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March 7, 2003

MAR 2003

Mr. Larry Rose
Solid Waste Section
Division of Waste Management
North Carolina Department of Environment and Natural Resources
401 Oberlin Road, Suite 150
Raleigh, NC 27605

Re: Groundwater Sampling and Statistical Analysis
Cherokee County Subtitle D Lined Landfill
MESCO Project No. G03007.0

Dear Mr. Rose:

Municipal Engineering Services Company, P.A. (MESCO) completed the statistical analyses for the Cherokee County Subtitle D Lined Landfill located in Marble, NC. The purpose of these analyses is to determine, in comparison to background levels, statistical significance of constituents detected during the August 2002 sampling event.

The Appendix 1 laboratory analyses conducted by Pace Analytical Services Incorporated of Asheville, NC and Houston, TX reveal several metal detections and four VOCs discovered. The metals barium, cadmium, chromium, lead, arsenic, and nickel were found in exceedance of the North Carolina Groundwater Standard within MW-3 and MW-4. The unprecedented VOCs were only detected within compliance well MW-6.

Statistical Analysis Methodology

Metals

An inter-well statistical analysis was conducted upon metals detected during the August 20, 2002 sampling event. Data compiled from background well MW-1, was defined as the background well, and an upper tolerance limit (UTL) with 95% coverage was computed for each detected constituent from the background data at a 95% confidence level. For each tested constituent, all the detections with a level below its background concentration were screened out in an effort to minimize the total number of comparisons to be conducted. Then an appropriate statistical analysis method was selected based on the percentages of non-detects (%ND) in the historical background data. The following table (Table 2) summarizes the methods used for four different %ND ranges.

Table 2. Statistical Analysis Methods for Various %ND Ranges

%ND	Analysis Method	ND Substitution
%ND<15%	Parametric tolerance limit	1/2 ND
15%<%ND<50%	Parametric tolerance limit	Cohen or 1/2 ND
50%<%ND<90%	Non-parametric tolerance limit	1/2 ND
90%<%ND	Poisson tolerance limit	-

NOTE: For parametric tolerance interval, normality of the background data was checked by the Shapiro-Wilks normality test, as the method requires that the data be normally distributed.

A total of 13 metals were tested for statistical significance. For antimony the Poisson tolerance limit with no ND substitution was used because the %ND was >90%. For arsenic, barium, cadmium, cobalt, and thallium the non-parametric tolerance interval method with ½ ND substitution was used because the data was not normally distributed or the %ND was greater than 50% but less than 90%. For all the remaining detected metals, the parametric tolerance limit with ½ ND substitution was used because the %ND was <50% and the data was either normally or "log-normally" distributed when evaluated via Shapiro-Wilks normality test.

VOCs

All historical VOC detections in the background well MW-1 were pooled in order to determine the total number of detections, from which the expected number of detections in a single down gradient monitoring point (y^{ι}) was derived by utilizing the Poisson prediction interval. The parameter $y^{\iota}$is defined by the following equation:

$$y^{\iota} = cy + \frac{t^2 c}{2} + tc\sqrt{y\left(1+\frac{1}{c}\right)} +$$

where

c= 1/ n (n=number of background samples)
t= one-sided value of students t-Statistic at 95% confidence [a]
y= number of events observed in $n$previous samples
y^{ι}= expected number of events in a single future sample

[a] Gibbons, R.D., 1994, Statistical methods for groundwater monitoring: John Wiley & Sons, Inc., p.12.

For each monitoring location showing any VOC detections, the number of detected VOCs was counted with each detection being considered a "hit". The number was then compared with the expected number of detections derived from the background VOC data. The value of Student's t-Statistic was derived from tabulated values included in Gibbons (1994).

Intrawell Analyses

For those constituents that had been found to be statistically significant by the interwell analysis, further analyses were conducted to determine whether the statistical significance was caused by spatial variability. Shewhart-CUSUM control charts were generated for each of the triggered constituents to determine its baseline levels. Baseline levels in this context are defined as the background level derived from the data in a given downgradient well. It's important to note that Shewhart-CUSUM control charts requires a minimum of eight independent historical sampling events and a detection rate greater than 25% (%ND≤75%).

Results

Historical data compiled for monitoring well MW-1 was used as the baseline. Data distributions were reviewed using time series and box and whiskers plots (enclosed charts). Table 3 summarizes those metals that were found statistically significant by interwell comparison analysis.

Table 3. Interwell Analyses Summary

Well	Sb	As	Ba	Be	Cd	Cr	Ni	Tl	V	Zn
MW-3	X	X	X	X	X	X	X	X	X	X
MW-4	X	X				X	X		X	X

x=level significantly higher than the background level

Metals with concentrations above the background monitoring well were found exclusively within MW-3 and MW-4 which are located next to each other near the NE portion of the landfill. Concentrations of all of the metals detected within these wells have increased since last sampling event and are above or near the highest ever recorded upon the site. Further Intrawell analysis was conducted to determine whether the statistical significance of metals was caused by spatial variability. Shewhart-CUSUM control charts were formulated for the compliance wells MW-3 and MW-4. All metals, with the exception of barium and thallium within MW-3, that were found to be in significant concentrations according to interwell analysis were also found to be above there own background

levels by intrawell analysis. Antimony within MW-3 and MW-4 as well as arsenic in MW-3 could not be analyzed by Shewhart-CUSUM chart due to the lack of historical detections.

MW-6S contained unprecedented detections of the VOCs 1,1-dichloroethane, tetrachloroethylene, trichloroethylene, and xylene. Since the expected number of detections in a single compliance well derived from the pooled background wells is 2.28, these detections were found to be significant. MW-6S is also the only compliance well to ever have detected a VOC in concentrations in exceedance of the Standard.

Conclusion

The statistical analyses results for the August 2002 sampling event at the Cherokee County Subtitle D Lined Landfill indicate that several inorganic constituents were found to be in significant concentrations according to both interwell and intrawell analysis within compliance wells MW-3 and MW-4. The lack of any current or historical VOC detections, which are more indicative of groundwater contamination, suggests that the elevated inorganics are likely fluctuations in metal concentrations due to the naturally occurring groundwater processes. MW-6S, located outside the SE portion of the liner limit, contains statistically significant concentrations of VOCs. The detected VOCs appear to be consistent with those found in compliance wells known to be impacted by leachate. However, the evidence of contamination in the MW-6S region is not conclusive at this time due to the lack of historical VOC detections. This region will be closely monitored and the results from the next sampling event will prove very useful in determining the presence/extent of VOCs in the groundwater. Pace Analytical Services continued detection sampling for Appendix I during the month of February 2003. If you have any questions or comments regarding this report, please contact me at (919) 772-5393 or email me at jpfohl@mesco.com.

Sincerely,
MUNICIPAL ENGINEERING SERVICES CO., P.A.

Jonathan Pfohl
Environmental Technician

Enclosures

cc: Mr. Robert Allen
Cherokee County

Exceedance Scan
Cherokee County Subtitle D Landfill

Well ID	Parameter Name [1]	Sample Date	Result	Unit	PQL [2]	MCL [3]	Exceedance
MW-1	Arsenic, total	8/20/2002	0.0076	mg/l	0.005	0.05	
MW-1	Barium, total	8/20/2002	0.21	mg/l	0.005	2	
MW-1	Beryllium, total	8/20/2002	0.0034	mg/l	0.002	-	
MW-1	**Cadmium, total**	**8/20/2002**	**0.0099**	**mg/l**	**0.001**	**0.005**	**0.0049**
MW-1	**Chromium, total**	**8/20/2002**	**0.09**	**mg/l**	**0.005**	**0.05**	**0.04**
MW-1	Cobalt, total	8/20/2002	0.076	mg/l	0.005	-	
MW-1	Copper, total	8/20/2002	0.16	mg/l	0.002	1	
MW-1	**Lead, total**	**8/20/2002**	**0.031**	**mg/l**	**0.01**	**0.015**	**0.016**
MW-1	Nickel, total	8/20/2002	0.065	mg/l	0.005	0.1	
MW-1	Tin, total	8/20/2002	0.027	mg/l	0.01	-	
MW-1	Vanadium	8/20/2002	0.081	mg/l	0.005	-	
MW-1	Zinc, total	8/20/2002	0.17	mg/l	0.01	2.1	
MW-2	Barium, total	8/20/2002	0.032	mg/l	0.005	2	
MW-2	Chromium, total	8/20/2002	0.009	mg/l	0.005	0.05	
MW-2	Copper, total	8/20/2002	0.0034	mg/l	0.002	1	
MW-2	Nickel, total	8/20/2002	0.0063	mg/l	0.005	0.1	
MW-2	Vanadium	8/20/2002	0.0064	mg/l	0.005	-	
MW-2	Zinc, total	8/20/2002	0.021	mg/l	0.01	2.1	
MW-3	Antimony, total	8/20/2002	0.04	mg/l	0.01	-	
MW-3	Arsenic, total	8/20/2002	0.043	mg/l	0.005	0.05	
MW-3	**Barium, total**	**8/20/2002**	**3.6**	**mg/l**	**0.005**	**2**	**1.6**
MW-3	Beryllium, total	8/20/2002	0.051	mg/l	0.002	-	
MW-3	**Cadmium, total**	**8/20/2002**	**0.068**	**mg/l**	**0.001**	**0.005**	**0.063**
MW-3	**Chromium, total**	**8/20/2002**	**0.69**	**mg/l**	**0.005**	**0.05**	**0.64**
MW-3	Cobalt, total	8/20/2002	0.45	mg/l	0.005	-	
MW-3	Copper, total	8/20/2002	0.26	mg/l	0.002	1	
MW-3	**Lead, total**	**8/20/2002**	**0.24**	**mg/l**	**0.01**	**0.015**	**0.225**
MW-3	**Nickel, total**	**8/20/2002**	**0.49**	**mg/l**	**0.005**	**0.1**	**0.39**
MW-3	Thallium, total	8/20/2002	0.0046	mg/l	0.002	-	
MW-3	Vanadium	8/20/2002	0.48	mg/l	0.005	-	
MW-3	Zinc, total	8/20/2002	2	mg/l	0.01	2.1	
MW-4	Antimony, total	8/20/2002	0.014	mg/l	0.01	-	
MW-4	**Arsenic, total**	**8/20/2002**	**0.062**	**mg/l**	**0.005**	**0.05**	**0.012**
MW-4	Barium, total	8/20/2002	1.8	mg/l	0.005	2	
MW-4	Beryllium, total	8/20/2002	0.018	mg/l	0.002	-	
MW-4	**Cadmium, total**	**8/20/2002**	**0.019**	**mg/l**	**0.001**	**0.005**	**0.014**
MW-4	**Chromium, total**	**8/20/2002**	**0.28**	**mg/l**	**0.005**	**0.05**	**0.23**
MW-4	Cobalt, total	8/20/2002	0.13	mg/l	0.005	-	
MW-4	Copper, total	8/20/2002	0.087	mg/l	0.002	1	
MW-4	**Lead, total**	**8/20/2002**	**0.033**	**mg/l**	**0.01**	**0.015**	**0.018**
MW-4	**Nickel, total**	**8/20/2002**	**0.29**	**mg/l**	**0.005**	**0.1**	**0.19**
MW-4	Vanadium	8/20/2002	0.19	mg/l	0.005	-	
MW-4	Zinc, total	8/20/2002	0.73	mg/l	0.01	2.1	
MW-5	Barium, total	8/20/2002	0.015	mg/l	0.005	2	
MW-5	Copper, total	8/20/2002	0.012	mg/l	0.002	1	
MW-5	Nickel, total	8/20/2002	0.011	mg/l	0.005	0.1	
MW-5	Zinc, total	8/20/2002	0.04	mg/l	0.01	2.1	
MW-6D	Barium, total	8/20/2002	0.0073	mg/l	0.005	2	
MW-6D	Copper, total	8/20/2002	0.0033	mg/l	0.002	1	

Well ID	Parameter Name [1]	Sample Date	Result	Unit	PQL [2]	MCL [3]	Exceedance
MW-6D	Zinc, total	8/20/2002	0.012	mg/l	0.01	2.1	
MW-6S	Barium, total	8/20/2002	0.13	mg/l	0.005	2	
MW-6S	Cobalt, total	8/20/2002	0.022	mg/l	0.005	-	
MW-6S	Nickel, total	8/20/2002	0.014	mg/l	0.005	0.1	
MW-6S	Zinc, total	8/20/2002	0.043	mg/l	0.01	2.1	
MW-7	Barium, total	8/20/2002	0.02	mg/l	0.005	2	
MW-7	Copper, total	8/20/2002	0.0023	mg/l	0.002	1	
MW-7	Zinc, total	8/20/2002	0.014	mg/l	0.01	2.1	
MW-6S	1,1-Dichloroethane	8/20/2002	8.7	ug/l	5	700	
MW-6S	**Tetrachloroethylene**	**8/20/2002**	**8.1**	**ug/l**	**5**	**0.7**	**7.4**
MW-6S	**Trichloroethylene**	**8/20/2002**	**6**	**ug/l**	**5**	**2.8**	**3.2**
MW-6S	Xylene	8/20/2002	11	ug/l	5	530	

[1] Table only contains detected constituents.

[2] PQL = Practical Quantitation Limit

[3] MCL = Maximum Contaminant Level (North Carolina Groundwater Standard)

Statistical Analyses Summary

Inter-Well Analysis Summary
Cherokee County Subtitle D Lined Landfill

Background Well: MW-1

Antinomy, total

%ND	Normality	Method	ND Adj.	Upper Limit (a = 95%)	Unit
92.31	-	Poisson tolerance interval	ND	13.5	ug/l

Well	Result	Significance
MW-3	40	yes
MW-4	14	yes

Arsenic, total

%ND	Normality	Method	ND Adj.	Upper Limit (a = 95%)	Unit
84.62	no	Non-parametric tolerance interval	1/2ND	11	ug/l

Well	Result	Significance
MW-3	43	yes
MW-4	62	yes

Barium, total

%ND	Normality	Method	ND Adj.	Upper Limit (a = 95%)	Unit
15.38	no	Non-parametric tolerance interval	1/2ND	3000	ug/l

Well	Result	Significance
MW-3	3600	yes
MW-4	1800	no

Beryllium, total

%ND	Normality	Method	ND Adj.	Upper Limit (a = 95%)	Unit
38.46	log-normal	Parametric Tolerance interval	1/2ND	3.822	log[ug/l]

Well	Result	Significance
MW-3	3.93183	yes
MW-4	2.89037	no

Cadmium, total

%ND	Normality	Method	ND Adj.	Upper Limit (a = 95%)	Unit
46.15	no	Non-parametric tolerance interval	1/2 ND	21	ug/l

Well	Result	Significance
MW-3	68	yes
MW-4	19	no

Chromium, total

%ND	Normality	Method	ND Adj.	Upper Limit (a = 95%)	
7.69	normal	Parametric Tolerance interval	1/2ND	142.708	ug/l

Well	Result	Significance
MW-3	690	yes
MW-4	280	yes

Cobalt, total

%ND	Normality	Method	ND Adj.	Upper Limit (a = 95%)	Unit
0.00	no	Non-parametric tolerance interval	1/2 ND	531	ug/l

Well	Result	Significance
MW-3	450	no
MW-4	130	no

Copper, total

%ND	Normality	Method	ND Adj.	Upper Limit (a = 95%)	Unit
0.00	log-normal	Parametric Tolerance interval	1/2ND	7.912	log[ug/l]

Well	Result	Significance
MW-3	5.56068	no

Lead, total

%ND	Normality	Method	ND Adj.	Upper Limit (a = 95%)	Unit
30.77	log-normal	Parametric Tolerance interval	1/2ND	6.24619	log[ug/l]

Well	Result	Significance
MW-3	5.5	no
MW-4	3	no

Nickel, total

%ND	Normality	Method	ND Adj.	Upper Limit (a = 95%)	Unit
30.77	log-normal	Parametric Tolerance interval	1/2ND	4.92231	log[ug/l]

Well	Result	Significance
MW-3	6.1944	yes
MW-4	5.6699	yes

Thallium, total

%ND	Normality	Method	ND Adj.	Upper Limit (a = 95%)	Unit
84.62	no	Non-parametric tolerance interval	1/2 ND	3	ug/l

Well	Result	Significance
MW-3	4.6	yes

Vanadium

%ND	Normality	Method	ND Adj.	Upper Limit (a = 95%)	Unit
23.08	normal	Parametric Tolerance interval	1/2ND	132.697	ug/l

Well	Result	Significance
MW-3	480	yes
MW-4	190	yes

Zinc, total

%ND	Normality	Method	ND Adj.	Upper Limit (a = 95%)	Unit
0	normal	Parametric Tolerance interval	1/2ND	374.337	ug/l

Well	Result	Significance
MW-3	2000	yes
MW-4	730	yes

NOTE: Bold-faced monitoring points indicate detected levels exceed North Carolina Groundwater Standard.

