



6.6 FILTRATION OF GROUNDWATER SAMPLES

Some contaminants and water quality parameters are impacted by excessive turbidity in the water sample. Therefore, it is important to avoid introducing turbidity into the water samples, since the HEER Office groundwater Environmental Action Levels (EALs) are intended for comparison to dissolved phase contaminants (and not contaminants adsorbed onto fine-grained soil particles) (HDOH, 2008a).

If sediment has accumulated at the bottom of a well, use proper purging and sampling techniques to prevent turbulence and suspension of sediment. In these cases, the low-flow purging and sampling technique is preferred, since it will not agitate the water column within the well. Bailer sampling should be avoided in cases where sediment has accumulated in the well, because it is likely to introduce turbulence due to repetitive insertion and retrieval.

It may be impossible to collect non-turbid samples from wells installed in some areas. In cases where extremely fine-grained substrate is known or anticipated (commonly for sites near or adjoining the shoreline or in caprock substrate) filtering of groundwater samples prior to analysis for metals is generally accepted, and filtering for organic contaminants is also acceptable, especially for highly sorptive contaminants (PAHs, TPH, etc.) In these known or anticipated situations, the potential need for filtering samples intended for organic analysis should be documented in the work plan and concurrence obtained from the HEER Office prior to field investigation. The following sections describe the considerations for filtering of samples intended for metals analysis followed by a description of overall sample filtering procedures.

6.6.1 Dissolved Metals versus Total Metals

Some metals can take on more than one oxidation state or valence state. Often an increase in oxidation state leads to a decrease in solubility. The valence state of the dissolved metal is dependent on the oxidation-reduction potential of the groundwater. In-situ groundwater is often under-saturated relative to the oxygen concentration in air. Therefore, oxygen can dissolve from air into groundwater, resulting in an increased oxidation-reduction potential, which may change the oxidation state of dissolved metals and result in metal precipitation. It is therefore important to avoid aeration of groundwater collected for metals analysis.



Figure 6-17. In-line 0.45 Micron Filter

This filter type is typically used in the field collecting a filtered groundwater sample. An arrow on the body of the filter indicates the water flow direction when using the filter.

[Source: Aqua Merik, 2008]

Aeration may occur during collection or transport. To avoid precipitation of dissolved metals after filtration, the sample must be properly preserved, preferably using Nitric Acid (HNO_3). The proper preservation of filtered metals samples results in a pH lower than 2, which keeps the dissolved metals in solution.

A groundwater sample that is not filtered prior to preservation may yield false, elevated levels of dissolved-phase metals. Lowering the pH of an unfiltered sample may dissolve metals that are bound to particles suspended in the water sample. Therefore, a sample to be analyzed for dissolved metals must be filtered prior to preservation in the field and analysis at the laboratory.

Due to the potential phase changes of metals that may occur during groundwater sampling and filtration, the HEER Office may require that analytical data for filtered samples be accompanied by data for unfiltered samples, especially at sites where groundwater is used as a water supply or may discharge into a nearby surface water body.

6.6.2 Filtering Procedures

Filtration methods in the order of preference are: in-line filtration, pressure filtration and vacuum filtration. Vacuum filtration should only be used if the other two methods cannot be used. The use of a vacuum filtration method should be justified in the SAP and must be performed in strict adherence to manufacturer's recommendations (NJDEP, 2005).

Select a filter apparatus made of polyethylene, polypropylene or borosilicate glass. Use ungridded, 0.45-micron pore-diameter filters. The filters are to be one-time use, disposable, laboratory cleaned filters that have a laboratory certification available from the manufacturer. An example of an in-line filter used in the field for the collection of a filtered water sample prior to preservation is illustrated in Figure 6-17.

Filter the sample immediately upon collection in a manner that minimizes aeration. Do not let the filter cake become too thick. Discard the first 150 to 200 milliliters of sample to allow the filter to chemically equilibrate with the groundwater. Preserve the sample immediately upon filtration using proper preservation methods, in the most common case for metals, with nitric acid to a pH less than 2. Filtration must always precede preservation. Place samples on ice for shipment to the laboratory.