery, and while keeping it close to your body, straighten your legs to lift it. Do not lift the battery by bending forward, which may cause back injury.
 - 3.3.2 Be careful when operating a 12-volt power supply under wet conditions.
 - 3.3.3 If using a generator for power supply (with a 12-volt adaptor) ensure that it is grounded to avoid electrical shock. Handle gasoline carefully. Always wear protective gloves when handling gasoline, and store gasoline containers outside of the work area.

4.0 Procedure Cautions

- 4.1 Refer to FSOP 2.2.4, Ground Water Sampling (General Practices) for general ground water sampling procedure cautions.
- 4.2 If NAPL is encountered in a monitoring well, do not perform ground water sampling. Immediately notify the DERR-SIFU supervisor and DERR site coordinator.

- 4.3 Ohio EPA does not recommend peristaltic pumps for collecting ground water compliance samples for VOCs or other vacuum-sensitive constituents (refer to paragraph 1.2.2).
- 4.4 If the pump does not have an internal rechargeable battery, a portable 12-volt battery or 12-volt power adapters will be needed to power the pump.
- 4.5 Discharge line and pump-head tubing used with the peristaltic pump should not adversely affect ground water quality. For discharge line, Ohio EPA recommends the use of fluorocarbon polymer (Teflon®), polyethylene or similarly inert materials.

5.0 Personnel Qualifications

Ohio EPA personnel working at sites that fall under the scope of OSHA's hazardous waste operations and emergency response standard (29 CFR 1910.120) must meet the training requirements described in that standard.

6.0 Equipment and Supplies

- 6.1 Peristaltic pump
- 6.2 12-volt battery or another power source (will need a 12-volt adaptor)
- 6.3 Appropriate diameter flexible tubing for pump head (cams/rollers)
- 6.4 Discharge line tubing (must connect to flexible pump head tubing)
- 6.5 Knife or tubing cutters
- 6.6 Other ground water sampling equipment and supplies as needed per FSOP 2.2.4, Ground Water Sampling (General Practices).

7.0 Procedures

- 7.1 Measure the well's static water level and total depth in accordance with FSOP 2.2.2, Ground Water Level Measurement.
- 7.2 Place the pump near the well, connect the power source (if external) and install the flexible tubing and discharge line. The end of the discharge line should extend to the approximate center of the well's screened interval. Take care to prevent potential cross contamination of the discharge tubing. Avoid lowering the discharge tubing to the bottom of the well if possible to avoid increased sample turbidity.
- 7.3 Calculate the well volume, even if low-flow sampling. (If the well yield is too low to stabilize the water level for low flow sampling, the volumetric sampling technique will need to be used.)
- 7.4 When low flow sampling, measure the static water level with the pump in the well. Monitor the static water level during sampling to ensure that drawdown is minimized. If low flow sampling, follow other low-flow sampling procedures as described in FSOP 2.2.6, Low-Flow Ground Water Sampling.

- 7.5 Adjust the pump speed control to increase or reduce the pumping rate. Refer to the pump's manual as needed for operating instructions.
- 7.6 Ohio EPA does not recommend peristaltic pumps for the collection of VOC ground water samples for regulatory compliance, risk assessment or modeling. However, if VOCs samples are collected using this device, compliance samples should be collected in-line and ahead of the pump in a zero-headspace container connected to the discharge line. To collect the sample, the pump is turned on, the sample container is allowed to fill completely and at least one purge volume is drawn through the container. Then the pump is the turned off (removing the vacuum from the discharge line and attached sample container), and the sample container is removed from the discharge line, preserved if necessary and sealed with zero headspace.
- 7.7 After purging criteria have been met, collect ground water samples in accordance with FSOP 2.2.4, Ground Water Sampling (General Practices). Handle ground water samples in accordance with FSOP 1.5, Sample Custody and Handling.
- 7.8 Replace the disposable discharge line and flexible pump-head tubing between each sampling location. No decontamination is necessary.
- 7.9 Dispose of investigation derived waste in accordance with FSOP 1.7, Investigation Derived Wastes.

8.0 Data and Records Management

Refer to FSOP 1.3, Field Documentation.

9.0 Quality Assurance and Quality Control

Refer to the SSWP and FSOP 2.2.4, Ground Water Sampling (General Practices).

10.0 Attachments

None

11.0 References

FSOP 1.3, Field Documentation.

FSOP 1.5, Sample Custody and Sampling

FSOP 1.7, Investigation Derived Wastes

FSOP 2.2.2, Ground Water Level Measurement

FSOP 2.2.4, Ground Water Sampling (General Practices)

FSOP 2.2.6, Low-Flow Ground Water Sampling

Ohio EPA, May 2012, Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring, Chapter 10, Ground Water Sampling: Ohio EPA Division of Drinking and Ground Waters

U.S. EPA (D. Yeskis and B. Zavala), May 2002, Ground Water Sampling Guidelines for Superfund and RCRA Project Managers (Ground Water Forum Issue Paper): Office of Solid Waste and Emergency Response, EPA 542-S-02-001