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Memorandum

Date: May 1, 2007
To: Sally Bilodeau/Camarillo
From: Sheena Blair/Westford
Subject: Data Review
Routine Monitoring Program
1st Quarter 2007
Tronox LLC Henderson, Nevada

Distribution: Robert Kennedy/Westford

04020-023-110
TH1stqtr2007

SUMMARY

A limited review was performed on the data for raw groundwater samples, raw surface water samples, and two equipment blanks analyzed for all or a subset of the following parameters:

- Perchlorate by EPA Method 314,
- Hexavalent chromium by SW-846 Method 7196
- Total chromium by SW846 6010B or EPA 200.7
- Total boron by EPA 200.7
- Total iron by EPA 200.7
- Total manganese by EPA 200.7
- Total dissolved solids (TDS) by SM2540C
- Bicarbonate alkalinity by EPA 310.1
- Chloride by EPA Method 300
- Ammonia by EPA Method 350.1
- Nitrate by EPA Method 300
- Nitrite by EPA Method 300
- Inorganic nitrogen by EPA Method 300 (calculated from ammonia and nitrate)
- pH by SW-846 Method 9040B

The samples were collected at the Tronox LLC site in Henderson, Nevada from December 18, 2006 through March 19, 2007 and submitted to MWH Laboratories in Monrovia, CA for analysis. The MWH project numbers, sample collection dates and analyses included in this review are summarized in Appendix A at the end of this memo. The data reports provided by MWH did not support a validation at the Tier 2 level as requested by NDEP. All provided QC elements submitted by MWH were reviewed and results of that review are summarized below.

The sample results were assessed according to the "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review" (October 2004), the Region 9 Superfund Data

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Evaluation/Validation Guidance, NDEP guidance (May 2006), and by the laboratory quality control (QC) criteria. The validation guidelines were modified to accommodate the non-CLP methodologies.

The data reviewed required minor qualification for selected samples and were considered generally acceptable for decision making. No major problems were identified and no data were rejected.

REVIEW ELEMENTS

The elements selected for review are based on the documentation provided in the laboratory data reports. Sample data were reviewed for the following elements:

- Agreement of analyses conducted with chain-of-custody (COC) requests
- Holding times and sample preservation
- Method blanks/equipment blanks/field blanks
- Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) results
- Matrix spike/matrix spike duplicate (MS/MSD) results
- Laboratory duplicate results
- Field duplicate results
- Sample results/detection limits

DISCUSSION**Agreement of Analyses Conducted with COC Requests**

Sample reports were checked to verify that the results reported corresponded to analytical requests as detailed on the chain of custody (COC) documentation. No discrepancies were noted.

The following issue was noted:

- At the time of sampling the field personnel made a notation on the pre-printed COC if any of the samples listed were not collected. In general these samples were not collected due to dry wells or low volume.

Holding Times and Sample Preservation

Method-specified holding times were met for all samples analyzed except for the following:

- **Report number 194743:**
 - The HT for aqueous pH is stated as "analyze immediately", which means sample pH should be determined at the time of sample collection. Since pH measurements were taken for all samples in this data set after receipt at the laboratory, the pH results for these samples were qualified as estimated (J).
 - The hexavalent chromium analyses for samples M-37 and EB-1 were performed a few hours outside of the method specified holding time of 24 hours. Detected and nondetect results for samples M-37 and EB-1 were therefore qualified as estimated (J and UJ, respectively).