Intra-Well Analysis Summary (Metals)
Cherokee County Subtitle D Lined Landfill

Well	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Nickel	Thallium	Vanadium	Zinc
MW-3	n/a	n/a	**no**	yes	**yes**	**yes**	**yes**	no	yes	yes
MW-4	n/a	**yes**				**yes**	**yes**		yes	yes

EXPLANATION

Bold=detected levels above Standard

n/a=Significant by interwell analysis but Intrawell analysis could not be conducted due to %ND requirement

yes=detection statistically significant by intrawell analysis

Summary of Pooled Appendix I VOCs in Background Well (MW-2)
Cherokee County Subtitle D Lined Landfill

Constituent	Samples	NDs	% NDs
1,1,1,2-Tetrachloroethane	13	13	100.00
1,1,1-Trichloroethane	13	13	100.00
1,1,2,2-Tetrachloroethane	13	13	100.00
1,1,2-Trichloroethane	13	13	100.00
1,1-Dichloroethane	13	13	100.00
1,1-Dichloroethene	13	13	100.00
1,2,3-Trichloropropane	13	13	100.00
1,2-Dibromo-3-chloropropane	13	13	100.00
1,2-Dibromoethane	13	13	100.00
1,2-Dichlorobenzene	13	13	100.00
1,2-Dichloroethane	13	13	100.00
1,2-Dichloropropane	13	13	100.00
1,4-Dichlorobenzene	13	13	100.00
2-Butanone	13	13	100.00
2-Hexanone	13	13	100.00
4-Methyl-2-Pentanone	13	13	100.00
Acetone	13	13	100.00
Acrylonitrile	13	13	100.00
Benzene	13	13	100.00
Bromochloromethane	13	13	100.00
Bromodichloromethane	13	13	100.00
Bromoform	13	13	100.00
Bromomethane	13	12	92.31
Carbon disulfide	13	10	76.92
Carbon tetrachloride	13	13	100.00
Chlorobenzene	13	13	100.00
Chloroethane	13	13	100.00
Chloroform	13	13	100.00
Chloromethane	13	13	100.00
cis-1,2-Dichloroethene	13	13	100.00
cis-1,3-Dichloropropene	13	13	100.00
Chlorodibromomethane	13	13	100.00
Dibromomethane	13	13	100.00
Ethylbenzene	13	13	100.00
Iodomethane	13	13	100.00
Dichloromethane	13	13	100.00
Styrene	13	13	100.00
Tetrachloroethylene	13	13	100.00
Toluene	13	13	100.00
trans-1,2-Dichloroethene	13	13	100.00
trans-1,3-Dichloropropene	13	13	100.00
trans-1,4-Dichloro-2-butene	13	13	100.00
Trichloroethylene	13	13	100.00
Trichlorofluoromethane	13	13	100.00
Vinyl acetate	13	13	100.00
Vinyl chloride	13	13	100.00
Xylene	13	13	100.00
Total	**611**	**607**	**99.35**

Poisson Prediction Interval Based upon Pooled Background Appendix I VOCs
Cherokee County Subtitle D Lined Landfill

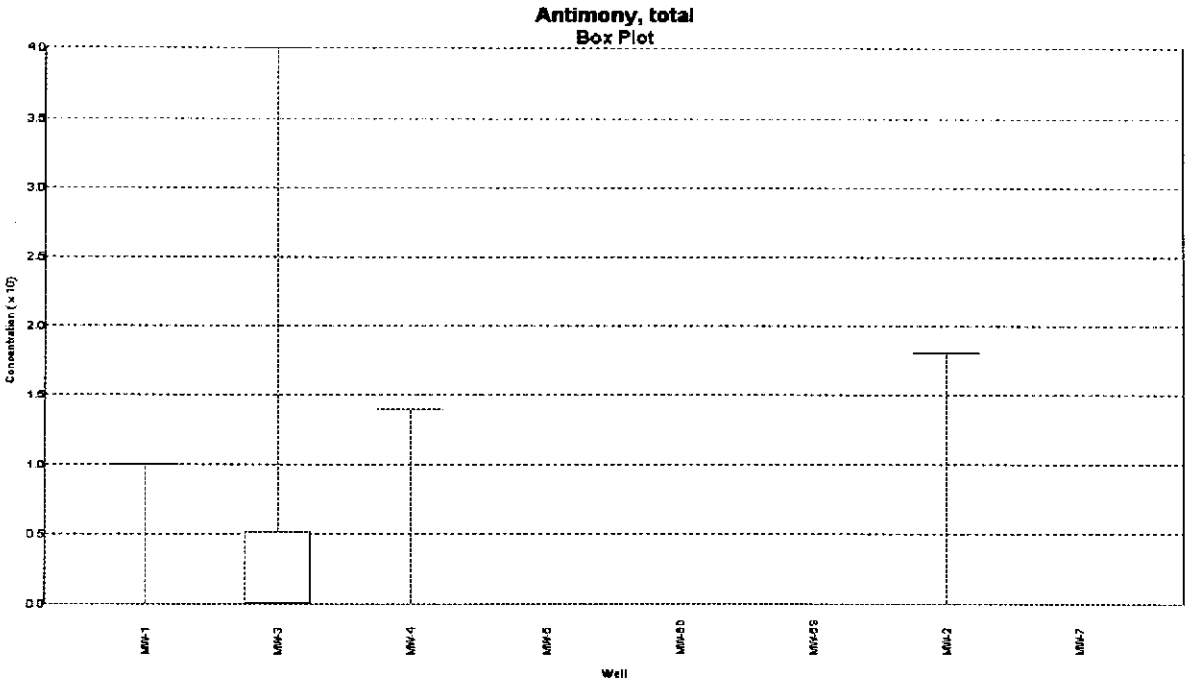
All detected VOCs (Background Well: MW-1)

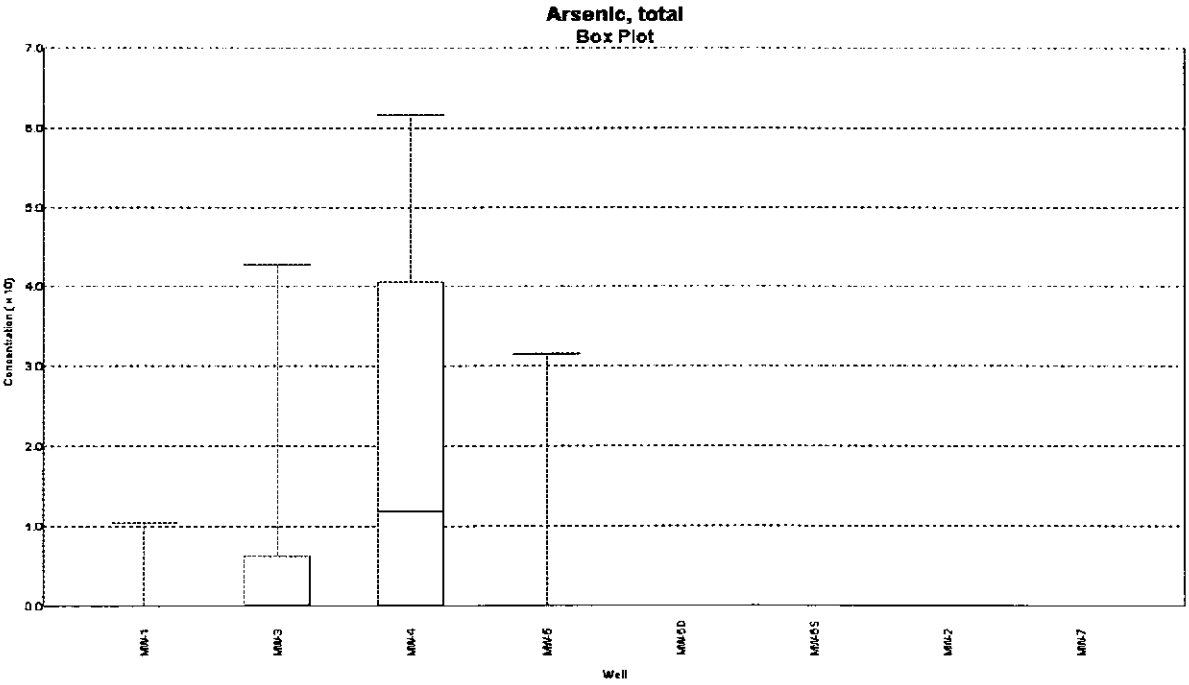
Constituent	MW-6S
Tetrachloroethylene	x
Trichloroethylene	x
1,1-Dichloroethane	x
Xylene	x
Detection(s) per Scan	4.00

Total number of sampling events [n] = 13
Total number of detections in background wells [y] = 4
Number of comparisons (downgradient wells) [k] = 7
One-sided value of Student's t-statistic (95% confidence) [t] = 2.8335
Expected number of detections in a single future sample [y*] = **2.2765**

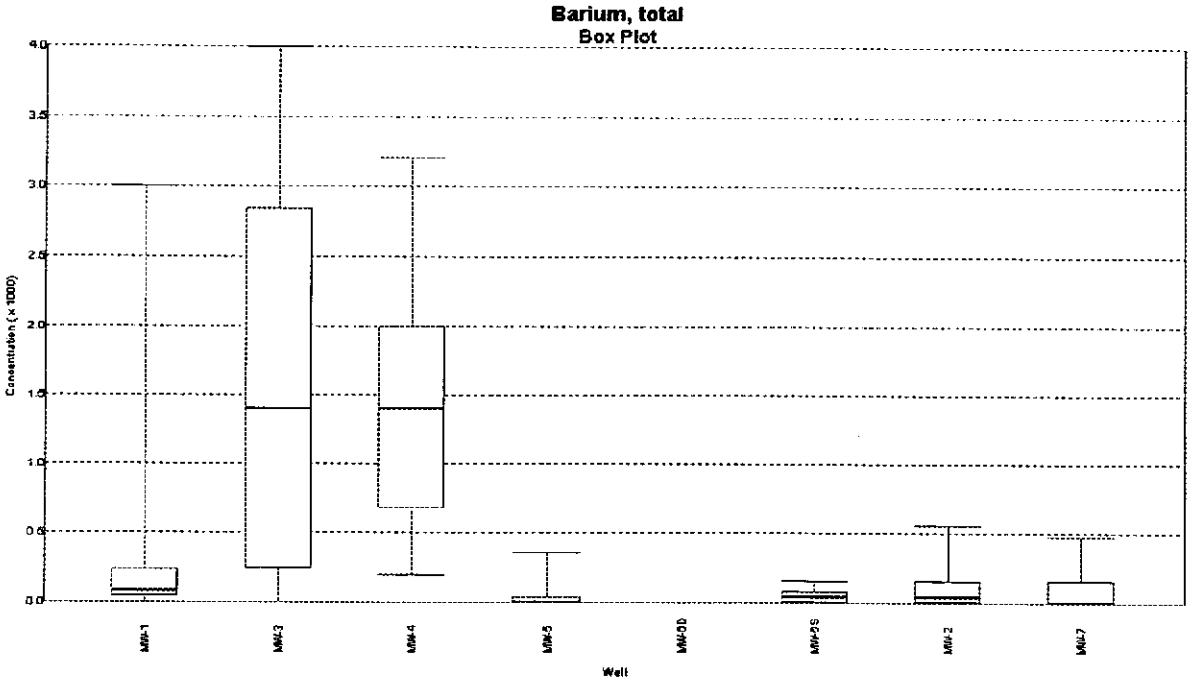
Statistically Significant VOC detections within MW-6S at a 95% confidence level

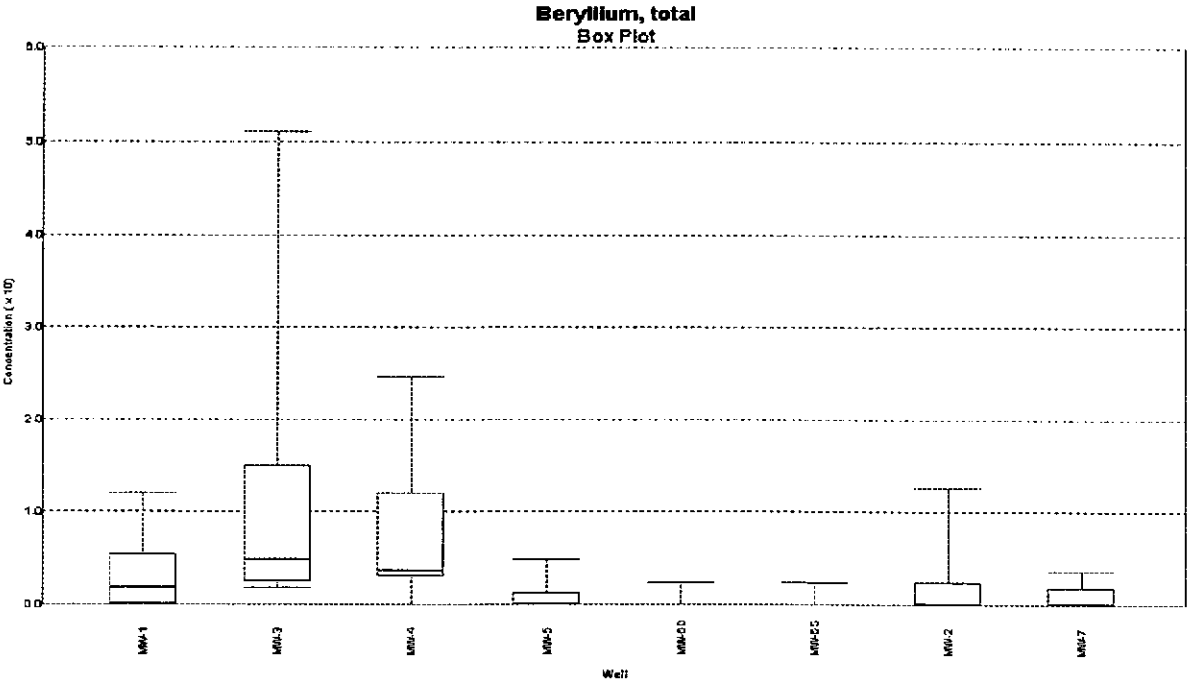
Box Plots for Select Constituents
Cherokee County Subtitle D Lined Landfill



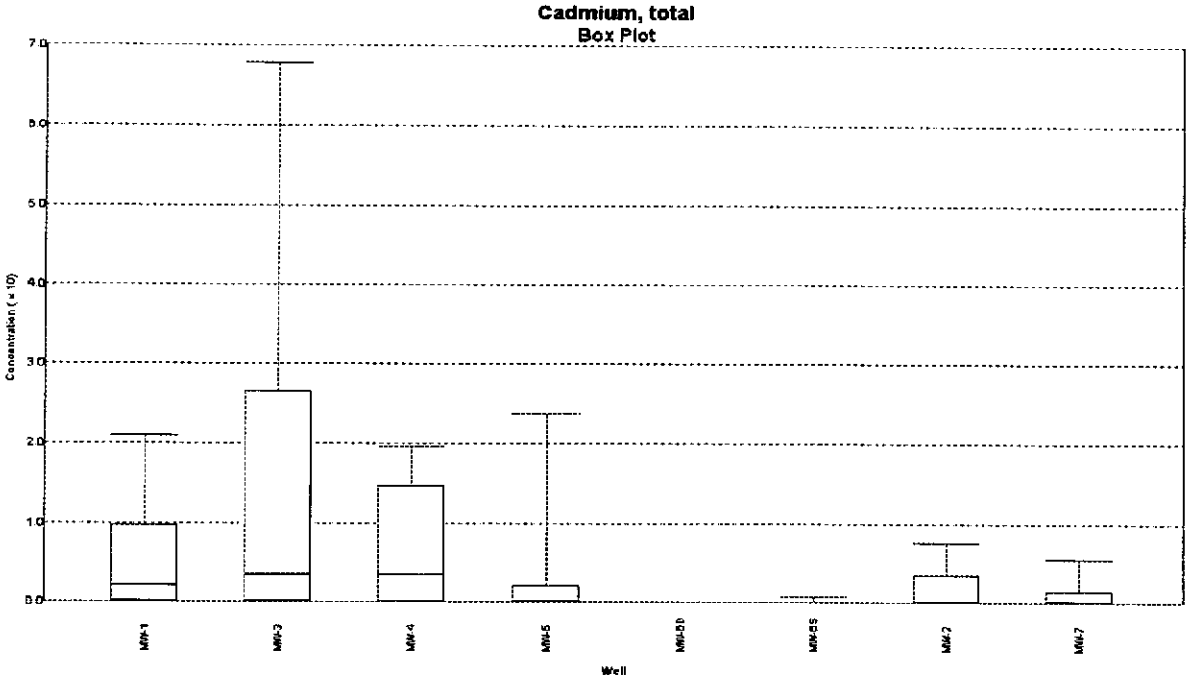


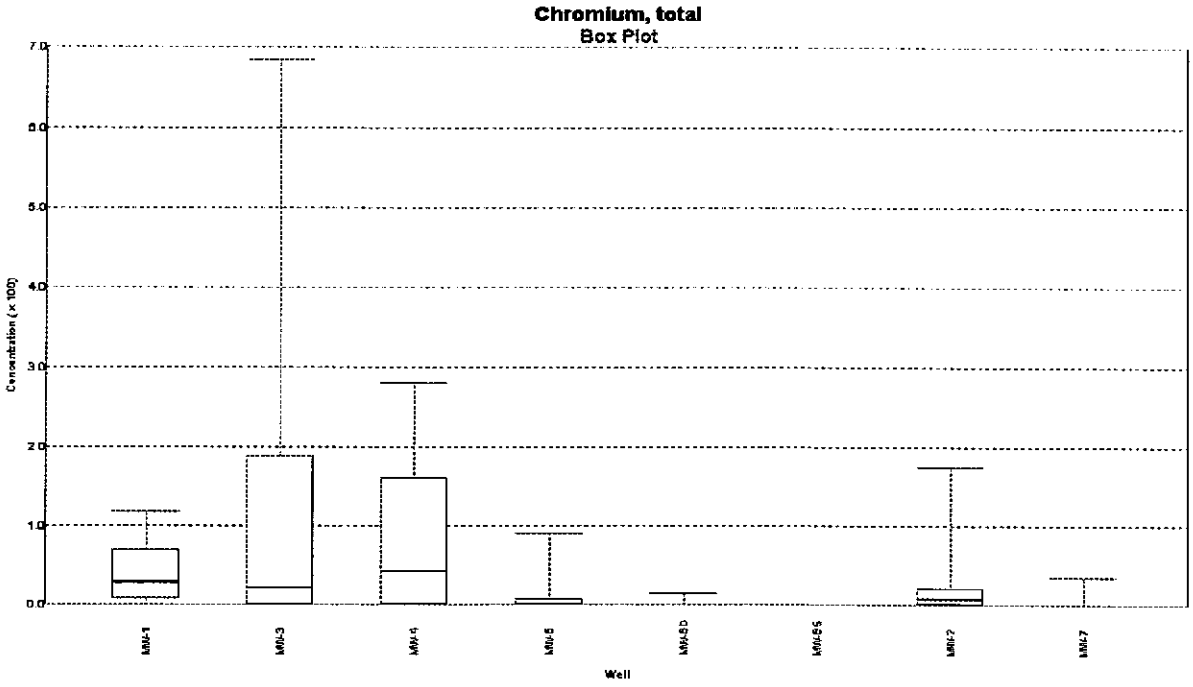
Box Plots for Select Constituents
Cherokee County Subtitle D Lined Landfill



