

July 20, 1998

MEMORANDUM

TO: Nick Vizzone, EPA

THROUGH: Mary Wolfe, SAIC

CC: Elaine Eby, EPA

FROM: Howard Finkel, ICF

SUBJECT: Calculation of Universal Treatment Standard (UTS) for High Concentration Selenium Wastes Using Data Submitted by Chemical Waste Management (CWM)

I followed the methodology presented in "Final Best Demonstrated Available Technology (BDAT) Background Document For Quality Assurance/Quality Control Procedures and Methodology," dated October 23, 1991 to evaluate the data submitted by CWM. As requested, I performed three sets of UTS calculations using CWM's data characterizing two different high concentration selenium wastes: (1) Case A - consisted of three samples of waste from facility "A," (2) Case B1 - consisted of five samples of waste from facility "B," and (3) Case B2 - consisted of 11 samples of the same waste from facility "B." EPA developed the data for each of the three cases based on their analysis of the various treatment recipes and resulting treatment data submitted by CWM. I describe my analyses of these data sets below.

EVALUATION OF CWM'S DATA

I entered all of CWM's data into an electronic spreadsheet for analysis and conducted the Z-score test, as described in Attachment A-1 of the background document, to identify any data points that fell outside of the -2.0 to +2.0 range.¹ Based on the Z-score outlier test, no outliers were identified. Exhibit 1 presents a summary of the Z-score analysis.

¹I was not provided with CWM's raw waste concentrations (which reportedly contained selenium at percent level concentrations; therefore, I did not conduct an analysis to remove samples that had effluent concentrations that were equal to, or greater than the influent concentrations.

EXHIBIT 1

**IDENTIFICATION OF STATISTICAL OUTLIERS -
THREE CASES USING CWM'S DATA FOR HIGH CONCENTRATION SELENIUM WASTES**

Samples	Facility	Selenium - Case A				Selenium - Case B1				Selenium - Case B2			
		Treated (LN)	Z-Score (Yes/No)	Outlier		Treated (LN)	Z-Score (Yes/No)	Outlier		Treated (LN)	Z-Score (Yes/No)	Outlier	
1	CWM	36.80	3.6055	-0.2489	No	11.60	2.4510	0.6119	No	11.60	2.4510	-0.4225	No
2	CWM	34.08	3.5287	-0.8520	No	7.47	2.0109	-0.3735	No	7.47	2.0109	-1.1646	No
3	CWM	43.70	3.7773	1.1009	No	8.22	2.1066	-0.1593	No	8.22	2.1066	-1.0033	No
4	CWM					15.60	2.7473	1.2752	No	15.60	2.7473	0.0770	No
5	CWM					4.82	1.5728	-1.3544	No	4.82	1.5728	-1.9033	No
6	CWM									26.10	3.2619	0.9448	No
7	CWM									18.70	2.9285	0.3826	No
8	CWM									17.70	2.8736	0.2900	No
9	CWM									30.00	3.4012	1.1796	No
10	CWM									24.70	3.2068	0.8518	No
11	CWM									23.50	3.1570	0.7679	No
	# of Obs:	3	3	3	3	5	5	5	5	11	11	11	11
	# of NDs:	0				0				0			
	Minimum:	34.08	3.53			4.82	1.57			4.82	1.57		
	Mean:	38.19	3.64			9.54	2.18			17.13	2.70		
	Maximum:	43.70	3.78			15.60	2.75			30.00	3.40		
	Std:	4.96	0.13			4.16	0.45			8.39	0.59		

I then used the BDAT methodology to calculate variability factors and treatment standards. Specifically, I followed Appendix D - Variability Factor to estimate the daily maximum variability factor using HRD's data. Following this procedure, I used equation [1], on page D-1 to calculate VF:

$$VF = \frac{C_{99}}{Mean}$$

Where:

$$C_{99} = EXP (y + 2.33 * Sy)$$

- y = the mean of the logtransformed (natural log) data
- Sy = the standard deviation of the logtransformed (natural log) data
- Mean = the average of the individual performance values.

As noted on page D-2 of the background document, "For residuals with concentrations that are not all below the detection limit, the 99th percentile and the mean can be estimated using equation 1".

The treatment standard for each constituent was then calculated by taking the product of the variability factor and mean constituent concentration. Exhibits 2 - 4 present both the variability factors and treatment standards calculated using CWM's data for each of the three cases.

EXHIBIT 2

EVALUATION OF TCLP DATA PROVIDED BY CWM FOR SELENIUM (MG/L) - CASE A

Samples	Facility	Selenium Untreated	Selenium Treated	(LN)
1	A		36.80	3.6055
2	A		34.08	3.5287
3	A		43.70	3.7773
	# of Obs:	0	3	3
	# of NDs:		0	
	Minimum:		34.08	
	Mean:		38.19	3.64
	Maximum:		43.70	
	Std:		4.96	0.13
	VF:		1.34	
	TS:		51.10	

EXHIBIT 3

EVALUATION OF TCLP DATA PROVIDED BY CWM FOR SELENIUM (MG/L) - CASE B1

Samples	Facility	Selenium Untreated	Selenium Treated	(LN)
1	B		11.60	2.4510
2	B		7.47	2.0109
3	B		8.22	2.1066
4	B		15.60	2.7473
5	B		4.82	1.5728
	# of Obs:	0	5	5
	# of NDs:		0	
	Minimum:		4.82	
	Mean:		9.54	2.18
	Maximum:		15.60	
	Std:		4.16	0.45
	VF:		2.62	
	TS:		24.99	

EXHIBIT 4

EVALUATION OF TCLP DATA PROVIDED BY CWM FOR SELENIUM (MG/L) - CASE B2

Samples	Facility	Selenium Untreated	Selenium Treated	(LN)
1	B		11.60	2.4510
2	B		7.47	2.0109
3	B		8.22	2.1066
4	B		15.60	2.7473
5	B		4.82	1.5728
6	B		26.10	3.2619
7	B		18.70	2.9285
8	B		17.70	2.8736
9	B		30.00	3.4012
10	B		24.70	3.2068
11	B		23.50	3.1570
	# of Obs:	0	11	11
	# of NDs:		0	
	Minimum:		4.82	
	Mean:		17.13	2.70
	Maximum:		30.00	
	Std:		8.39	0.59
	VF:		3.47	
	TS:		59.35	

If you have any questions regarding the attached analyses, please call me at (703) 934-3656.