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- Although the initial TDS analysis for sample I-S was performed within the method specified holding time, the reanalysis (authorized by the client) was performed outside the method specified holding time of 7 days. The detected TDS result for sample I-S was therefore qualified as estimated, biased low (J-).
- **Report number 194964R:**
 - The HT for aqueous pH is stated as "analyze immediately", which means sample pH should be determined at the time of sample collection. Since pH measurements were taken for all samples in this data set after receipt at the laboratory, the pH results for these samples were qualified as estimated (J).
 - The hexavalent chromium analyses for samples M-10, M-11, MD-1, and EB-2 were performed a few hours outside of the method specified holding time of 24 hours. Detected and nondetect results for samples M-10, M-11, MD-1, and EB-2 were therefore qualified as estimated (J and UJ, respectively).
- **Report number 195035R:**
 - The HT for aqueous pH is stated as "analyze immediately", which means sample pH should be determined at the time of sample collection. Since pH measurements were taken for all samples in this data set after receipt at the laboratory, the pH results for these samples were qualified as estimated (J).
 - The hexavalent chromium analyses for samples M-12A, M-36, M-84, M-100, and MD-2 were performed a few hours outside of the method specified holding time of 24 hours. Detected and nondetect results for samples M-12A, M-36, M-84, M-100, and MD-2 were therefore qualified as estimated (J and UJ, respectively).
- **Report number 194600:**
 - The HT for aqueous pH is stated as "analyze immediately", which means sample pH should be determined at the time of sample collection. Since pH measurements were taken for all samples in this data set after receipt at the laboratory, the pH results for these samples were qualified as estimated (J).
 - The hexavalent chromium analyses for samples M-44, M-94, and FB-1 were performed a few hours outside of the method specified holding time of 24 hours. Detected and nondetect results for samples M-44, M-94, and FB-1 were therefore qualified as estimated (J and UJ, respectively).
 - Although the initial TDS analyses for samples M-96, M-95, M-48, and PC-72 were performed within the method specified holding time, the re-analyses at dilutions were performed beyond 1x but <2x the method-specified holding time of 7 days. The detected TDS result for samples M-96, M-95, M-48, and PC-72 were therefore qualified as estimated, biased low (J-).
- **Report number 195091:** The HT for aqueous pH is stated as "analyze immediately", which means sample pH should be determined at the time of sample collection. Since pH measurements were taken for all samples in this data set after receipt at the laboratory, the pH results for these samples were qualified as estimated (J).

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- **Report number 194651R:** The TDS analyses for samples ART-2, ART-3, and ART-7 were performed beyond 1x but <2x the method-specified holding time of 7 days. The detected TDS results for samples ART-2, ART-3, and ART-7 were therefore qualified as estimated, biased low (J-).
- **Report number 198847:** The TDS analyses for samples ARP-4 and ARP-6A were performed beyond 1x but <2x the method-specified holding time of 7 days. The detected TDS results for samples ARP-4 and ARP-6A were therefore qualified as estimated, biased low (J-).

The cooler temperatures upon receipt at the laboratory met the acceptable range of 4+ 2°C.

Documentation regarding sample pH verification upon receipt at the laboratory for total chromium was not included in the data package. No action was taken except for this notation.

Method Blanks/Equipment Blanks/Field Blanks

Equipment blank samples EB-1 (collected January 30, 2007), EB-2 (collected January 31, 2007), and field blank FB-1 (collected January 30, 2007) were reviewed in association with the samples collected during the 1st Quarter 2007.

No analytes were detected in the laboratory method blanks. Selected analytes were detected in the equipment blanks and field blank. The following table summarizes the analytes, the concentrations detected, and the associated samples.

Equipment Blank/ Collection/Date	Analyte	Conc. Detected (µg/L)
EB-1 (01/30/2007)	Perchlorate	628
EB-2 (01/31/2007)	Perchlorate	152
	TDS	10 (mg/L)
Associated samples: Samples by analyte and collection date.		

Sample results were qualified as follows:

- Positive sample results > RL but < 10x the blank result were qualified as estimated high (J+).
- Positive sample results that were ≥ 10x the blank result were accepted unqualified.

It should be noted that TDS was reported as being present in field blank sample FB-1 at an elevated concentration (8010 mg/L). Due to some uncertainty with the reported result and based on the absence or extremely low level of contamination in the associated equipment blanks it is the validator opinion that the TDS field blank should not be used to qualify the associated sample results.

LCS/LCSD Results

The percent recoveries (%R) and relative percent differences (RPDs) of the LCSs/LCSDs for perchlorate, total chromium and hexavalent chromium met the laboratory acceptance criteria.

MS/MSD Results

The %Rs and RPDs of the MS/MSDs for all client specific samples met the laboratory acceptance criteria.