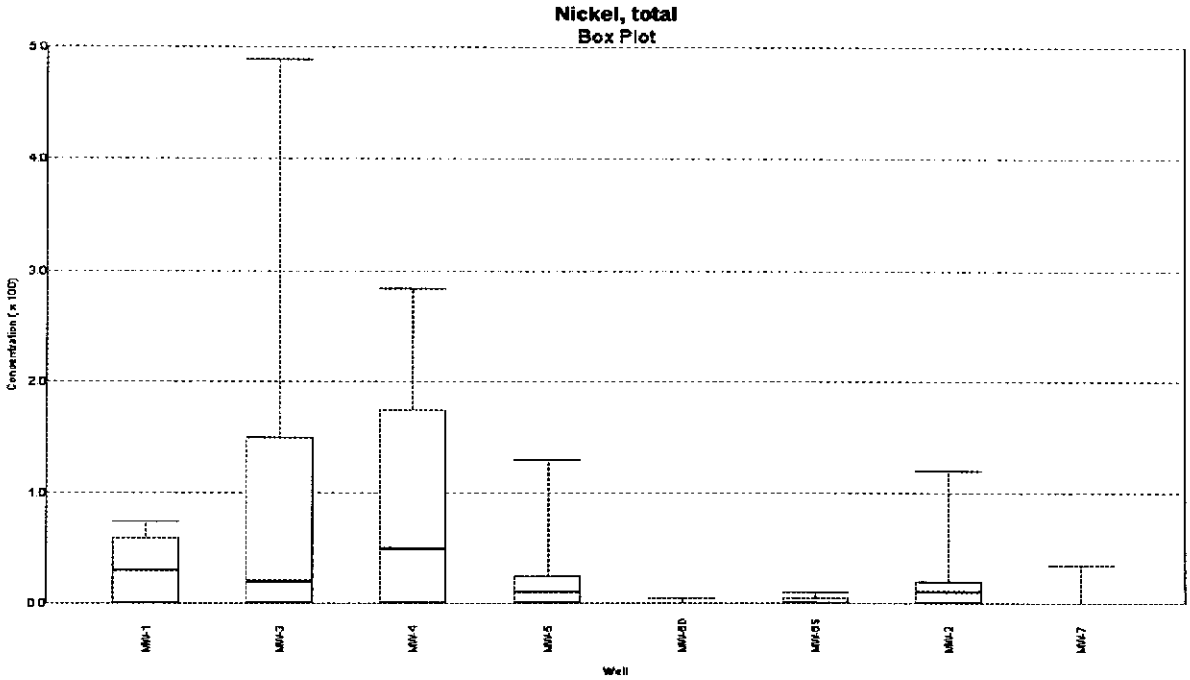


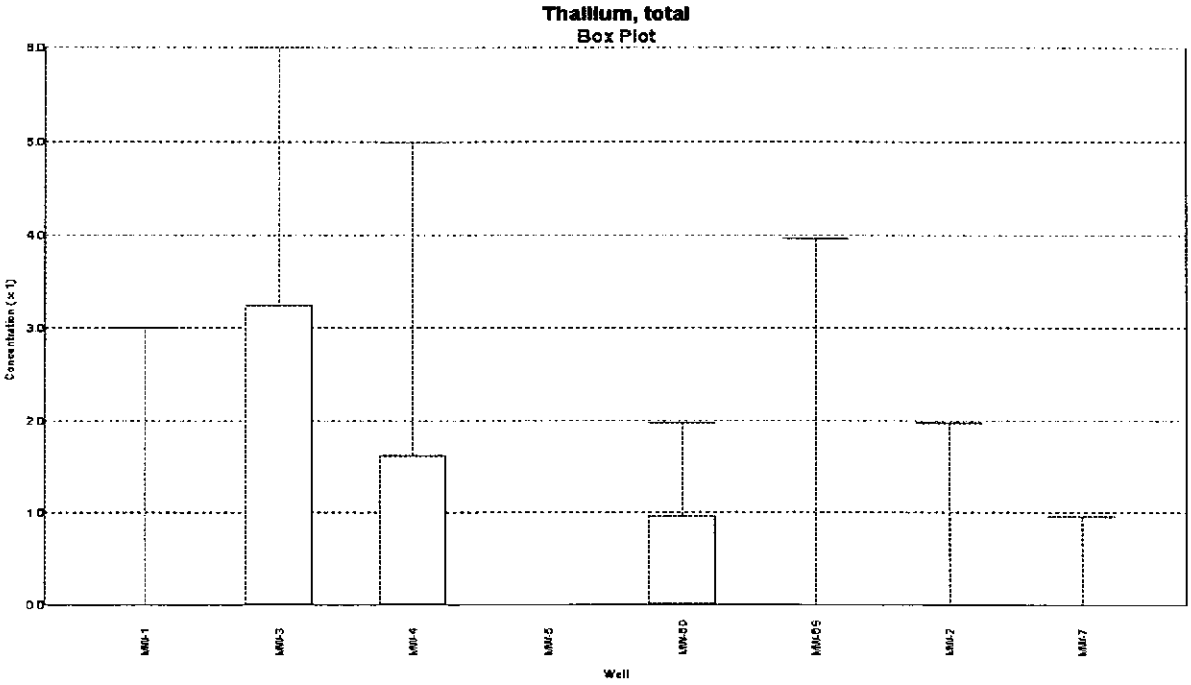
Box Plots for Select Constituents
Cherokee County Subtitle D Lined Landfill



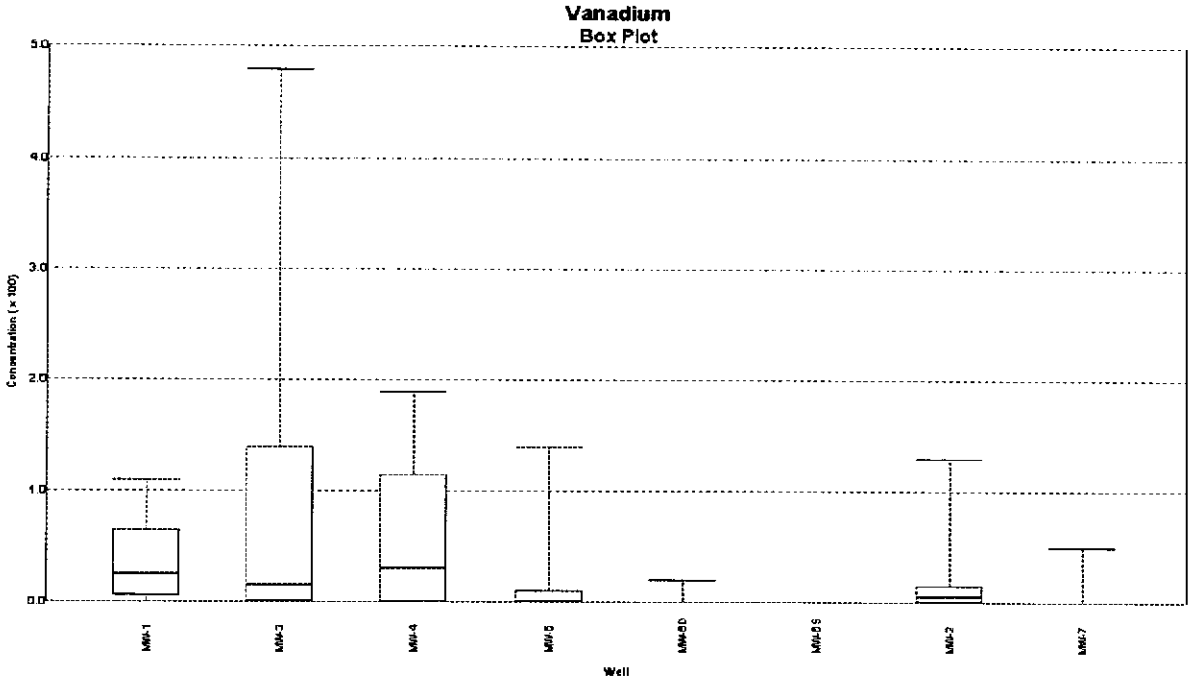


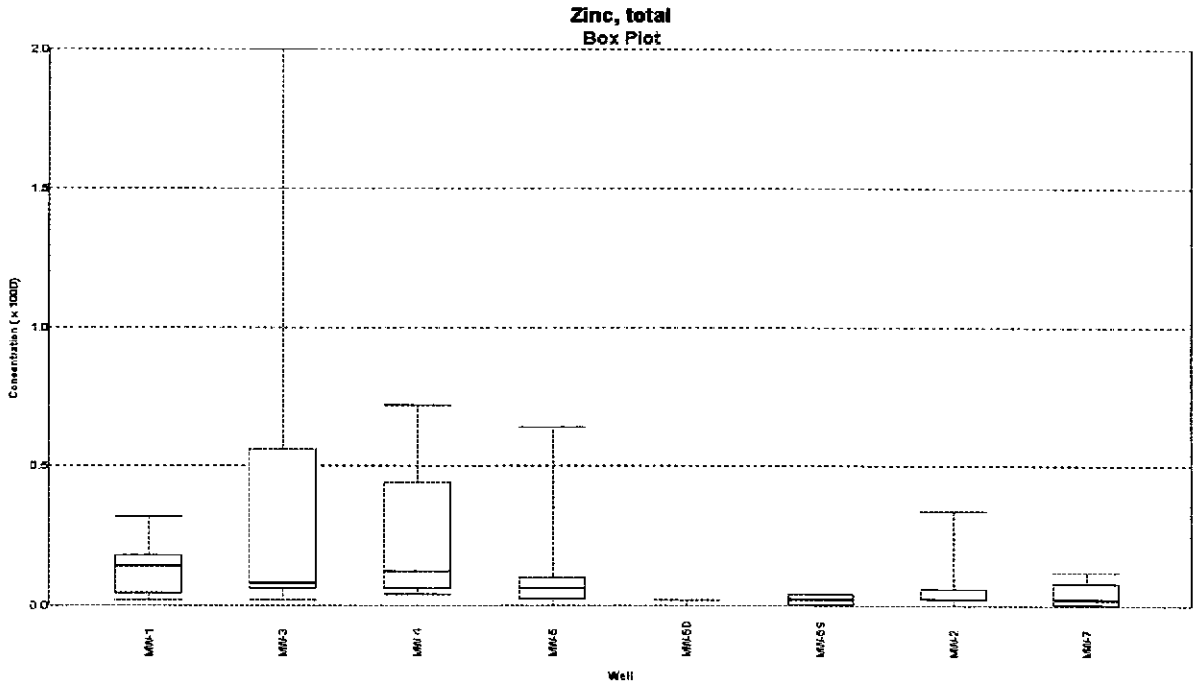
Box Plots for Select Constituents
Cherokee County Subtitle D Lined Landfill



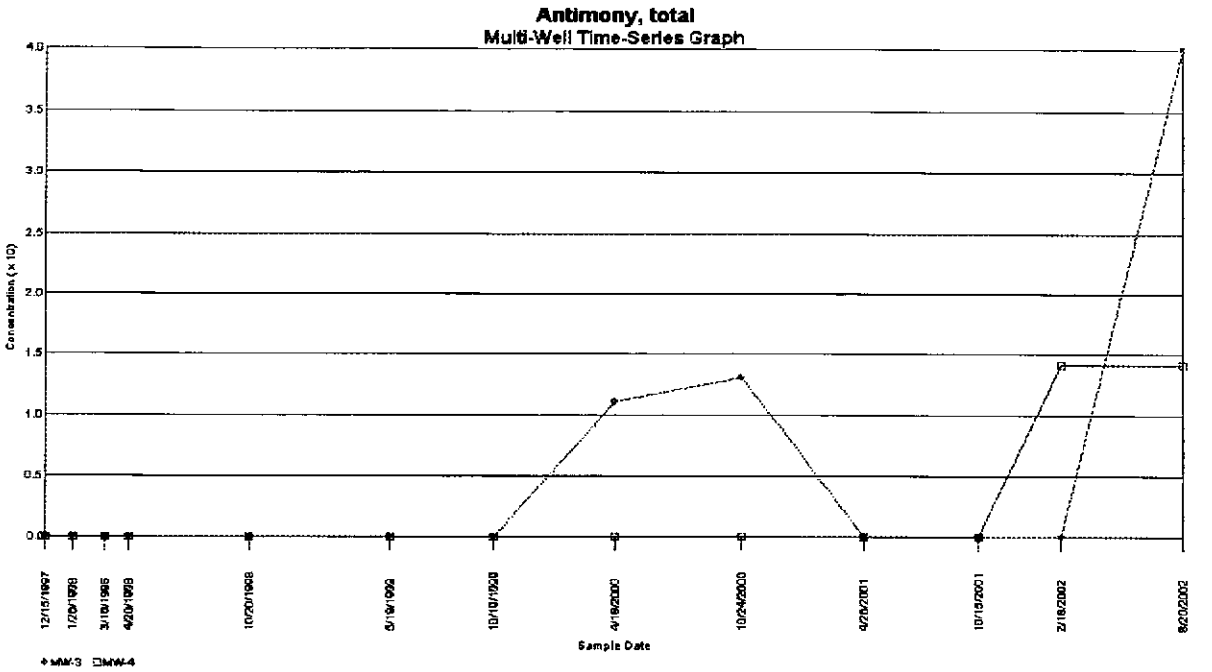


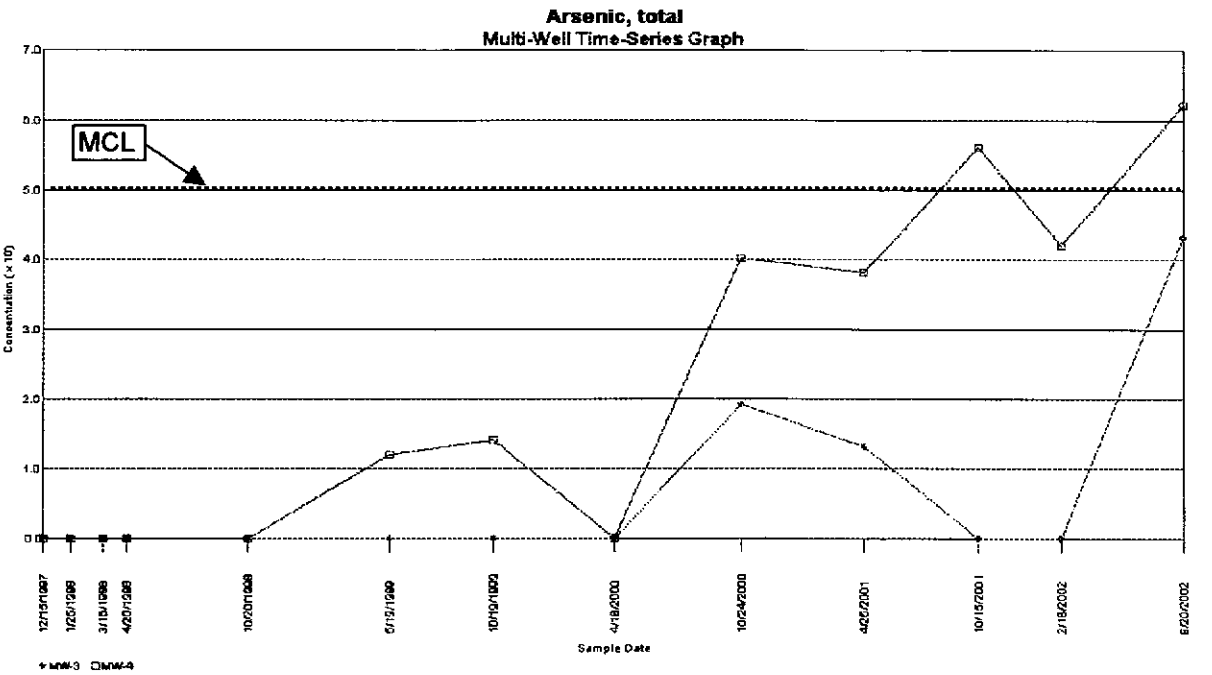
Box Plots for Select Constituents
Cherokee County Subtitle D Lined Landfill



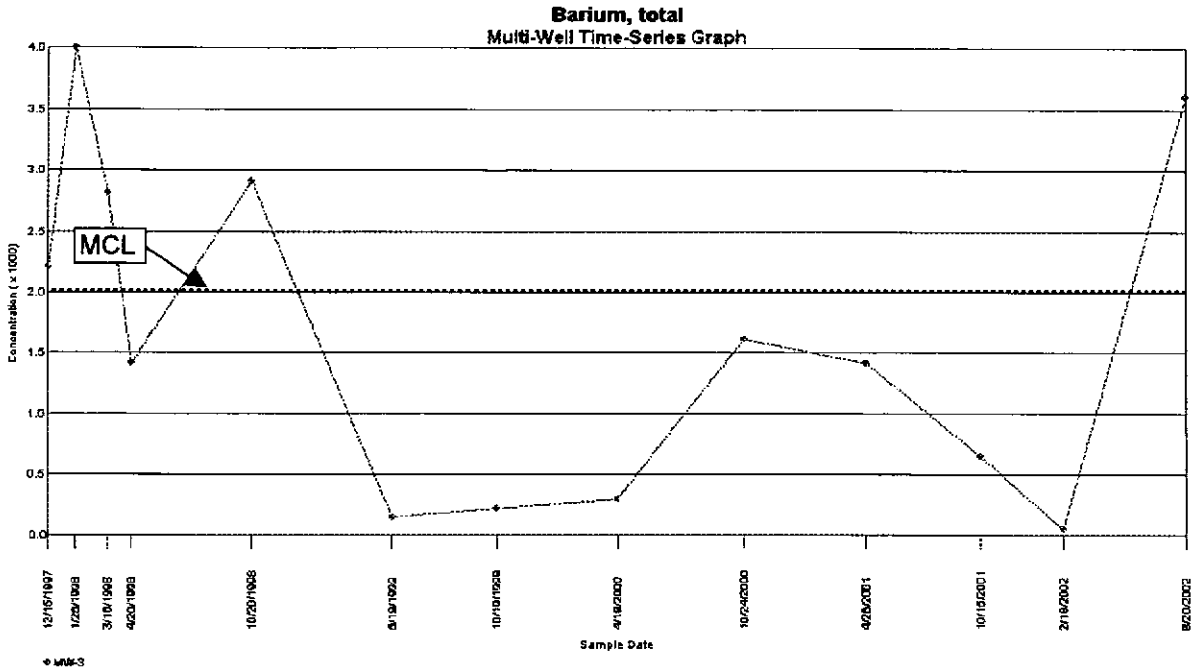


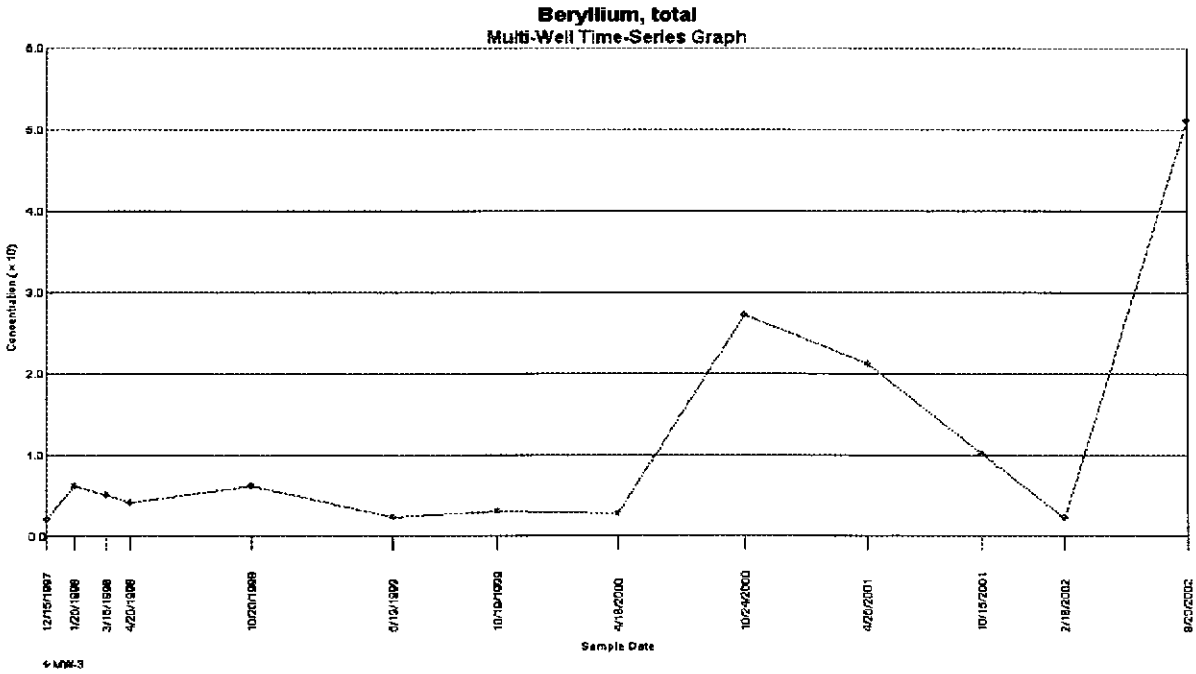
Time Series Plots for Select Constituents (Metals)
Cherokee County Subtitle D Lined Landfill



