

### **Bailers - What is a Bailer?**

Bailers are a type of grab sampler used in ground water monitoring wells to retrieve a water sample from below the ground surface. Bailers, as a generic group, consist of a hollow tube with a check valve at the bottom and a handle at the top. To retrieve a water sample from a well, a tether cord is attached to the handle at the top of the bailer and the bailer is lowered into the well where it contacts the groundwater.

The weight of the bailer causes it to begin to sink into the fluid. Hydrostatic pressure of the fluid pushes up on the check valve (usually a ball check) at the bottom of the bailer causing the valve to open and water to flow into the tube, just like water fills a drinking straw when immersed in a glass of water. Water entering a bailer fill until the level inside the bailer reaches the level outside the bailer. A partially submerged bailer will be partially full and a fully submerged bailer will be full.

When the bailer has filled to its submerged level the valve closes, preventing water from escaping. The bailer is retrieved using the tether and the sample discharged to an appropriate laboratory sample container, typically a 40ml vial (for Volatile compounds) or a 1 liter glass jar (for metals analysis).

### **Weighted versus Non-Weighted Bailers**

Generally, bailer construction materials are lightweight (they have a low specific gravity) so that they are easy to use in the field. The most common bailer material is high density polyethylene, known for its chemical resistance, strength, and low cost. Other materials include PVC, Teflon, and Stainless Steel. Polyethylene has a specific gravity of just under 1.0 which means that the bailers will sink until just a small portion is left floating on top of the water surface.

A non-weighted polyethylene bailer is only able to collect a sample from the top of the water column. Repeated lowering, filling, retrieving, and emptying are required to “bail down” the well to remove water that may have stagnated in the casing where flow from the aquifer is prevented by the solid wall of the well casing.

Bailers can be manufactured with the addition of stainless steel components or other material with a high specific gravity so that when introduced to the well the bailer will submerge to the depth allowed by the length of the suspension cord. Weighted polyethylene bailers can sample well below the water surface to the bottom of the water column.

### **3-5 Volume Purging**

The user should be aware that well water does not fill the bailer at the same rate the bailer is being lowered because the inlet nozzle is usually a smaller diameter than the sample chamber being filled. The restricted flow into the larger diameter sample chamber and the friction as the water pushes past the valve components cause the bailer to carry down water from upper strata as the bailer descends. This means the sample in the bailer will not necessarily represent the maximum depth of deployment. For this reason wells sampled by bailers are typically purged 3 to 5 well volumes to make it more likely the stagnant water has been removed and the water in the well represent aquifer water that flowed into through the well screen or rock fractures to replace water removed by repeated bailing. Bailers generally are not suitable for passive sampling (sampling without purging the well) because they displace a large volume of water causing the water in the screen to change direction of flow, the water trapped in the bailer is not readily refreshed by water in the well coming from the aquifer, the body of the bailer does not allow compounds to diffuse into the sampler, so at it's basics, what enters the bailer during the lowering process tends to remain in the bailer.