



Groundwater Sampling For Metals: Summary April 6, 2005

Discussion: The goal of sampling groundwater is to obtain a sample that is representative of existing conditions. This becomes especially difficult when trying to obtain a representative sample for certain inorganic constituents, such as metals. The method in which the sample is collected has a significant impact on the sample quality, accuracy and reproducibility. In order to obtain a sample representative of existing groundwater, subsurface disturbance and sample handling must be kept to a minimum. "Sample collection practices that induce artificially high levels of turbidity have been shown to have the greatest negative impacts on sample quality." (Puls and Powell, 1992)

In order to allow the well to recover from drilling and development activities, the WDEQ does not recommend sampling monitoring wells within 48 hours of development. The following discussion outlines procedures that are acceptable to the WDEQ for analyses of metals in groundwater. Because of the potential for turbid samples to bias the analyses for total metals, the WDEQ recommends the use of low stress (low flow) purging techniques to minimize turbidity during collection of unfiltered samples.

Option 1: Conventional Purging Procedures (e.g., 3 well volumes evacuated).

Purge well and monitor field parameters that include turbidity, temperature, specific conductance, and pH (careful documentation of sampling procedures is required). When field parameters stabilize (measurements have stabilized when three consecutive readings spaced 5 minutes apart, are within 10 % of previous reading) and if turbidity readings are:

a.) Less than or equal to 20 NTUs

Collect analytical sample for WDEQ groundwater classification parameters listed in Table 1 for total metals analysis.

b.) Greater than 20 NTUs - Go to Options listed below:

Option 2: Low Stress (Low Flow) Technique

Conduct Low Stress (Low Flow) purging as described by Puls and Barcelona, 1996, and measure field parameters as discussed in Option 1. Other documents describing low stress techniques are referenced below.

- a.) If turbidity is less than or equal to 20 NTUs, collect sample for WDEQ groundwater classification parameters listed in Table 1 for total metals analysis.
- b.) If turbidity is still greater than 20 NTUs, but turbidity and other indicator parameter measurements have stabilized as discussed above, collect sample for WDEQ groundwater classification parameters listed in Table 1 for total metals analysis.

Option 3: Re-develop and Re-sample Monitoring Well

Re-develop well, wait a minimum 48 hours, re-purge and measure field parameters as in Option 1 above.

- a.) If turbidity is less than or equal to 20 NTUs then collect sample for groundwater classification for total metals analysis;
- b.) If turbidity is still greater than 20 NTUs, collect sample for groundwater classification parameters listed in Table 1 for dissolved metals analysis (filtered with 0.45 micron filter and preserved).

Option 4: Collect Groundwater Sample for Dissolved Metals Analyses

Collect analytical sample for groundwater classification parameters listed in Table 1 for dissolved metals (filtered with 0.45 micron filter and preserved).

Table 1: Classification Analytes

Aluminum (Al)
Arsenic (As)
Boron (B)
Cadmium (Cd)
Chloride (Cl)
Chromium (Cr)
Copper (Cu)
Iron (Fe)
Lead (Pb)
Manganese (Mn)
Selenium (Se)
Sulfate (SO ₄)
Total Dissolved Solids (TDS)
Zinc (Zn)
pH
Sodium Adsorption Ration (SAR)

References:

Puls, R.W. and Barcelona, M.J. (1996) Low-flow (minimal drawdown) groundwater sampling procedures: Washington, D.C., U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, EPA Ground Water Issue, EPA/540/S-95/504, 12 pp. <http://www.epa.gov/tio/tsp/download/lwflw2a.pdf>

Puls, R.W. and R.M. Powell (1992), Acquisition of Representative Ground Water Quality Samples for Metals: Ground Water Monitoring Review, Vol 12, No. 3, pp.167-176.

Yeskis, D. and Zavala B. (2002) Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers: Washington, D.C., U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Ground Water Forum Issue Paper, EPA/542/S-02/001, 53 pp. http://www.epa.gov/tio/tsp/download/gw_sampling_guide.pdf