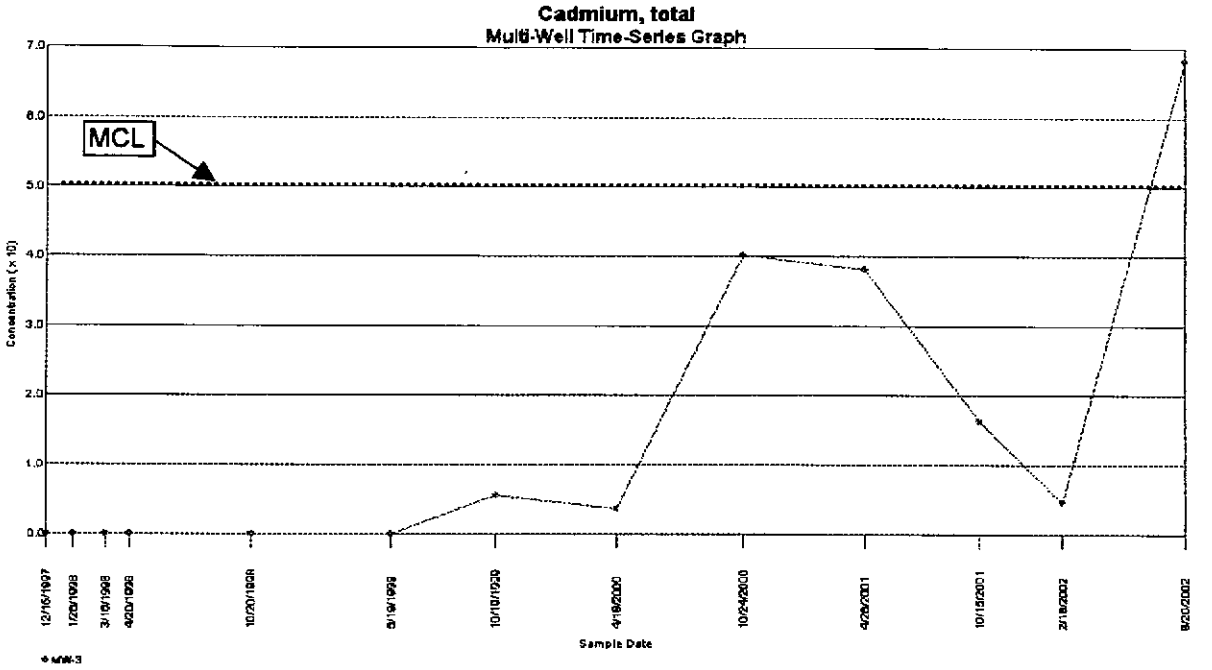


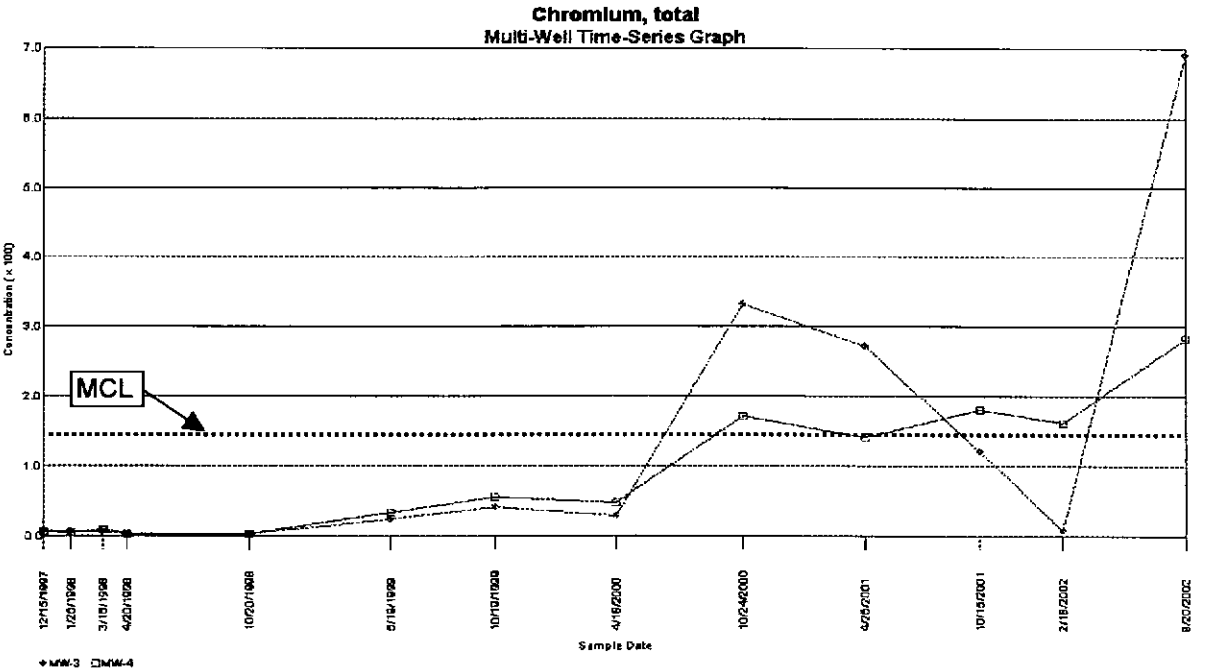
Time Series Plots for Select Constituents (Metals)
Cherokee County Subtitle D Lined Landfill



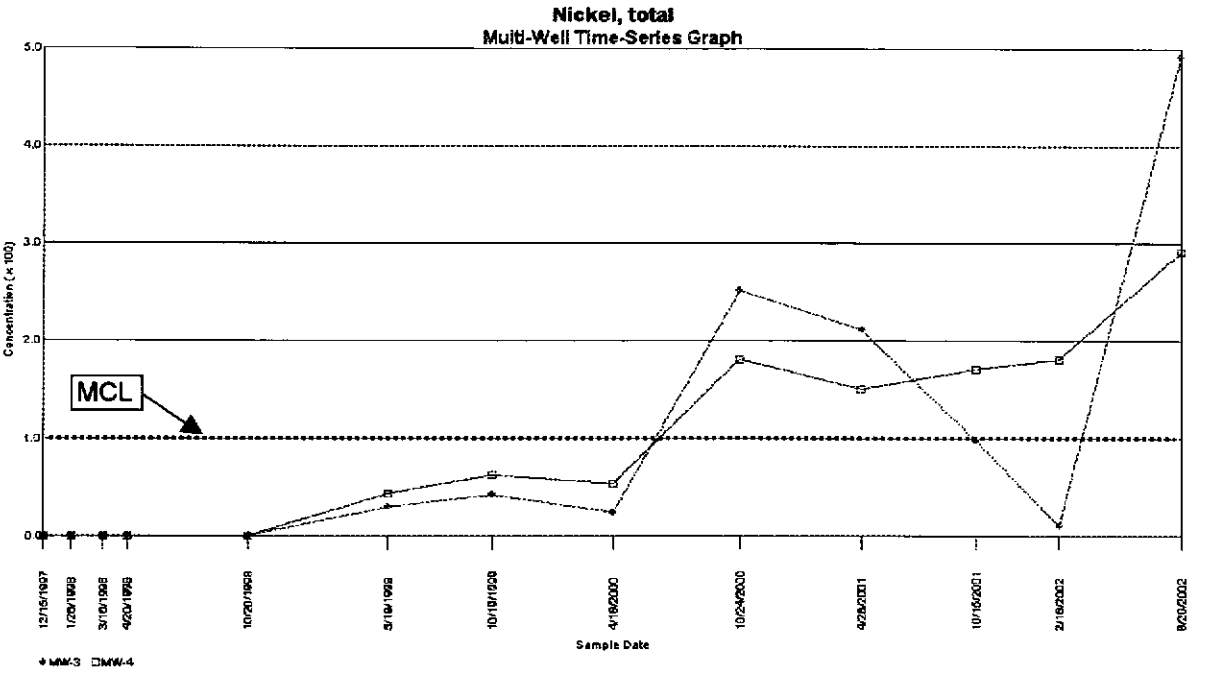


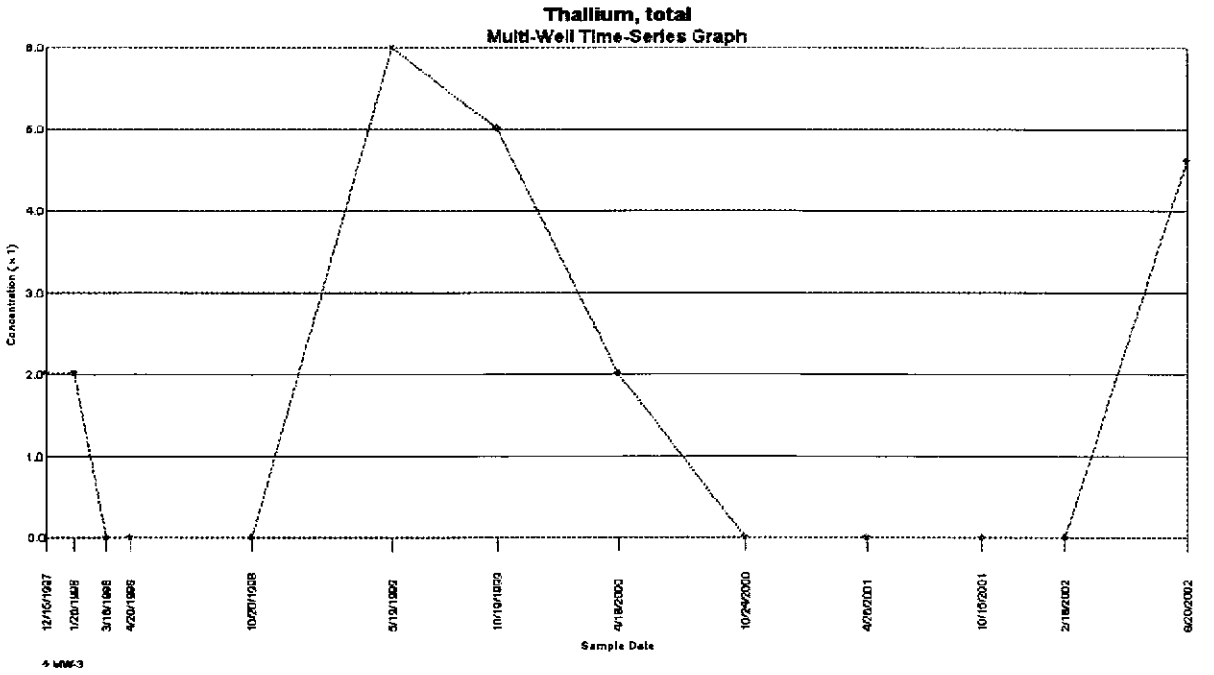
Time Series Plots for Select Constituents (Metals)
Cherokee County Subtitle D Lined Landfill



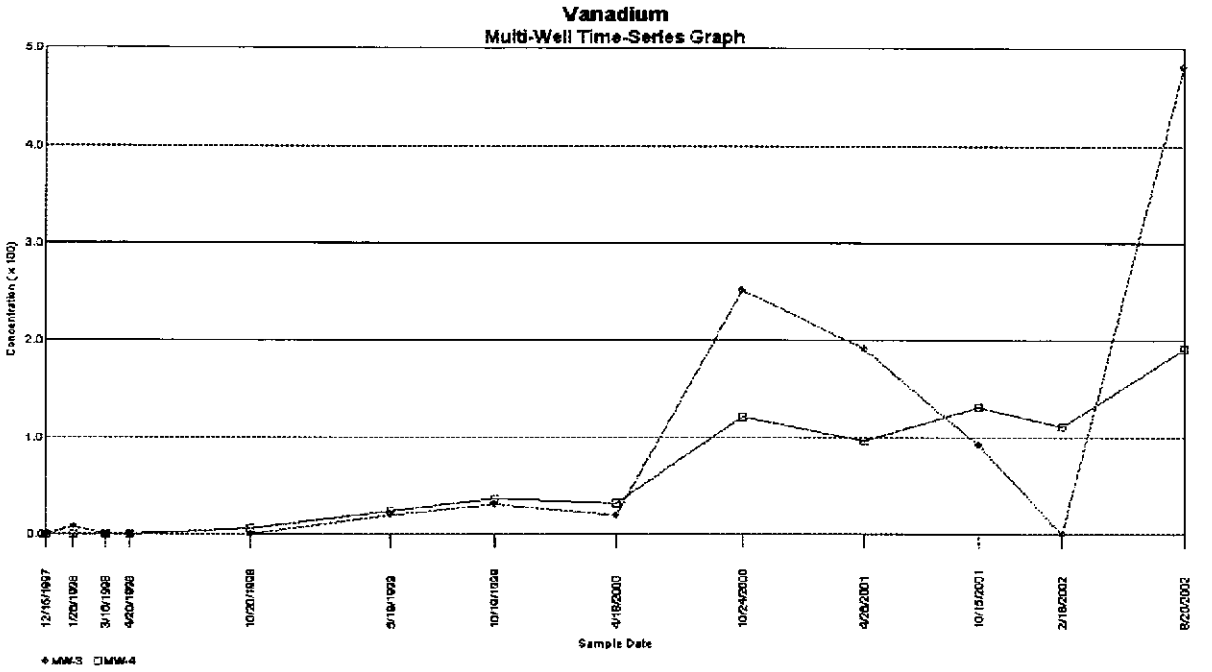


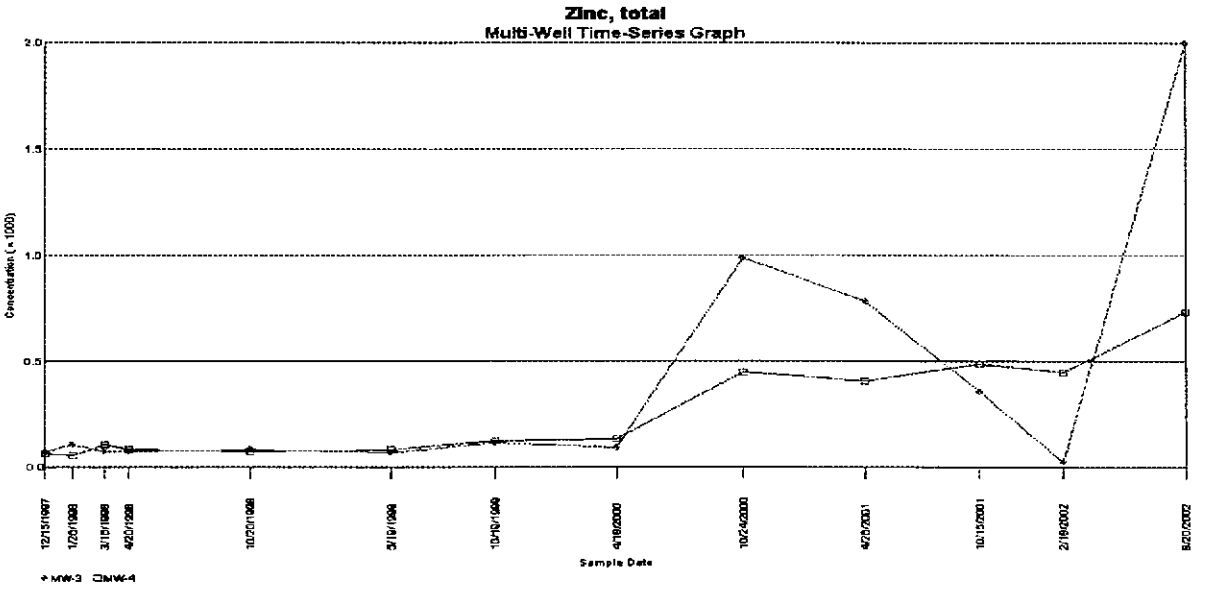
Time Series Plots for Select Constituents (Metals)
Cherokee County Subtitle D Lined Landfill



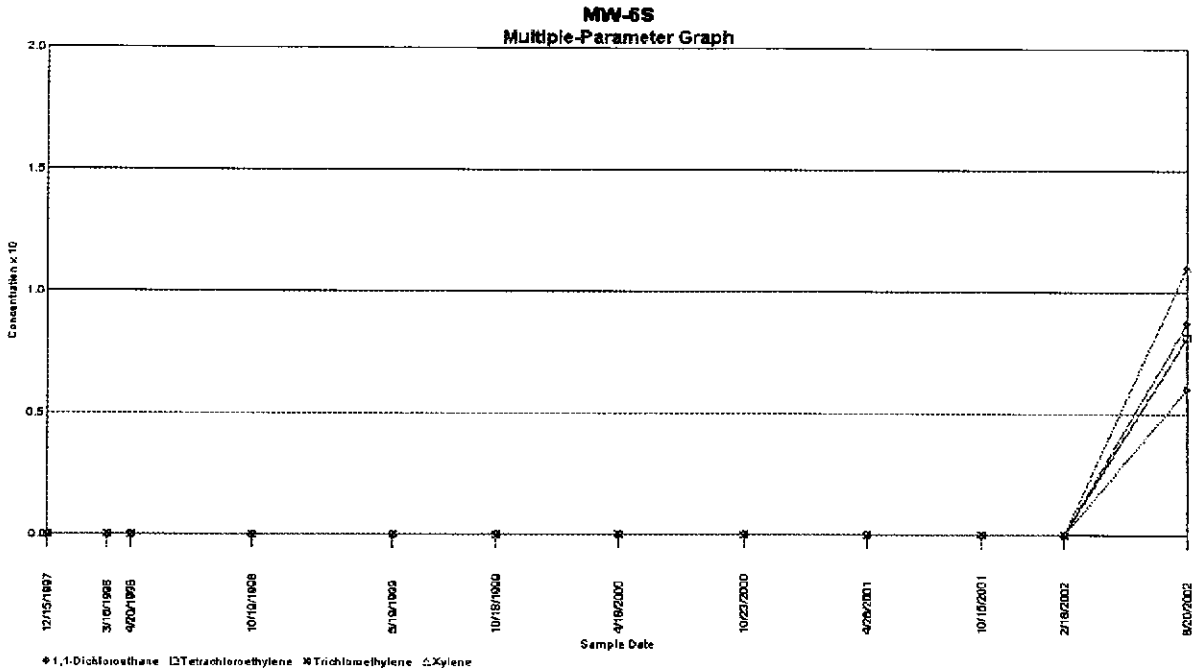


Time Series Plots for Select Constituents (Metals)
Cherokee County Subtitle D Lined Landfill

