Frequently Asked Questions (FAQs)

DSP-5: Protocol on the Use of Five Passive Samplers to Sample for a Variety of Constituents in Groundwater (Feb. 2007)

NOTE: The Passive/Diffusion Sampler Team generated this list of FAQs from two Internet training sessions. The questions are paraphrased and not taken directly from the questions received from our training.

Q1: When comparing passive sampling methods to traditional purge methods, how it is determined that the passive sampling groundwater data produces more reliable results than the traditional sampling groundwater data?

Each groundwater sampling technique characterizes contamination in the groundwater differently. It is important to understand the conceptual basis of any sampling technology since results from each method may differ. These differences should be considered when comparing sampling methods for interpreting sampling results. Differences may occur when comparing 3-volume purge, low-flow or passive sampling techniques. These differences do not necessarily indicate inaccuracies, but reflect the nature of the sampling methods.

When comparing passive groundwater data to data collected with other types of sampling devices, even other types of passive sampling devices, the team has found that the more variables that are introduced into your sampling technique then there is reduced data reliability. When compared to passive sampling methods, traditional groundwater sampling methods introduce more variables such as where your groundwater sample is being collected (i.e., biased toward zone of highest hydraulic conductivity), increased turbidity concern since increase disturbance to the well, and possible unusable data due to cross contamination from well to well. Passive sampling methods require minimal handling procedures and equipment needs; therefore, reduce these errors.

Q2: What is the advantage of the "Equilibrium Grab" sampling devices versus just using a bailer to collect the same type of sample?

The "equilibrium" aspect of an equilibrium grab sample is the aspect that makes these methods “passive” sampling methods. Passive is defined by the ITRC Passive Sampler Team as a sampling method that relies on ambient flow-through in a well to deliver representative formation water to the sampling device without pumping or purging the well. Part of passive sampling approach is to allow the aquifer and well "equilibrate" after insertion of the passive sampling device. That equilibration includes both restabilization of the water column from the disturbance of device insertion, and equilibration of the device to the surrounding water (e.g. diffusion through a membrane).

In the case of the grab samplers (Snap Sampler™ and Hydrasleeve®), you only have to wait for the well to restabilize from the insertion of the device. Generally this requires a couple a well volume flushes from ambient horizontal flow in the aquifer to re-establish ambient conditions. As a rule of thumb, the Team has said that takes 1 to 2 weeks. Every situation is different, however, so you may be able to collect sooner if you have good flow through.

A bailer is not a point sample, so you get a "rougher" idea of where the water you sample comes from, and is not very repeatable. If you have a submerged well screen, a bailer will not fully flush on it's way through the blank casing water, and a bailer is open on top on it's way back up though the blank casing water; so it will not provide a sample from a discrete location.

Also, an equilibration time may be needed for some analytes. Laboratory studies show that for some VOC analytes, materials in the HydraSleeve® Sampler and the Snap Sampler™ may need a couple of days to equilibrate. Using the “rule of thumb” deployment periods (or longer), concerns regarding sorption are avoided entirely. It is important to note that sorption of analytes

by sampler materials is not unique to these two samplers. Plastics in bailers, polyethylene tubing, and even Teflon tubing (or Teflon-lined tubing) will sorb some analytes. The equilibrium aspect of these samplers actually avoids potential sample bias from exposure to plastics when deployed in advance of sampling.

More information on the equilibration times for the Snap Sampler™ can be found in a recently published ERDC-CRREL report at the following URL:
http://www.crrel.usace.army.mil/library/technicalreports/ERDC-CRREL-TR-07-14.pdf

More studies on sorption losses to pump tubing can be found within Parker and Ranney publications such as:
CRREL *Sampling Trace-Level Organics with Polymeric Tubing*s Louise V. Parker and Thomas A. Ranney; February 1996 (revised October 1996)
http://www.crrel.usace.army.mil/techpub/CRREL_Reports/reports/SR96_03.pdf

Q3: In the DSP-5 training and document, the Team states that passive samplers have "reproducible" results. What margin of error should one expect from the samplers to conclude that I am getting high reproducibility?

When performing ongoing sampling events, it is critical to place the passive sampler in the same location or depth for consistency and comparability of results over time. Sampling at a consistent deployment depth can improve data reproducibility. The Team expects high reliability or reproducibility of groundwater data if for each sampling event you are collecting groundwater with the same device at the same interval using the same sampling methodology. At this time, the Team has not designated a "margin of error" associated with reproducibility. In general, the Team agrees that in a well that has a low temporal variability, a 1:1 correlation is expected if using the same sampling device with the same methodology.

Q4: What are the costs associated with each device?

The Team has put together a Matrix Table that itemizes costs for each of the samplers that are discussed in the DSP-5 document. This table is included in the Team's DSP-4 document "Overview of Passive Sampling Devices", as Chapter 14, page 83. The document can be downloaded for free at http://www.itrcweb.org/gd_DS.asp.

Q5: How does groundwater pH (high and low values) affect the integrity of the diffusion-type sampling devices?

The Team has had no reports of any negative effect of high or low groundwater pHs on Polyethylene Diffusion Bags (PDBs), Rigid Porous Polyethylene (RPPs) samplers, or Regenerated Cellulose Dialysis Membrane (Dialysis) samplers (i.e., diffusion-type sampling devices). Polyethylene materials in general are resistant to attack by both acidic and basic solutions. PDBs, RPP samplers and Dialysis samplers have been used to successfully sample ground waters and acidified laboratory test solutions with pHs ranging from 2 to 11 after equilibration periods of up to 4 weeks without any compromise of sampler integrity.

Q6: Regarding the SNAP Sampler™, Is there any concern for the sample to react with the spring or preservative with the spring itself?

The SNAP Sampler™ spring is PFA (i.e., Teflon) coated stainless steel. There has not been detectable degradation of the spring material due to preservation. For VOA samples, the sample is preserved with the spring left in the glass vial unopened. For metal sampling, it is recommended to remove the spring prior to preservation, which is very easy to perform. Air exposure of a metal sample once collected is not important in a Snap Sample because any precipitation reactions due to exposure will be redissolved during the preservation process.