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In most cases the batch MS/MSD analyses were performed on samples from other clients, and although this practice is acceptable, the results could not be directly applied to the samples reviewed in these data packages due to possible differences in the sample matrix and type. No validation action was taken on this basis.

Laboratory Duplicate Results

No laboratory duplicates were analyzed for perchlorate, total chromium and hexavalent chromium. Precision in the laboratory was demonstrated by the MS/MSD and/or the LCS/LCSD analyses (see discussions above).

Field Duplicate Results

The following field duplicates pairs were submitted with the samples collected during the 1st Quarter 2007 and were included in this review. The following table summarizes the sample IDs, the detected results and the associated RPDs. For reference the RPD is calculated by the following formula: $[\frac{\text{the absolute value of (original sample value minus the duplicate value)}}{(\text{original sample value plus the duplicate value})/2}] \times 100$ for sample results <10x the sample quantitation limit (SQL).

Analyte	Sample IDs/Collection Date	Sample	Duplicate	RPD (%)
Perchlorate (µg/L) Total Chromium (mg/L) TDS (mg/L) pH (pH units)	M25/MD-4 (01/30/2007)	523000	530000	1
		12	12	0
		9280	9600	3
		8.0	8.3	4
Perchlorate (µg/L) Total Chromium (mg/L) pH (pH units) TDS (mg/L)	M-10/MD-1 (01/31/2007)	32000	21200	41
		0.61	0.57	7
		7.7	7.4	4
		3190	3300	3
Perchlorate (µg/L) Hexavalent Chromium (mg/L) Total Chromium (mg/L) pH (pH units) TDS (mg/L)	M-84/MD-2 (02/01/2007)	5320	4950	7
		0.051	0.048	6
		0.045	0.044	2
		8.0	7.9	1
		978	970	1
Perchlorate (µg/L) Total Chromium (mg/L) TDS (mg/L) pH (pH units)	PC-129/MD-3 (01/29/2007)	407000	397000	2
		0.57	0.57	0
		7110	6220	13
		8.0	8.1	1

The RPD for perchlorate (41%) in field duplicate pair M-10/MD-1 was deemed acceptable due to the sample and duplicate results being <10x the SQL with the absolute difference being < 4x the SQL. The remaining RPDs met the QC acceptance criteria of 30% maximum RPD for an aqueous matrix.

Sample Results/Detection Limits

Analytical dilutions were necessary for most samples due to matrix interferences or to bring the perchlorate and total chromium concentrations within the instrument calibration range.

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Appendix A: 1ST Quarter 2007

MWH Report #	Sample Collection Date	Analyses
191457	12/18/2006	Perchlorate, TDS
191957	12/26/2006	Perchlorate, TDS
192344	01/02/2007	Perchlorate, TDS
192766	01/08/2007	Perchlorate, TDS
192772	01/08/2007	Perchlorate, TDS
193100	01/10/2007	Perchlorate, TDS
193335	01/15/2007	Perchlorate, TDS
194043	12/22/2007	Perchlorate, TDS
194600	01/29/2007	Perchlorate, Total Chromium, Hexavalent Chromium, TDS, pH
194651R	01/29/2007	Perchlorate, TDS
194743	01/30/2007	Perchlorate, Total Chromium, Hexavalent Chromium, TDS, pH
194964R2	01/31/2007	Perchlorate, Total Chromium, Hexavalent Chromium, TDS, pH
194991R	1/31/2007	Total Metals: Boron, Chromium, Iron, Manganese Chloride, Nitrate, Nitrate, Ammonia, Inorganic Nitrogen
195091	02/02/2007	Perchlorate, Total Chromium, TDS, pH
195327	02/05/2007	Perchlorate, Total Chromium, TDS
195713	02/08/2007	Perchlorate, Total Chromium, TDS
195983		
195035	02/01/2007	Perchlorate, Total Chromium, Hexavalent Chromium, TDS, pH
196553	02/20/2007	Perchlorate, TDS
197248	02/26/2007	Perchlorate, TDS
198078	03/07/2007	Perchlorate, TDS
198415	03/12/2007	Perchlorate, TDS
198847	03/14/2007	Perchlorate, TDS
199043	03/19/2007	Perchlorate, TDS