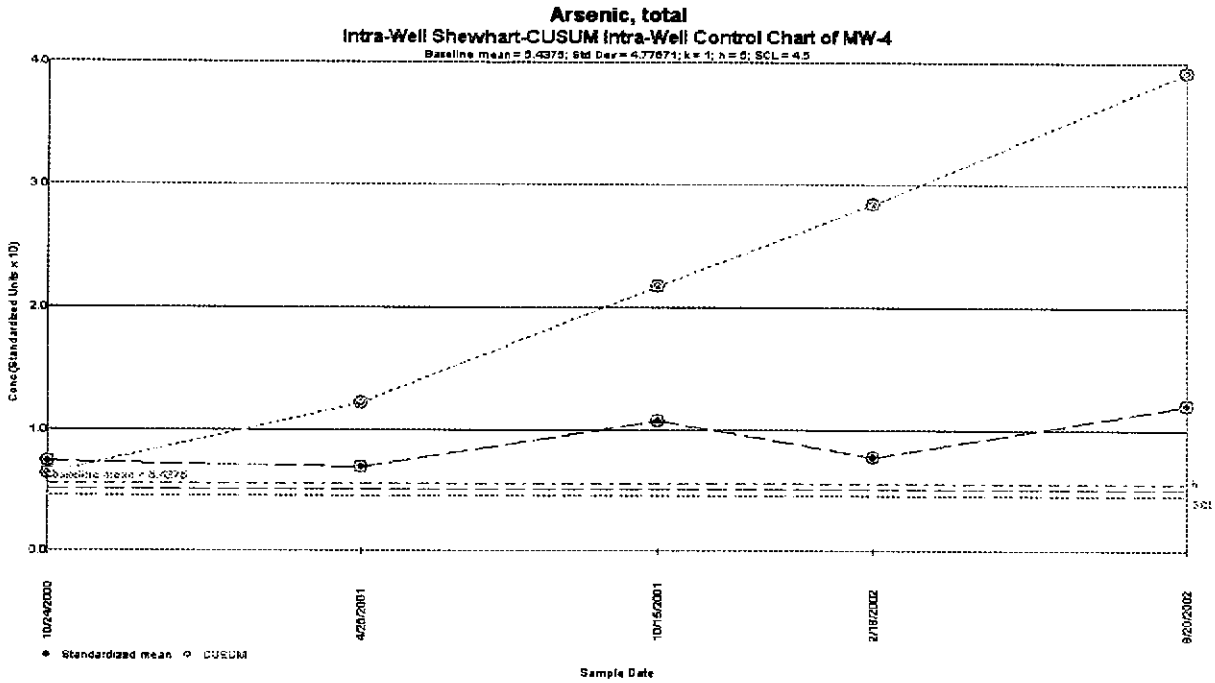


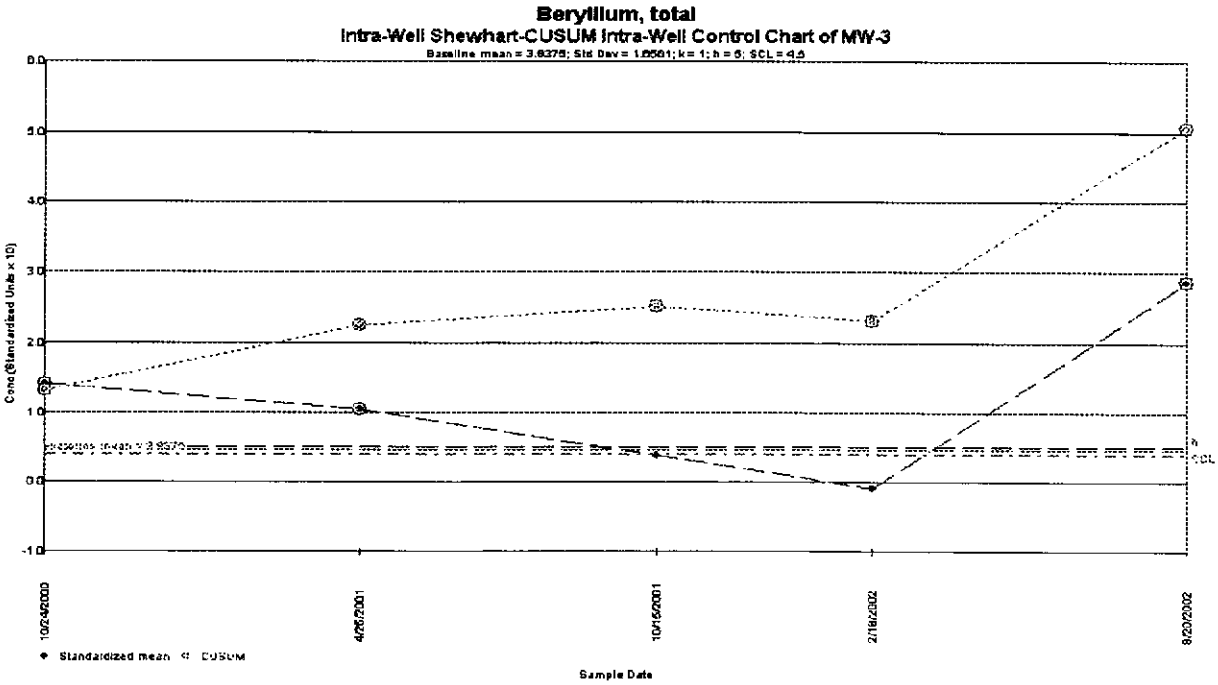


Time Series Plots for Select Constituents (VOCs)
Cherokee County Subtitle D Lined Landfill

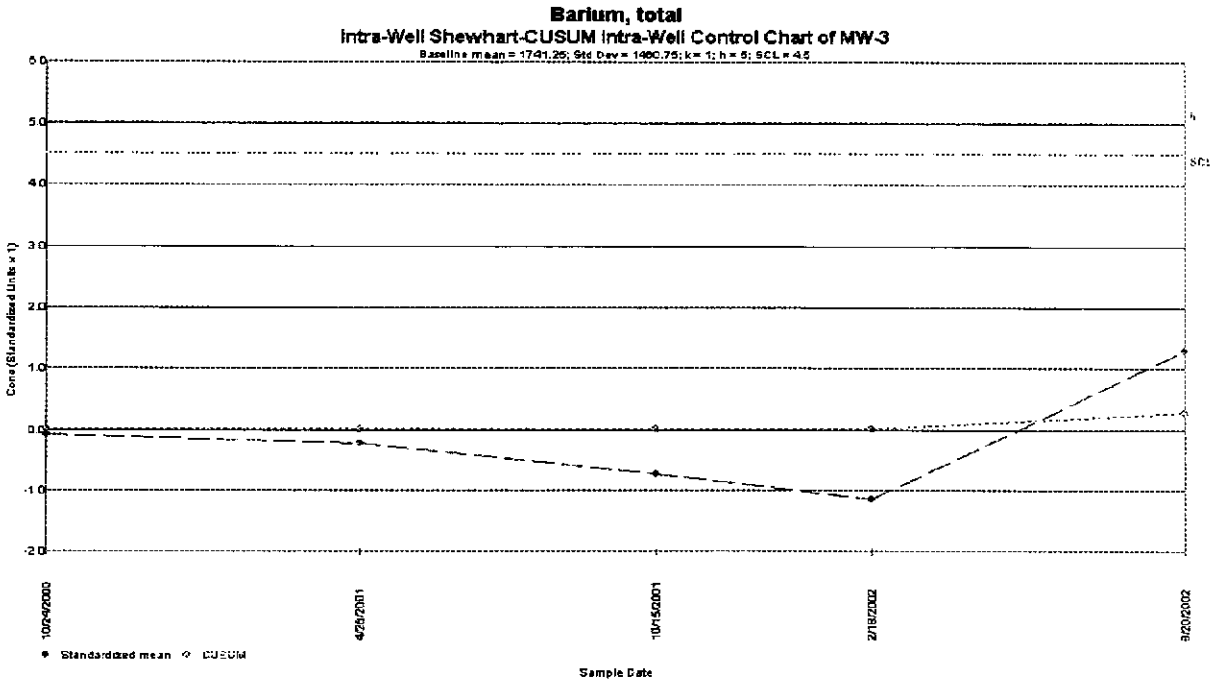


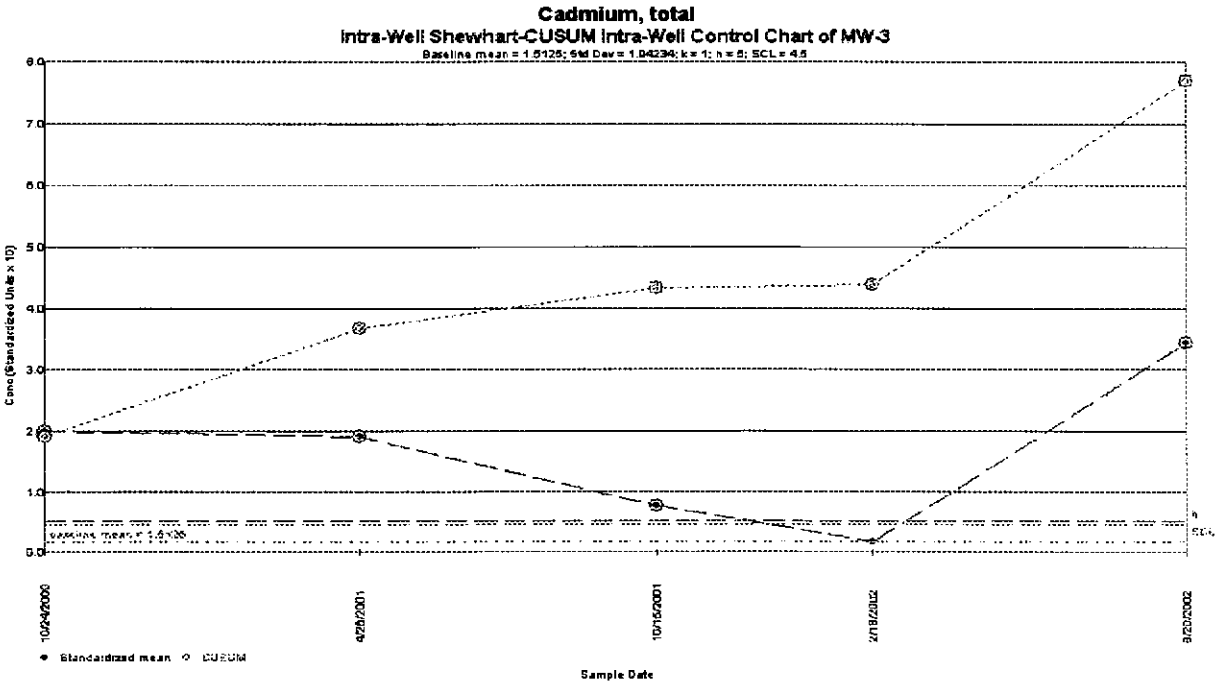
Shewhart-CUSUM Charts for Selected Constituents
Cherokee County Subtitle D Lined Landfill



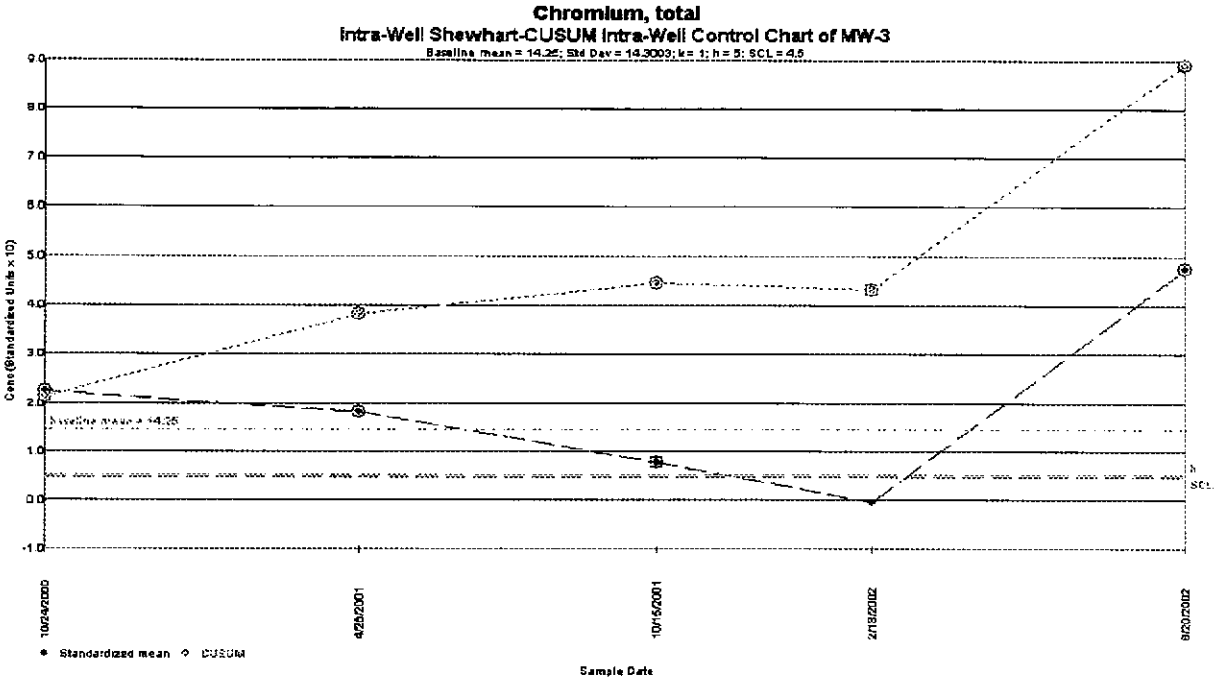


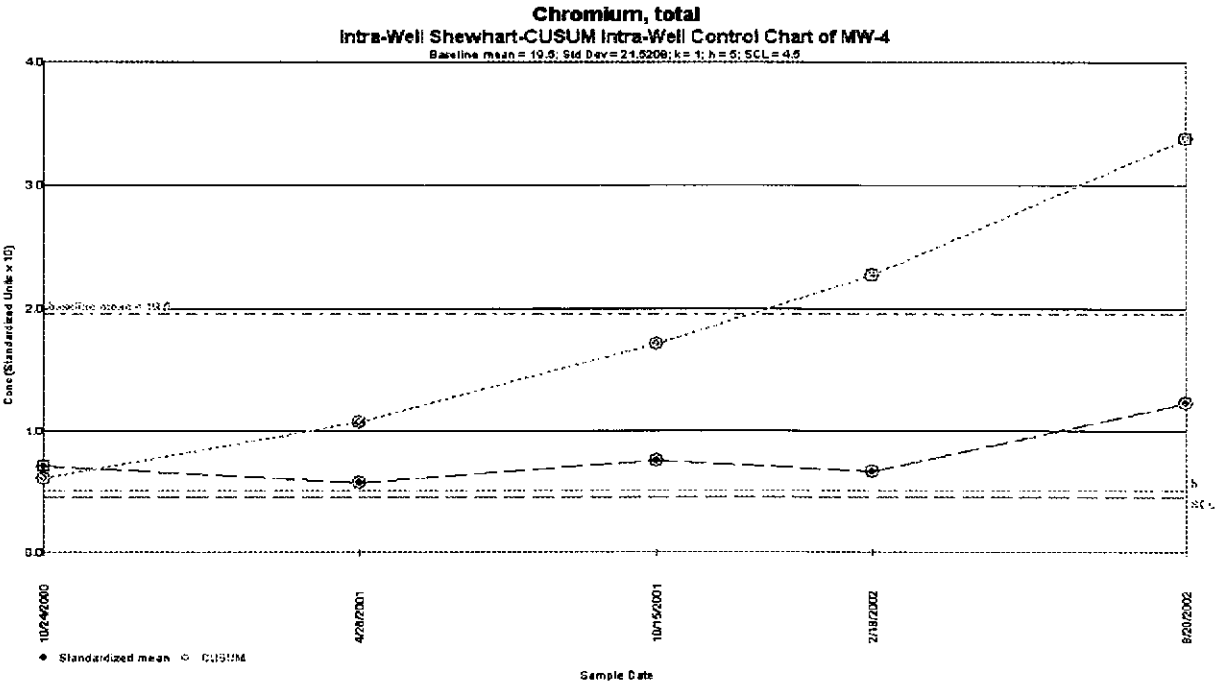
Shewhart-CUSUM Charts for Selected Constituents
Cherokee County Subtitle D Lined Landfill



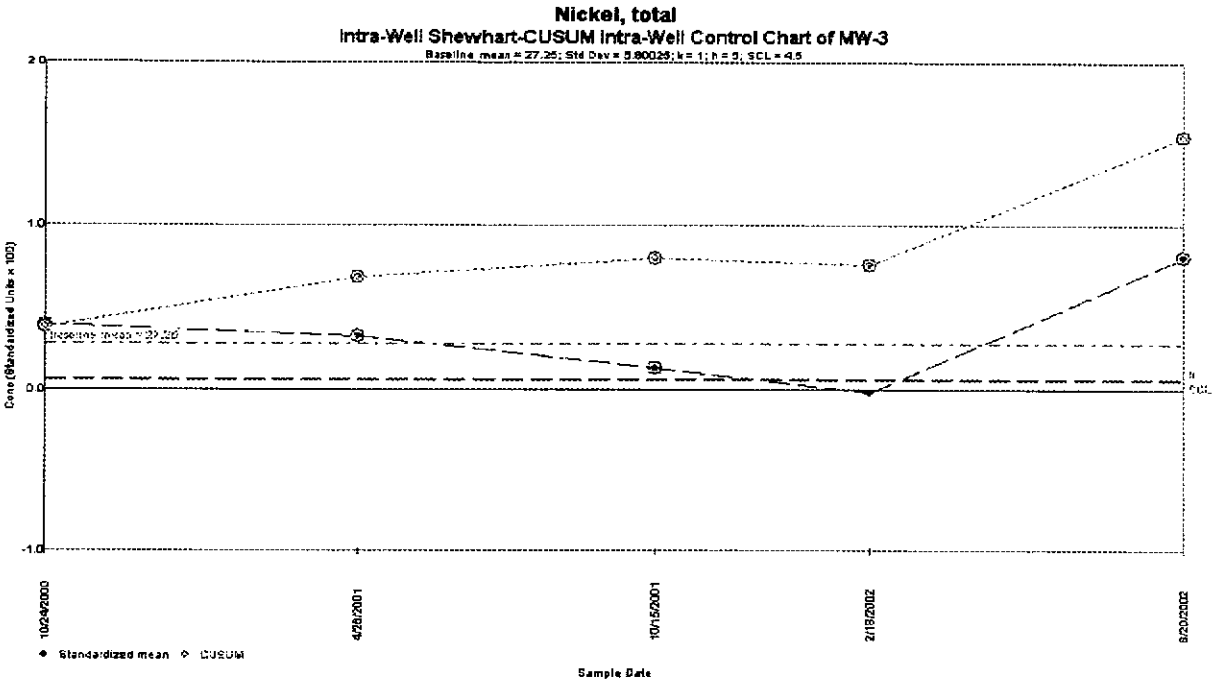


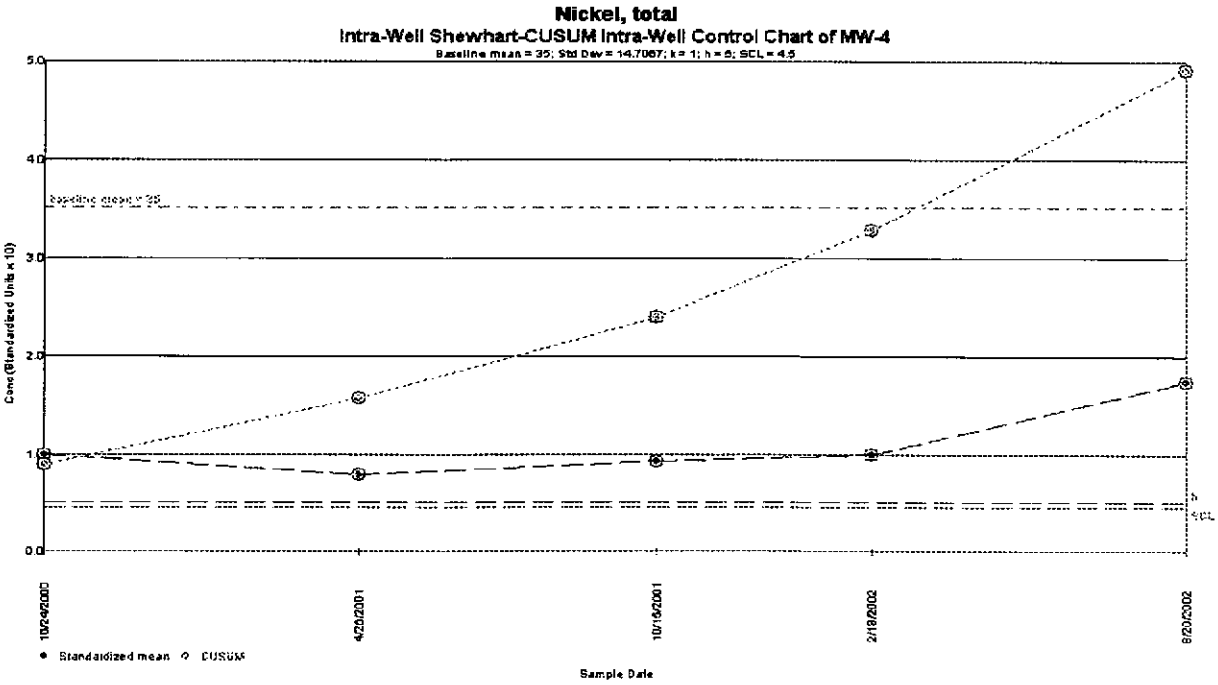
Shewhart-CUSUM Charts for Selected Constituents
Cherokee County Subtitle D Lined Landfill



