

Low Flow and Passive Sampling

The collection of groundwater samples from wells is neither straightforward nor easily achievable and variations in results, even from the same site, can occur when different sample collection techniques are used by different people, following different procedures, using different equipment and environmental conditions have changed. As a remedy the US EPA has produced standard operating procedures for groundwater sample collection (<http://www.epa.gov/region9/qa/pdfs/finalsopls1217.pdf>) and alternative methods are being explored that will minimise variances to achieve consistent, accurate results: safely, quickly and cost effectively.

These 'newer' techniques include low flow and passive sampling. These methods can help minimise the impact the purging process has on the groundwater chemistry during sample collection and the volume of water that is being purged and disposed.

Low flow or micro purging is now an accepted method in the United States (Puls and Barcelona 1996) and is becoming more popular in Europe. With this type of sampling, a pump is hung in the well opposite the most contaminated zone in the well screen and adjusted to a very low speed. There is no need to renew (purge) the water in the blind section of the well. By using this method, the volume of the purge water can be reduced, sometimes significantly over the conventional purging method. Water quality indicator parameters are measured (pH, EC, DO and increasingly turbidity: EC and DO are the best stability indicators) until stability is achieved. After 3 successive readings of the water quality indicator parameters have stabilized (recorded after a minimum of one tubing, pump and flow-cell volume) per cycle then sampling can begin. Drawdown is usually kept within 10 and 20cm and this should be regularly checked. This technique is excellent for slow recovering wells and saves time and purge water disposal volumes. A dedicated pumping system for each well is recommended to ensure minimal mixing of the stagnant water above the screen.

Passive or Diffusion Sampling is well beyond the infancy stage in the United States and has been gaining greater acceptance since its introduction in 2000, particularly as it has three huge benefits: it saves time and money (50-80%), the logistics are simple and above all it is "green" technology. The main principle is that a device is deployed and left in a well for a certain period which may vary depending on the instrument used. Diffusion samplers need to reach an osmotic equilibrium with the surrounding water. Diffusion samplers are not a "one size fits all" solution and some are good for VOC's and SVOC's, whereas others might be good for inorganics. The common factor is that there is minimal disturbance in the water.

Passive or no purge sampling systems offer a completely different solution for a range of compounds including the sensitive analytes such as Redox, pH and Turbidity. Snap type samplers do not work on the principle of diffusion but rather grabs or "snaps" a sample of groundwater whilst in position inside the well. These have the advantage of not disturbing the well water and therefore are perfectly suitable for all analytes. Samples are captured in a sealed bottle which is then removed from the well and sent directly to a laboratory for analysis. The sample is never exposed to the open air and collection of the sample does not require pumps, controllers, meters and purge water waste containers. It is simpler, safer and cost effective to collect the samples and data quality is improved. Fewer pieces of equipment are required and there is no purge water to dispose of; variations in site conditions and the personnel taking the samples will not affect the quality of the results so there is improved data quality and field repeatability.