Brian Rakvica

From: Crowley, Susan [Susan.Crowley@tronox.com]
Sent: Tuesday, May 01, 2007 9:21 AM
To: Brian Rakvica; Shannon Harbour
Cc: Bailey, Keith; Ho, Brian; Bilodeau, Sally; Gerry, Dave
Subject: Work Plan Appendum to the Tronox Phase A Source Area Evaluation
Attachments: Phase A Addendum for Re-Sampling Selected Wells for Filtered vs Non-Filtered Metals.pdf

Brian,

Please find attached an addendum to our Phase A Work Plan for the Tronox Source Area Investigation. In our April 25th teleconference we covered the need to understand the groundwater metals concentrations obtained during the Phase A field sampling and the apparent effect of filtering vs. non-filtering (and low-flow vs. very low-flow sampling). The attached Work Plan is intended to give us more information on the topic and is a continuation of the Phase A work.

Please provide us any comment you have? We expect to be in the field very soon. Thanks for your consideration.

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Re-Sampling of the Phase A Source Area Investigation Wells

Background: Analytical results of the groundwater samples from Phase A of the Source Area Investigation at the Tronox facility indicated that the results for metals and radionuclides may have been affected by the turbidity of the water samples. The 21 wells were sampled using low-flow techniques with pump rates varying (from well-to-well) between 100 milliliters per minute (ml/min) and 480 ml/min. Pump rates varied depending upon the maximum rate that yielded relatively stable water levels with minimal (<3-inches) drawdown.

At the pump rates listed above, turbidity of the groundwater varied between seven and 148 NTUs (nephelometric turbidity units).

Objectives: To assess the potential for analytical bias of metals and radionuclides groundwater results based on sampling methodology.

Scope of Work: Three samples will be collected from each of the 21 wells. Each sample will be collected using a different method in a sequential manner described as follows:

1. Low Low-Flow Sampling (Unfiltered): After water levels have been measured, each well will be purged at a pump rate of no more than 100 ml/min, if possible. During purging, the turbidity will be monitored and groundwater samples for metals and radionuclides will be collected once the following criteria have been met:

    a. Turbidity levels of 50 NTUs (or less) are achieved for three consecutive readings, and
    b. Other water quality parameters (pH, conductivity, etc.) have stabilized (± 10%), and
    c. Water levels are stable (< 3-inches drawdown).

    If turbidity levels of 50 NTUs or less cannot be achieved, then sample containers will be filled when turbidity levels have stabilized (± 10%) for three consecutive readings. For each well, field parameters will be recorded on groundwater sampling field data sheets (the same type of field data sheets described in the Phase A Work Plan [ENSR 2006]).

2. Low-Flow Sampling (Filtered): Each well will be pumped at the same rate that was used in the December 2006 sampling event (see Table 1). Field parameters will be measured. When the criteria (a through c) described in Step 1 have been met, the groundwater will be filtered using a peristaltic pump and 0.45 micron disposable filter to remove suspended particulate matter before the groundwater is placed in the sample containers.

3. Low-Flow Sampling (Unfiltered): Each well will be pumped at the same rate that was used in the December 2006 sampling event. Field parameters will be measured and

when the criteria (a through c) described in Step 1 have been met, the groundwater sample containers will be filled.

As shown in the attached **Table 1**, quality assurance/quality control (QA/QC) samples consisting of field duplicates, field blanks, equipment blanks, and a pump rinsate blank will also be collected using the same sampling frequency as that described in the Phase A Work Plan (ENSR 2006). The samples will be sent to the same NDEP-certified laboratories as those used in the Phase A investigation, and the same analytical methods will be used as described in the Phase A Work Plan (ENSR 2006).

Data Evaluation: The analytical results from the three sampling methods will be evaluated as follows:

- The results from the Low-Flow unfiltered samples will serve as a baseline for comparison to the other two methods and for comparison to the December 2006 sample results.
- The Low-Flow filtered and unfiltered samples will be compared to evaluate the effects of sediment in water samples on the metals and radionuclide analytical results.
- The Low Low-Flow unfiltered sample results will be evaluated to determine whether a standard pump rate of 100 ml/min can produce stable, but minimal turbidity in water samples, and whether the analytical results for metals and radionuclides are affected.
- The Low Low-Flow unfiltered sample results will be compared to the Low-Flow filtered samples to assess how the different sampling methods affect the analytical results for metals and radionuclides.

Reporting: The results of the re-sampling of the Phase A wells will be presented in the report on the Phase B findings of the Source Area Investigation.

References

ENSR 2006, Phase A Source Area Investigation Workplan, Tronox LLC Facility, Henderson, Nevada, September 2006.

Table 1
Groundwater Sampling and Analytical Plan
May 2007 Re-Sampling of Phase A Wells
Tronox Facility - Henderson, Nevada

	Sampling Plan						Analytical Plan (per sample)			
Well No.	**Sample Type**	**Sample 1: Low-Low flow sampling (100 m/min) unfiltered**	**Sample 2: Low flow using Dec '06 pump rates filtered**	**Sample 3: Low flow using Dec '06 pump rates unfiltered**	**Dec 2006 pump rate ml/min**	**Dec 2006 Turbidity (NTUs)**	**Metals (6010B)**	**Cr 6 (7196 or 7199)**	**gamma spec Ra-226&-228 (903.1 & 904.0)**	**alpha spec U & Th isotopes for secular equilibrium**
M2A		X	X	X	350	49	X	X	X	
M5A		X	X	X	200	7	X	X	X	
M7B		X	X	X	290	16	X	X	X	
M11		X	X	X	150	89.5	X	X	X	
M12A		X	X	X	210	19.7	X	X	X	
M13		X	X	X	300	32.4	X	X	X	
M31A		X	X	X	150	155	X	X	X	X
M39	parent	X	X	X	320	62.9	X	X	X	X
M39D	duplicate	X	X	X	320	62.9	X	X	X	X
M48		X	X	X	350	nm*	X	X	X	
M55		X	X	X	360	nm*	X	X	X	
M76		X	X	X	100	0.1	X	X	X	
M89		X	X	X	235	0.3	X	X	X	
M92		X	X	X	280	76	X	X	X	
M95	parent	X	X	X	480	68.8	3	X	X	X
M95D	duplicate	X	X	X	480	68.8	X	X	X	X
M97		X	X	X	380	31.7	X	X	X	
M98		X	X	X	300	nm*	X	X	X	
M100		X	X	X	360	nm*	X	X	X	
M120		X	X	X	320	1.8	X	X	X	
MC45		X	X	X	290	0.5	X	X	X	
PC40		X	X	X	420	149	X	X	X	
IAR		ns	X	X	2000	nm*	X	X	X	
QA/QC Samples										
Field Blanks							X	X	X	X
Equipment Blanks							X	X	X	X
Pump Rinsate							X	X	X	X

ns not sampled because well has permanent pump in it.