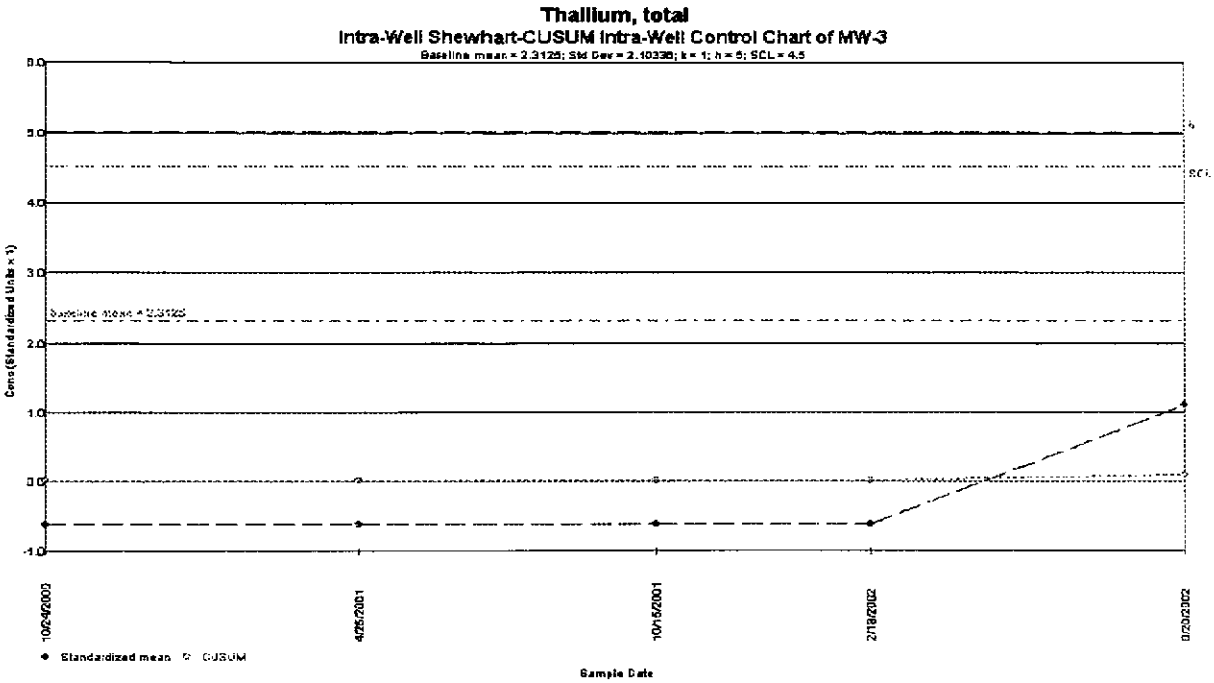


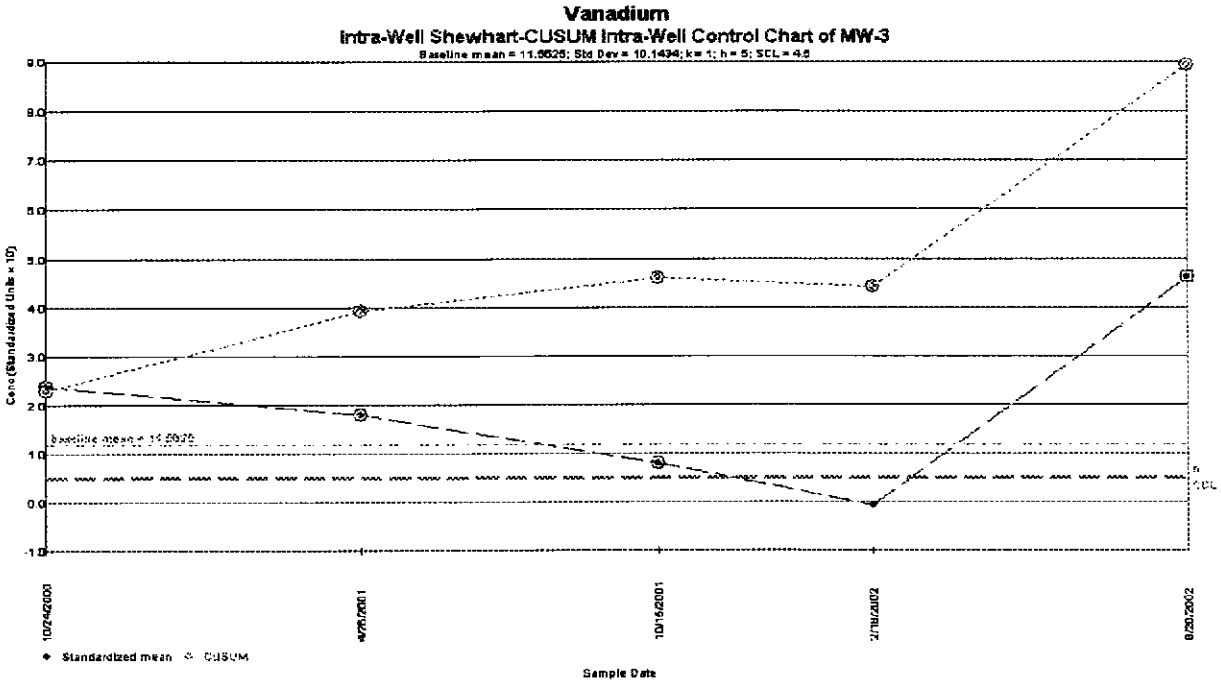
Shewhart-CUSUM Charts for Selected Constituents
Cherokee County Subtitle D Lined Landfill



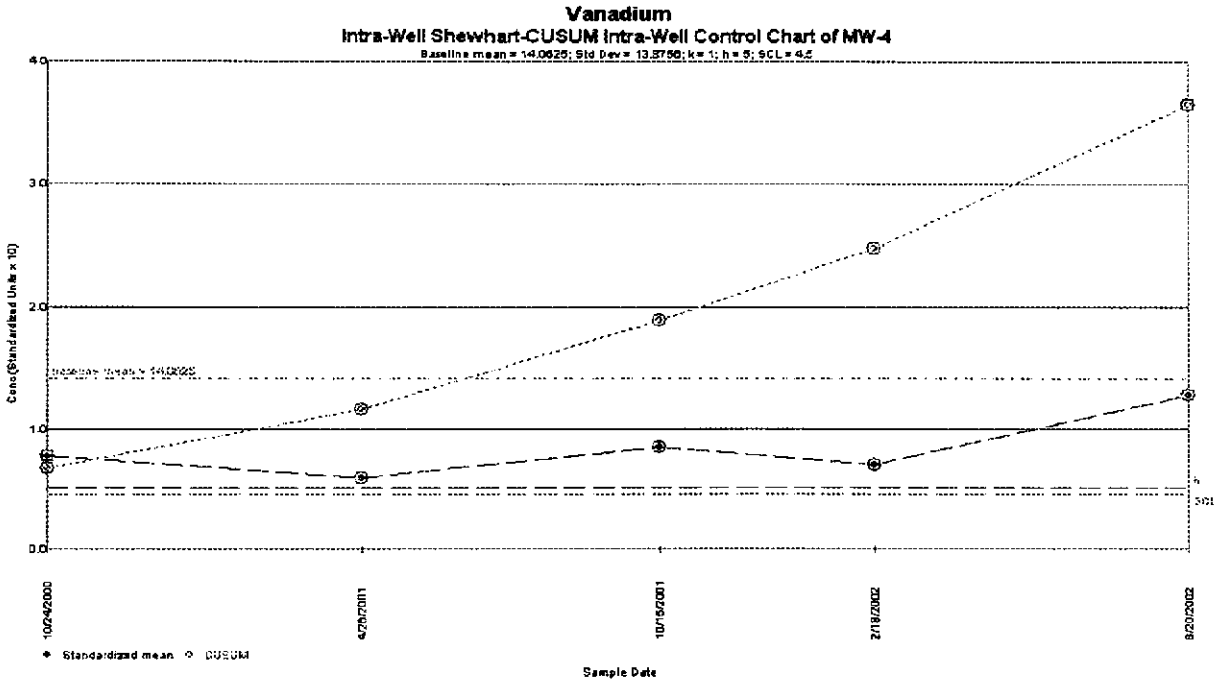


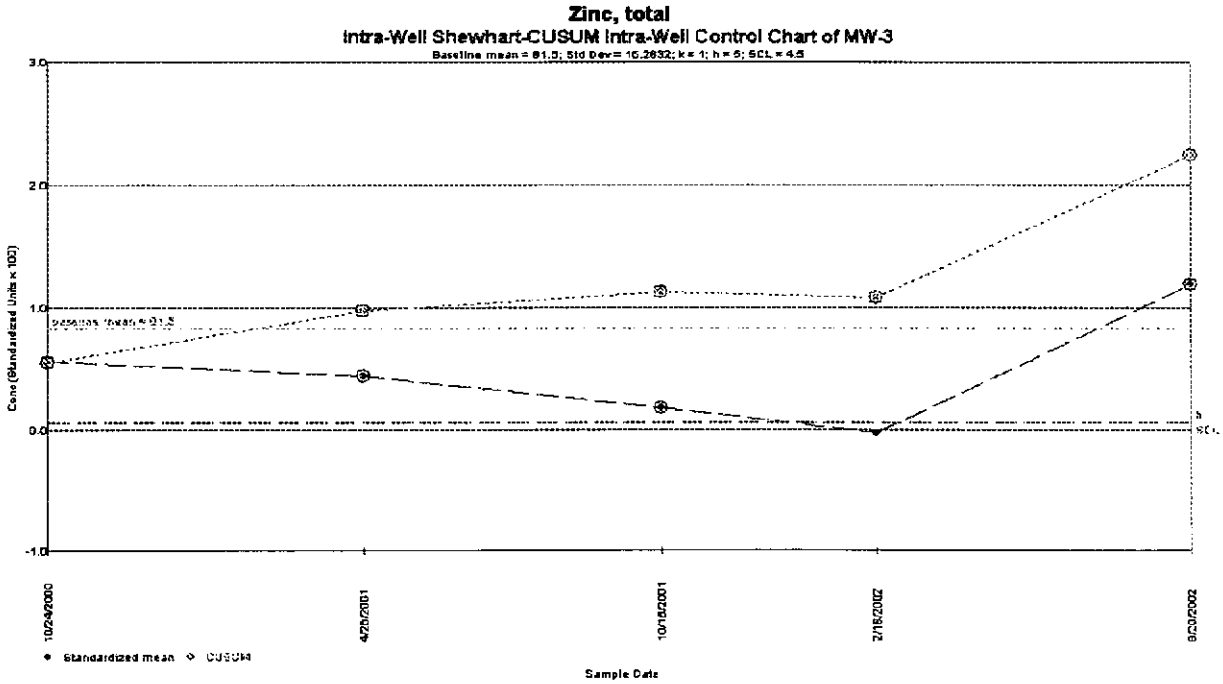
Shewhart-CUSUM Charts for Selected Constituents
Cherokee County Subtitle D Lined Landfill



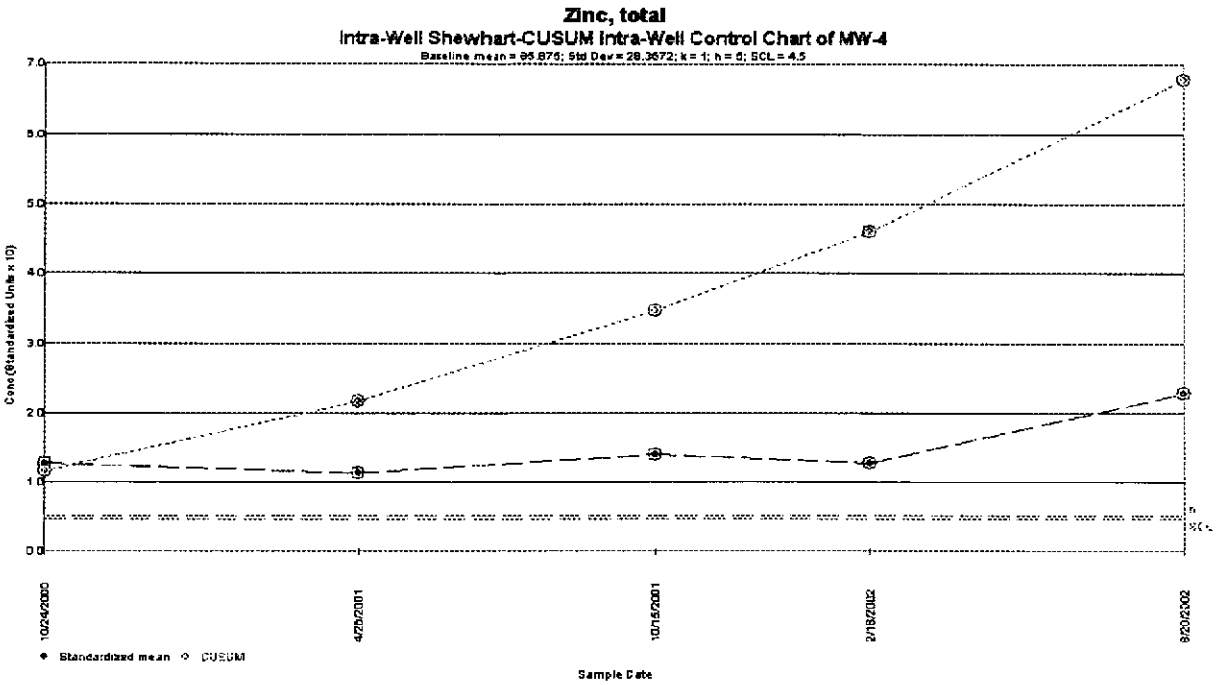


Shewhart-CUSUM Charts for Selected Constituents
Cherokee County Subtitle D Lined Landfill





Shewhart-CUSUM Charts for Selected Constituents
Cherokee County Subtitle D Lined Landfill



Basic Statistics

Basic Statistics

Parameter: Antimony, total

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

	Total Observations
103	
Total Non-Detects	96
Pooled Mean	7.85437
Pooled Std Dev	4.86969
Background Mean	7.30769
Background Std Dev	3.54459

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	13	12	92.3077	95

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	7.30769	3.54459	0	679	52.2308

Compliance Wells

There are 7 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-3	13	10	76.9231	129
MW-4	13	11	84.6154	103
MW-5	13	13	100	95
MW-6D	13	13	100	95
MW-6S	13	13	100	95
MW-2	13	12	92.3077	105
MW-7	12	12	100	92

Well	Mean	Std Dev	Dif From Bk	Std Err	Rank Sum	Rank Mean
MW-3	9.92308	9.81038	2.61538	1.94936	785	60.3846
MW-4	7.92308	4.29072	0.615385	1.94936	734.5	56.5
MW-5	7.30769	3.54459	0	1.94936	630.5	48.5
MW-6D	7.30769	3.54459	0	1.94936	630.5	48.5
MW-6S	7.30769	3.54459	0	1.94936	630.5	48.5
MW-2	8.07692	4.44338	0.769231	1.94936	684	52.6154
MW-7	7.66667	3.44656	0.358974	1.98956	582	48.5

Analysis of Variance Statistics

SS Wells	72.3027
SS Total	2418.82

Kruskal-Wallis Statistics

Non-Detect Rank	48.5
Background Rank Sum	679
Background Rank Mean	52.2308
H Statistic	2.02488
H Adjusted for Ties	10.6375

Basic Statistics

Parameter: Arsenic, total

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

	Total Observations
103	
Total Non-Detects	90
Pooled Mean	10.3845
Pooled Std Dev	10.0501
Background Mean	7.96923
Background Std Dev	2.55192

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	13	11	84.6154	103.6

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	7.96923	2.55192	0	683.5	52.5769

Compliance Wells

There are 7 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-3	13	10	76.9231	150
MW-4	13	6	46.1538	299
MW-5	13	12	92.3077	122
MW-6D	13	13	100	100
MW-6S	13	13	100	100
MW-2	13	13	100	100
MW-7	12	12	100	95

Well	Mean	Std Dev	Dif From Bk	Std Err	Rank Sum	Rank Mean
MW-3	11.5385	10.3006	3.56923	3.54764	746	57.3846
MW-4	23	21.362	15.0308	3.54764	963	74.0769
MW-5	9.38462	7.24038	1.41538	3.54764	643	49.4615
MW-6D	7.69231	2.59437	-0.276923	3.54764	591.5	45.5
MW-6S	7.69231	2.59437	-0.276923	3.54764	591.5	45.5
MW-2	7.69231	2.59437	-0.276923	3.54764	591.5	45.5
MW-7	7.91667	2.57464	-0.0525641	3.62079	546	45.5

Analysis of Variance Statistics

SS Wells	2530.86
SS Total	10302.5

Kruskal-Wallis Statistics

Non-Detect Rank	45.5
Background Rank Sum	683.5
Background Rank Mean	52.5769
H Statistic	10.0327
H Adjusted for Ties	30.1389

Basic Statistics

Parameter: Barium, total

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

	Total Observations
103	
Total Non-Detects	21
Pooled Mean	507.747
Pooled Std Dev	882.815
Background Mean	486.846
Background Std Dev	886.855

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	13	2	15.3846	6329

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	486.846	886.855	0	753	57.9231

Compliance Wells

There are 7 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-3	13	0	0	21207
MW-4	13	0	0	18340
MW-5	13	4	30.7692	1240.9
MW-6D	13	9	69.2308	550.7
MW-6S	13	3	23.0769	1225
MW-2	13	2	15.3846	1965
MW-7	12	1	8.33333	1440.3

Well	Mean	Std Dev	Dif From Bk	Std Err	Rank Sum	Rank Mean
MW-3	1631.31	1368.94	1144.46	260.09	1089	83.7692
MW-4	1410.77	873.665	923.923	260.09	1142	87.8462
MW-5	95.4538	95.478	-391.392	260.09	453	34.8462
MW-6D	42.3615	47.4429	-444.485	260.09	195	15
MW-6S	94.2308	39.8793	-392.615	260.09	546	42
MW-2	151.154	159.942	-335.692	260.09	632	48.6154
MW-7	120.025	142.702	-366.821	265.454	546	45.5

Analysis of Variance Statistics

SS Wells	3.77229e+007
SS Total	7.94949e+007

Kruskal-Wallis Statistics

Non-Detect Rank	11
Background Rank Sum	753
Background Rank Mean	57.9231
H Statistic	60.3353
H Adjusted for Ties	60.8499

Basic Statistics

Parameter: Beryllium, total

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

	Total Observations
103	
Total Non-Detects	53
Pooled Mean	4.25728
Pooled Std Dev	6.70548
Background Mean	4.05385
Background Std Dev	3.84027

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	13	5	38.4615	52.7

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	4.05385	3.84027	0	764	58.7692

Compliance Wells

There are 7 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-3	13	0	0	141.8
MW-4	13	1	7.69231	113.8
MW-5	13	10	76.9231	26.9
MW-6D	13	12	92.3077	21.6
MW-6S	13	10	76.9231	22.6
MW-2	13	8	61.5385	35.3
MW-7	12	7	58.3333	23.8

Well	Mean	Std Dev	Dif From Bk	Std Err	Rank Sum	Rank Mean
MW-3	10.9077	14.3344	6.85385	2.35431	1063	81.7692
MW-4	8.75385	7.23667	4.7	2.35431	1079	83
MW-5	2.06923	1.16145	-1.98462	2.35431	502	38.6154
MW-6D	1.66154	0.567947	-2.39231	2.35431	394	30.3077
MW-6S	1.73846	0.537802	-2.31538	2.35431	453	34.8462
MW-2	2.71538	3.13471	-1.33846	2.35431	568	43.6923
MW-7	1.98333	0.95806	-2.07051	2.40286	533	44.4167

Analysis of Variance Statistics

SS Wells	1163.62
SS Total	4586.27

Kruskal-Wallis Statistics

Non-Detect Rank	27
Background Rank Sum	764
Background Rank Mean	58.7692
H Statistic	43.0935
H Adjusted for Ties	49.8888

Basic Statistics

Parameter: Cadmium, total

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

	Total Observations
103	
Total Non-Detects	66
Pooled Mean	4.6534
Pooled Std Dev	9.38177
Background Mean	5.66923
Background Std Dev	6.23971

Background Wells

There is 1 background well

Well	Samples	Non-Detect	% ND	Total
MW-1	13	6	46.1538	73.7

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	5.66923	6.23971	0	816	62.7692

Compliance Wells

There are 7 compliance wells

Well	Samples	Non-Detect	% ND	Total
MW-3	13	6	46.1538	181.6
MW-4	13	6	46.1538	96.9
MW-5	13	8	61.5385	46.1
MW-6D	13	13	100	13
MW-6S	13	12	92.3077	13.3
MW-2	13	7	53.8462	31.8
MW-7	12	8	66.6667	22.9

Well	Mean	Std Dev	Dif From Bk	Std Err	Rank Sum	Rank Mean
MW-3	13.9692	21.3242	8.3	3.41933	842	64.7692
MW-4	7.45385	7.65709	1.78462	3.41933	836	64.3077
MW-5	3.54615	6.41958	-2.12308	3.41933	674	51.8462
MW-6D	1	0	-4.66923	3.41933	435.5	33.5
MW-6S	1.02308	0.083205	-4.64615	3.41933	470	36.1538
MW-2	2.44615	2.25707	-3.22308	3.41933	704.5	54.1923
MW-7	1.90833	1.82182	-3.7609	3.48984	578	48.1667

Analysis of Variance Statistics

SS Wells	1758.11
SS Total	8977.8

Kruskal-Wallis Statistics

Non-Detect Rank	33.5
Background Rank Sum	816
Background Rank Mean	62.7692
H Statistic	15.1784
H Adjusted for Ties	20.5967

Basic Statistics

Parameter: Chromium, total

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

	Total Observations
103	
Total Non-Detects	35
Pooled Mean	37.9728
Pooled Std Dev	89.0445
Background Mean	41.6154
Background Std Dev	37.8319

Background Wells

There is 1 background well

Well	Samples	Non-Detect	% ND	Total
MW-1	13	1	7.69231	541

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	41.6154	37.8319	0	948	72.9231

Compliance Wells

There are 7 compliance wells

Well	Samples	Non-Detect	% ND	Total
MW-3	13	0	0	1530.7
MW-4	13	0	0	1086
MW-5	13	7	53.8462	172.4
MW-6D	13	10	76.9231	66
MW-6S	13	9	69.2308	52
MW-2	13	2	15.3846	345
MW-7	12	6	50	118.1

Well	Mean	Std Dev	Dif From Bk	Std Err	Rank Sum	Rank Mean
MW-3	117.746	203.135	76.1308	32.4605	944	72.6154
MW-4	83.5385	91.4974	41.9231	32.4605	989	76.0769
MW-5	13.2615	26.3772	-28.3538	32.4605	504	38.7692
MW-6D	5.07692	3.09466	-36.5385	32.4605	355	27.3077
MW-6S	4	1.63299	-37.6154	32.4605	340	26.1538
MW-2	26.5385	47.6211	-15.0769	32.4605	812	62.4615
MW-7	9.84167	13.9437	-31.7737	33.1299	464	38.6667

Analysis of Variance Statistics

SS Wells	158099
SS Total	808750

Kruskal-Wallis Statistics

Non-Detect Rank	18
Background Rank Sum	948
Background Rank Mean	72.9231
H Statistic	46.1476
H Adjusted for Ties	48.0308

Basic Statistics

Parameter: Cobalt, total

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

	Total Observations
103	
Total Non-Detects	22
Pooled Mean	47.4291
Pooled Std Dev	83.5984
Background Mean	106.538
Background Std Dev	162.331

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	13	0	0	1385

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	106.538	162.331	0	955	73.4615

Compliance Wells

There are 7 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-3	13	1	7.69231	1534
MW-4	13	0	0	974
MW-5	13	3	23.0769	222.3
MW-6D	13	11	84.6154	55
MW-6S	13	0	0	206.8
MW-2	13	2	15.3846	372.8
MW-7	12	5	41.6667	135.3

Well	Mean	Std Dev	Dif From Bk	Std Err	Rank Sum	Rank Mean
MW-3	118	115.516	11.4615	29.1156	1050.5	80.8077
MW-4	74.9231	38.0448	-31.6154	29.1156	1056	81.2308
MW-5	17.1	28.6981	-89.4385	29.1156	477.5	36.7308
MW-6D	4.23077	2.24179	-102.308	29.1156	189.5	14.5769
MW-6S	15.9077	11.5618	-90.6308	29.1156	604	46.4615
MW-2	28.6769	38.2315	-77.8615	29.1156	633	48.6923
MW-7	11.275	7.77632	-95.2635	29.7159	390.5	32.5417

Analysis of Variance Statistics

SS Wells	189382
SS Total	712847

Kruskal-Wallis Statistics

Non-Detect Rank	11.5
Background Rank Sum	955
Background Rank Mean	73.4615
H Statistic	60.7234
H Adjusted for Ties	61.3197

Basic Statistics

Parameter: Copper, total

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

	Total Observations
103	
Total Non-Detects	56
Pooled Mean	42.8262
Pooled Std Dev	104.253
Background Mean	173.154
Background Std Dev	214.715

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	13	0	0	2251

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	173.154	214.715	0	1150	88.4615

Compliance Wells

There are 7 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-3	13	7	53.8462	596
MW-4	13	7	53.8462	371.4
MW-5	13	3	23.0769	751.7
MW-6D	13	11	84.6154	95.3
MW-6S	13	13	100	84
MW-2	13	6	46.1538	152.4
MW-7	12	9	75	109.3

Well	Mean	Std Dev	Dif From Bk	Std Err	Rank Sum	Rank Mean
MW-3	45.8462	75.6173	-127.308	36.4926	705.5	54.2692
MW-4	28.5692	28.4349	-144.585	36.4926	702.5	54.0385
MW-5	57.8231	124.951	-115.331	36.4926	876.5	67.4231
MW-6D	7.33077	4.71052	-165.823	36.4926	444.5	34.1923
MW-6S	6.46154	3.0988	-166.692	36.4926	370.5	28.5
MW-2	11.7231	14.802	-161.431	36.4926	644	49.5385
MW-7	9.10833	6.15518	-164.046	37.2451	462.5	38.5417

Analysis of Variance Statistics

SS Wells	286283
SS Total	1.10861e+006

Kruskal-Wallis Statistics

Non-Detect Rank	28.5
Background Rank Sum	1150
Background Rank Mean	88.4615
H Statistic	38.1442
H Adjusted for Ties	45.4464

Basic Statistics

Parameter: Lead, total

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

	Total Observations
103	
Total Non-Detects	51
Pooled Mean	22.2913
Pooled Std Dev	31.5982
Background Mean	34.6923
Background Std Dev	41.8218

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	13	4	30.7692	451

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	34.6923	41.8218	0	845	65

Compliance Wells

There are 7 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-3	13	2	15.3846	748
MW-4	13	2	15.3846	283
MW-5	13	8	61.5385	186
MW-6D	13	10	76.9231	143
MW-6S	13	10	76.9231	136
MW-2	13	7	53.8462	200
MW-7	12	8	66.6667	149

Well	Mean	Std Dev	Dif From Bk	Std Err	Rank Sum	Rank Mean
MW-3	57.5385	65.3052	22.8462	11.2096	1022	78.6154
MW-4	21.7692	9.37331	-12.9231	11.2096	885	68.0769
MW-5	14.3077	11.3313	-20.3846	11.2096	569	43.7692
MW-6D	11	6.91616	-23.6923	11.2096	464	35.6923
MW-6S	10.4615	4.55733	-24.2308	11.2096	458	35.2308
MW-2	15.3846	12.0245	-19.3077	11.2096	621	47.7692
MW-7	12.4167	4.98102	-22.2756	11.4408	492	41

Analysis of Variance Statistics

SS Wells	24249
SS Total	101841

Kruskal-Wallis Statistics

Non-Detect Rank	26
Background Rank Sum	845
Background Rank Mean	65
H Statistic	27.3835
H Adjusted for Ties	31.1657

Basic Statistics

Parameter: Nickel, total

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

	Total Observations
103	
Total Non-Detects	51
Pooled Mean	51.3728
Pooled Std Dev	66.7205
Background Mean	47.7692
Background Std Dev	18.1207

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	13	4	30.7692	621

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	47.7692	18.1207	0	849	65.3077

Compliance Wells

There are 7 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-3	13	5	38.4615	1399.8
MW-4	13	5	38.4615	1375
MW-5	13	5	38.4615	522.6
MW-6D	13	12	92.3077	290
MW-6S	13	6	46.1538	321.7
MW-2	13	5	38.4615	461.3
MW-7	12	9	75	300

Well	Mean	Std Dev	Dif From Bk	Std Err	Rank Sum	Rank Mean
MW-3	107.677	135.717	59.9077	23.4915	819	63
MW-4	105.769	79.3496	58	23.4915	881	67.7692
MW-5	40.2	31.9096	-7.56923	23.4915	714	54.9231
MW-6D	22.3077	22.7866	-25.4615	23.4915	364	28
MW-6S	24.7462	20.9455	-23.0231	23.4915	568	43.6923
MW-2	35.4846	31.139	-12.2846	23.4915	708	54.4615
MW-7	25	21.0886	-22.7692	23.9759	453	37.75

Analysis of Variance Statistics

SS Wells	113297
SS Total	454065

Kruskal-Wallis Statistics

Non-Detect Rank	26
Background Rank Sum	849
Background Rank Mean	65.3077
H Statistic	20.2985
H Adjusted for Ties	23.1021

Basic Statistics

Parameter: Thallium, total

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

	Total Observations
103	
Total Non-Detects	83
Pooled Mean	1.87282
Pooled Std Dev	0.913858
Background Mean	1.76923
Background Std Dev	0.599145

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	13	11	84.6154	23

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	1.76923	0.599145	0	643	49.4615

Compliance Wells

There are 7 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-3	13	7	53.8462	32.6
MW-4	13	9	69.2308	27.3
MW-5	13	13	100	21
MW-6D	13	10	76.9231	23
MW-6S	13	11	84.6154	24
MW-2	13	11	84.6154	22
MW-7	12	11	91.6667	20

Well	Mean	Std Dev	Dif From Bk	Std Err	Rank Sum	Rank Mean
MW-3	2.50769	1.61785	0.738462	0.353559	863	66.3846
MW-4	2.1	1.38323	0.330769	0.353559	762	58.6154
MW-5	1.61538	0.50637	-0.153846	0.353559	546	42
MW-6D	1.76923	0.438529	0	0.353559	696	53.5385
MW-6S	1.84615	0.800641	0.0769231	0.353559	646	49.6923
MW-2	1.69231	0.480384	-0.0769231	0.353559	651	50.0769
MW-7	1.66667	0.492366	-0.102564	0.360849	549	45.75

Analysis of Variance Statistics

SS Wells	7.99414
SS Total	85.1839

Kruskal-Wallis Statistics

Non-Detect Rank	42
Background Rank Sum	643
Background Rank Mean	49.4615
H Statistic	5.89183
H Adjusted for Ties	12.3581

Basic Statistics

Parameter: Vanadium

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

	Total Observations
103	
Total Non-Detects	56
Pooled Mean	31.9379
Pooled Std Dev	63.3976
Background Mean	39
Background Std Dev	34.6843

Background Wells

There is 1 background well

Well	Samples	Non-Detect	% ND	Total
MW-1	13	3	23.0769	507

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	39	34.6843	0	913.5	70.2692

Compliance Wells

There are 7 compliance wells

Well	Samples	Non-Detect	% ND	Total
MW-3	13	5	38.4615	1126
MW-4	13	4	30.7692	775
MW-5	13	7	53.8462	274.7
MW-6D	13	11	84.6154	103
MW-6S	13	13	100	80
MW-2	13	4	30.7692	268.8
MW-7	12	9	75	155.1

Well	Mean	Std Dev	Dif From Bk	Std Err	Rank Sum	Rank Mean
MW-3	86.6154	141.987	47.6154	23.356	825.5	63.5
MW-4	59.6154	61.6503	20.6154	23.356	894	68.7692
MW-5	21.1308	37.3752	-17.8692	23.356	642.5	49.4231
MW-6D	7.92308	6.21103	-31.0769	23.356	455.5	35.0385
MW-6S	6.15385	4.16025	-32.8462	23.356	370.5	28.5
MW-2	20.6769	33.9931	-18.3231	23.356	760	58.4615
MW-7	12.925	18.0397	-26.075	23.8376	494.5	41.2083

Analysis of Variance Statistics

SS Wells	73116.7
SS Total	409964

Kruskal-Wallis Statistics

Non-Detect Rank	28.5
Background Rank Sum	913.5
Background Rank Mean	70.2692
H Statistic	25.3844
H Adjusted for Ties	30.2439

Basic Statistics

Parameter: Zinc, total

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

	Total Observations
103	
Total Non-Detects	13
Pooled Mean	128.553
Pooled Std Dev	251.832
Background Mean	139.769
Background Std Dev	87.8532

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	13	0	0	1817

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	139.769	87.8532	0	950	73.0769

Compliance Wells

There are 7 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-3	13	0	0	4784
MW-4	13	0	0	3177
MW-5	13	1	7.69231	1422
MW-6D	13	7	53.8462	166
MW-6S	13	1	7.69231	408
MW-2	13	2	15.3846	819
MW-7	12	2	16.6667	648

Well	Mean	Std Dev	Dif From Bk	Std Err	Rank Sum	Rank Mean
MW-3	368	576.358	228.231	91.0845	961	73.9231
MW-4	244.385	223.368	104.615	91.0845	1025	78.8462
MW-5	109.385	165.114	-30.3846	91.0845	727	55.9231
MW-6D	12.7692	4.02397	-127	91.0845	165	12.6923
MW-6S	31.3846	14.1865	-108.385	91.0845	444	34.1538
MW-2	63	86.9626	-76.7692	91.0845	566	43.5385
MW-7	54	47.5758	-85.7692	92.9627	518	43.1667

Analysis of Variance Statistics

SS Wells	1.34577e+006
SS Total	6.46878e+006

Kruskal-Wallis Statistics

Non-Detect Rank	7
Background Rank Sum	950
Background Rank Mean	73.0769
H Statistic	53.4199
H Adjusted for Ties	53.5269

Interwell Analyses for Metals

Poisson Tolerance Limit

Parameter: Antimony, total

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Poisson Count of 13 background Samples = 95
Degrees of Freedom = 192

95% Confidence Values

Chi-Squared Value (95% Confidence) = 225.329
Lambda (from Zack's formula) = 8.66649
Smallest Degrees of Freedom = 29
Upper Tolerance Limit (95%) = 13.5

99% Confidence Values

Chi-Squared Value (99% Confidence) = 240.505
Lambda (from Zack's formula) = 9.25018
Smallest Degrees of Freedom = 35
Upper Tolerance Limit (99%) = 16.5

	Date	Result	Impacted 95%	Impacted 99%
MW-3	12/15/1997	ND<3	FALSE	FALSE
	1/26/1998	ND<3	FALSE	FALSE
	3/16/1998	ND<3	FALSE	FALSE
	4/20/1998	ND<3	FALSE	FALSE
	10/20/1998	ND<3	FALSE	FALSE
	5/19/1999	ND<10	FALSE	FALSE
	10/19/1999	ND<10	FALSE	FALSE
	4/18/2000	11	FALSE	FALSE
	10/24/2000	13	FALSE	FALSE
	4/26/2001	ND<10	FALSE	FALSE
	10/15/2001	ND<10	FALSE	FALSE
	2/18/2002	ND<10	FALSE	FALSE
	8/20/2002	40	TRUE	TRUE
MW-4	12/15/1997	ND<3	FALSE	FALSE
	1/26/1998	ND<3	FALSE	FALSE
	3/16/1998	ND<3	FALSE	FALSE
	4/20/1998	ND<3	FALSE	FALSE
	10/20/1998	ND<3	FALSE	FALSE
	5/19/1999	ND<10	FALSE	FALSE
	10/19/1999	ND<10	FALSE	FALSE
	4/18/2000	ND<10	FALSE	FALSE
	10/24/2000	ND<10	FALSE	FALSE
	4/26/2001	ND<10	FALSE	FALSE
	10/15/2001	ND<10	FALSE	FALSE
	2/18/2002	14	TRUE	FALSE
	8/20/2002	14	TRUE	FALSE

Non-Parametric Tolerance Interval

Parameter: Arsenic, total

Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL

Total Percent Non-Detects = 69.2308%
Background Samples (n) = 13
Maximum Background Concentration = 11
Minimum Coverage = 79.4%
Average Coverage = 92.8571%

Well	Sample	Result	Impacted
MW-3	12/15/1997	ND<2.5	FALSE
MW-3	1/26/1998	ND<2.5	FALSE
MW-3	3/16/1998	ND<2.5	FALSE
MW-3	4/20/1998	ND<2.5	FALSE
MW-3	10/20/1998	ND<2.5	FALSE
MW-3	5/19/1999	ND<5	FALSE
MW-3	10/19/1999	ND<5	FALSE
MW-3	4/18/2000	ND<5	FALSE
MW-3	10/24/2000	19	TRUE
MW-3	4/26/2001	13	TRUE
MW-3	10/15/2001	ND<5	FALSE
MW-3	2/18/2002	ND<5	FALSE
MW-3	8/20/2002	43	TRUE
MW-4	12/15/1997	ND<2.5	FALSE
MW-4	1/26/1998	ND<2.5	FALSE
MW-4	3/16/1998	ND<2.5	FALSE
MW-4	4/20/1998	ND<2.5	FALSE
MW-4	10/20/1998	ND<2.5	FALSE
MW-4	5/19/1999	12	TRUE
MW-4	10/19/1999	14	TRUE
MW-4	4/18/2000	ND<5	FALSE
MW-4	10/24/2000	40	TRUE
MW-4	4/26/2001	38	TRUE
MW-4	10/15/2001	56	TRUE
MW-4	2/18/2002	42	TRUE
MW-4	8/20/2002	62	TRUE

Shapiro-Wilks Test of Normality
Parameter: Barium, total
Background Wells
Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL
K = 6; Samples = 13

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	49	3000	2951	0.5359	1581.44
2	50	1800	1750	0.3325	581.875
3	50	310	260	0.2412	62.712
4	64	240	176	0.1707	30.0432
5	86	210	124	0.1099	13.6276
6	100	160	60	0.0539	3.234
7	110	110	0		
8	160	100	-60		
9	210	86	-124		
10	240	64	-176		
11	310	50	-260		
12	1800	50	-1750		
13	3000	49	-2951		

Sum of b values = 2272.93
Sample Standard Deviation = 890.681
W Statistic = 0.542685
5% Critical value of 0.866 exceeds 0.542685
Evidence of non-normality at 95% level of significance
1% Critical value of 0.814 exceeds 0.542685
Evidence of non-normality at 99% level of significance

Non-Parametric Tolerance Interval

Parameter: Barium, total

Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL

Total Percent Non-Detects = 5.12821%
Background Samples (n) = 13
Maximum Background Concentration = 3000
Minimum Coverage = 79.4%
Average Coverage = 92.8571%

Well	Sample	Result	Impacted
MW-3	12/15/1997	2200	FALSE
MW-3	1/26/1998	4000	TRUE
MW-3	3/16/1998	2800	FALSE
MW-3	4/20/1998	1400	FALSE
MW-3	10/20/1998	2900	FALSE
MW-3	5/19/1999	140	FALSE
MW-3	10/19/1999	210	FALSE
MW-3	4/18/2000	280	FALSE
MW-3	10/24/2000	1600	FALSE
MW-3	4/26/2001	1400	FALSE
MW-3	10/15/2001	640	FALSE
MW-3	2/18/2002	37	FALSE
MW-3	8/20/2002	3600	TRUE
MW-4	12/15/1997	3200	TRUE
MW-4	1/26/1998	2400	FALSE
MW-4	3/16/1998	2200	FALSE
MW-4	4/20/1998	1100	FALSE
MW-4	10/20/1998	1400	FALSE
MW-4	5/19/1999	210	FALSE
MW-4	10/19/1999	300	FALSE
MW-4	4/18/2000	330	FALSE
MW-4	10/24/2000	1100	FALSE
MW-4	4/26/2001	1600	FALSE
MW-4	10/15/2001	1600	FALSE
MW-4	2/18/2002	1100	FALSE
MW-4	8/20/2002	1800	FALSE

Shapiro-Wilks Test of Normality
Parameter: Beryllium, total
Background Wells
Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
K = 6; Samples = 13

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	-0.693147	2.48491	3.17805	0.5359	1.70312
2	-0.693147	2.48491	3.17805	0.3325	1.0567
3	-0.693147	1.75786	2.45101	0.2412	0.591182
4	0	1.6864	1.6864	0.1707	0.287868
5	0	1.22378	1.22378	0.1099	0.134493
6	0.693147	1.06471	0.371564	0.0539	0.0200273
7	0.788457	0.788457	0		
8	1.06471	0.693147	-0.371564		
9	1.22378	0	-1.22378		
10	1.6864	0	-1.6864		
11	1.75786	-0.693147	-2.45101		
12	2.48491	-0.693147	-3.17805		
13	2.48491	-0.693147	-3.17805		

Sum of b values = 3.79339
Sample Standard Deviation = 1.14032
W Statistic = 0.92219
5% Critical value of 0.866 is less than 0.92219
Data is normally distributed at 95% level of significance
1% Critical value of 0.814 is less than 0.92219
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: Beryllium, total

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL

Background mean = 0.777286
Background standard deviation = 1.14032
One-sided normal tolerance factor at 95% confidence = 2.67
Tolerance factor calculation follows USEPA 1989 Guidance
Upper tolerance limit = 3.82194

Well	Date	Result	Impacted
MW-3	12/15/1997	0.693147	FALSE
	1/26/1998	1.79176	FALSE
	3/16/1998	1.60944	FALSE
	4/20/1998	1.38629	FALSE
	10/20/1998	1.79176	FALSE
	5/19/1999	0.788457	FALSE
	10/19/1999	1.06471	FALSE
	4/18/2000	0.955511	FALSE
	10/24/2000	3.29584	FALSE
	4/26/2001	3.04452	FALSE
	10/15/2001	2.30259	FALSE
	2/18/2002	0.741937	FALSE
	8/20/2002	3.93183	TRUE
MW-4	12/15/1997	1.38629	FALSE
	1/26/1998	1.09861	FALSE
	3/16/1998	1.38629	FALSE
	4/20/1998	1.09861	FALSE
	10/20/1998	ND<-0.693147	FALSE
	5/19/1999	3.21888	FALSE
	10/19/1999	1.06471	FALSE
	4/18/2000	1.36098	FALSE
	10/24/2000	2.48491	FALSE
	4/26/2001	2.48491	FALSE
	10/15/2001	2.56495	FALSE
	2/18/2002	2.48491	FALSE
	8/20/2002	2.89037	FALSE

Shapiro-Wilks Test of Normality
Parameter: Cadmium, total
Background Wells
Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL
K = 6; Samples = 13

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	0.5	21	20.5	0.5359	10.986
2	0.5	13	12.5	0.3325	4.15625
3	0.5	9.9	9.4	0.2412	2.26728
4	0.5	9.9	9.4	0.1707	1.60458
5	0.5	6.5	6	0.1099	0.6594
6	0.5	5	4.5	0.0539	0.24255
7	2.4	2.4	0		
8	5	0.5	-4.5		
9	6.5	0.5	-6		
10	9.9	0.5	-9.4		
11	9.9	0.5	-9.4		
12	13	0.5	-12.5		
13	21	0.5	-20.5		

Sum of b values = 19.916
Sample Standard Deviation = 6.4293
W Statistic = 0.799643
5% Critical value of 0.866 exceeds 0.799643
Evidence of non-normality at 95% level of significance
1% Critical value of 0.814 exceeds 0.799643
Evidence of non-normality at 99% level of significance

Non-Parametric Tolerance Interval

Parameter: Cadmium, total

Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL

Total Percent Non-Detects = 46.1538%
Background Samples (n) = 13
Maximum Background Concentration = 21
Minimum Coverage = 79.4%
Average Coverage = 92.8571%

Well	Sample	Result	Impacted
MW-3	12/15/1997	ND<0.5	FALSE
MW-3	1/26/1998	ND<0.5	FALSE
MW-3	3/16/1998	ND<0.5	FALSE
MW-3	4/20/1998	ND<0.5	FALSE
MW-3	10/20/1998	ND<0.5	FALSE
MW-3	5/19/1999	ND<0.5	FALSE
MW-3	10/19/1999	5.5	FALSE
MW-3	4/18/2000	3.6	FALSE
MW-3	10/24/2000	40	TRUE
MW-3	4/26/2001	38	TRUE
MW-3	10/15/2001	16	FALSE
MW-3	2/18/2002	4.5	FALSE
MW-3	8/20/2002	68	TRUE
MW-4	12/15/1997	ND<0.5	FALSE
MW-4	1/26/1998	ND<0.5	FALSE
MW-4	3/16/1998	ND<0.5	FALSE
MW-4	4/20/1998	ND<0.5	FALSE
MW-4	10/20/1998	ND<0.5	FALSE
MW-4	5/19/1999	ND<0.5	FALSE
MW-4	10/19/1999	4.8	FALSE
MW-4	4/18/2000	4.1	FALSE
MW-4	10/24/2000	13	FALSE
MW-4	4/26/2001	15	FALSE
MW-4	10/15/2001	20	FALSE
MW-4	2/18/2002	15	FALSE
MW-4	8/20/2002	19	FALSE

Shapiro-Wilks Test of Normality

Parameter: Chromium, total

Background Wells

Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL
K = 6; Samples = 13

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	0.5	120	119.5	0.5359	64.0401
2	2	92	90	0.3325	29.925
3	10	90	80	0.2412	19.296
4	15	57	42	0.1707	7.1694
5	19	43	24	0.1099	2.6376
6	22	36	14	0.0539	0.7546
7	34	34	0		
8	36	22	-14		
9	43	19	-24		
10	57	15	-42		
11	90	10	-80		
12	92	2	-90		
13	120	0.5	-119.5		

Sum of b values = 123.823
Sample Standard Deviation = 37.8769
W Statistic = 0.890574
5% Critical value of 0.866 is less than 0.890574
Data is normally distributed at 95% level of significance
1% Critical value of 0.814 is less than 0.890574
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: Chromium, total

Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL

Background mean = 41.5769
Background standard deviation = 37.8769
One-sided normal tolerance factor at 95% confidence = 2.67
Tolerance factor calculation follows USEPA 1989 Guidance
Upper tolerance limit = 142.708

Well	Date	Result	Impacted
MW-3	12/15/1997	7	FALSE
	1/26/1998	5	FALSE
	3/16/1998	5	FALSE
	4/20/1998	3	FALSE
	10/20/1998	3	FALSE
	5/19/1999	23	FALSE
	10/19/1999	41	FALSE
	4/18/2000	27	FALSE
	10/24/2000	330	TRUE
	4/26/2001	270	TRUE
	10/15/2001	120	FALSE
	2/18/2002	6.7	FALSE
	8/20/2002	690	TRUE
MW-4	12/15/1997	5	FALSE
	1/26/1998	4	FALSE
	3/16/1998	9	FALSE
	4/20/1998	3	FALSE
	10/20/1998	2	FALSE
	5/19/1999	32	FALSE
	10/19/1999	54	FALSE
	4/18/2000	47	FALSE
	10/24/2000	170	TRUE
	4/26/2001	140	FALSE
	10/15/2001	180	TRUE
	2/18/2002	160	TRUE
	8/20/2002	280	TRUE

Shapiro-Wilks Test of Normality

Parameter: Cobalt, total

Background Wells

Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL
K = 6; Samples = 13

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	18	531	513	0.5359	274.917
2	20	397	377	0.3325	125.353
3	22	79	57	0.2412	13.7484
4	23	76	53	0.1707	9.0471
5	27	58	31	0.1099	3.4069
6	29	53	24	0.0539	1.2936
7	52	52	0		
8	53	29	-24		
9	58	27	-31		
10	76	23	-53		
11	79	22	-57		
12	397	20	-377		
13	531	18	-513		

Sum of b values = 427.765
Sample Standard Deviation = 162.331
W Statistic = 0.578666
5% Critical value of 0.866 exceeds 0.578666
Evidence of non-normality at 95% level of significance
1% Critical value of 0.814 exceeds 0.578666
Evidence of non-normality at 99% level of significance

Non-Parametric Tolerance Interval

Parameter: Cobalt, total

Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL

Total Percent Non-Detects = 2.5641%
Background Samples (n) = 13
Maximum Background Concentration = 531
Minimum Coverage = 79.4%
Average Coverage = 92.8571%

Well	Sample	Result	Impacted
MW-3	12/15/1997	146	FALSE
MW-3	1/26/1998	93	FALSE
MW-3	3/16/1998	141	FALSE
MW-3	4/20/1998	90	FALSE
MW-3	10/20/1998	86	FALSE
MW-3	5/19/1999	26	FALSE
MW-3	10/19/1999	36	FALSE
MW-3	4/18/2000	26	FALSE
MW-3	10/24/2000	190	FALSE
MW-3	4/26/2001	170	FALSE
MW-3	10/15/2001	75	FALSE
MW-3	2/18/2002	ND<2.5	FALSE
MW-3	8/20/2002	450	FALSE
MW-4	12/15/1997	92	FALSE
MW-4	1/26/1998	55	FALSE
MW-4	3/16/1998	143	FALSE
MW-4	4/20/1998	64	FALSE
MW-4	10/20/1998	50	FALSE
MW-4	5/19/1999	26	FALSE
MW-4	10/19/1999	35	FALSE
MW-4	4/18/2000	22	FALSE
MW-4	10/24/2000	78	FALSE
MW-4	4/26/2001	90	FALSE
MW-4	10/15/2001	110	FALSE
MW-4	2/18/2002	79	FALSE
MW-4	8/20/2002	130	FALSE

Shapiro-Wilks Test of Normality

Parameter: Copper, total

Background Wells

Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
K = 6; Samples = 13

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	2.30259	6.62007	4.31749	0.5359	2.31374
2	2.99573	6.13123	3.13549	0.3325	1.04255
3	3.3322	5.56068	2.22848	0.2412	0.537509
4	3.3322	5.19296	1.86075	0.1707	0.31763
5	3.63759	5.1358	1.49821	0.1099	0.164654
6	4.20469	5.07517	0.870481	0.0539	0.0469189
7	4.38203	4.38203	0		
8	5.07517	4.20469	-0.870481		
9	5.1358	3.63759	-1.49821		
10	5.19296	3.3322	-1.86075		
11	5.56068	3.3322	-2.22848		
12	6.13123	2.99573	-3.13549		
13	6.62007	2.30259	-4.31749		

Sum of b values = 4.42301
Sample Standard Deviation = 1.29526
W Statistic = 0.97172
5% Critical value of 0.866 is less than 0.97172
Data is normally distributed at 95% level of significance
1% Critical value of 0.814 is less than 0.97172
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: Copper, total

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL

Background mean = 4.45407
Background standard deviation = 1.29526
One-sided normal tolerance factor at 95% confidence = 2.67
Tolerance factor calculation follows USEPA 1989 Guidance
Upper tolerance limit = 7.91241

Well	Date	Result	Impacted
MW-3	12/15/1997	2.30259	FALSE
	1/26/1998	2.30259	FALSE
	3/16/1998	ND<1.60944	FALSE
	4/20/1998	ND<1.60944	FALSE
	10/20/1998	ND<1.60944	FALSE
	5/19/1999	ND<0.916291	FALSE
	10/19/1999	ND<0.916291	FALSE
	4/18/2000	ND<0.916291	FALSE
	10/24/2000	4.86753	FALSE
	4/26/2001	4.54329	FALSE
	10/15/2001	3.80666	FALSE
	2/18/2002	ND<0	FALSE
	8/20/2002	5.56068	FALSE

Shapiro-Wilks Test of Normality
Parameter: Lead, total
Background Wells
Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
K = 6; Samples = 13

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	0.916291	4.99043	4.07414	0.5359	2.18333
2	0.916291	4.60517	3.68888	0.3325	1.22655
3	1.60944	3.61092	2.00148	0.2412	0.482757
4	1.60944	3.46574	1.8563	0.1707	0.31687
5	2.63906	3.43399	0.79493	0.1099	0.0873628
6	2.77259	3.13549	0.362905	0.0539	0.0195606
7	3.04452	3.04452	0		
8	3.13549	2.77259	-0.362905		
9	3.43399	2.63906	-0.79493		
10	3.46574	1.60944	-1.8563		
11	3.61092	1.60944	-2.00148		
12	4.60517	0.916291	-3.68888		
13	4.99043	0.916291	-4.07414		

Sum of b values = 4.31644
Sample Standard Deviation = 1.28064
W Statistic = 0.946701
5% Critical value of 0.866 is less than 0.946701
Data is normally distributed at 95% level of significance
1% Critical value of 0.814 is less than 0.946701
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: Lead, total

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL

Background mean = 2.82687
Background standard deviation = 1.28064
One-sided normal tolerance factor at 95% confidence = 2.67
Tolerance factor calculation follows USEPA 1989 Guidance
Upper tolerance limit = 6.24619

Well	Date	Result	Impacted
MW-3	12/15/1997	3.71357	FALSE
	1/26/1998	3.7612	FALSE
	3/16/1998	3.78419	FALSE
	4/20/1998	3.46574	FALSE
	10/20/1998	2.99573	FALSE
	5/19/1999	ND<1.60944	FALSE
	10/19/1999	2.70805	FALSE
	4/18/2000	2.63906	FALSE
	10/24/2000	4.86753	FALSE
	4/26/2001	4.58497	FALSE
	10/15/2001	3.93183	FALSE
	2/18/2002	ND<1.60944	FALSE
	8/20/2002	5.48064	FALSE
MW-4	12/15/1997	3.13549	FALSE
	1/26/1998	3.29584	FALSE
	3/16/1998	3.4012	FALSE
	4/20/1998	2.83321	FALSE
	10/20/1998	2.3979	FALSE
	5/19/1999	ND<1.60944	FALSE
	10/19/1999	ND<1.60944	FALSE
	4/18/2000	2.30259	FALSE
	10/24/2000	3.4012	FALSE
	4/26/2001	2.94444	FALSE
	10/15/2001	3.52636	FALSE
	2/18/2002	3.3673	FALSE
	8/20/2002	3.49651	FALSE

Shapiro-Wilks Test of Normality
Parameter: Nickel, total
Background Wells
Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
K = 6; Samples = 13

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	2.77259	4.34381	1.57122	0.5359	0.842015
2	3.21888	4.2485	1.02962	0.3325	0.342348
3	3.21888	4.17439	0.955511	0.2412	0.230469
4	3.21888	4.09434	0.875469	0.1707	0.149443
5	3.21888	3.85015	0.631272	0.1099	0.0693768
6	3.21888	3.43399	0.215111	0.0539	0.0115945
7	3.4012	3.4012	0		
8	3.43399	3.21888	-0.215111		
9	3.85015	3.21888	-0.631272		
10	4.09434	3.21888	-0.875469		
11	4.17439	3.21888	-0.955511		
12	4.2485	3.21888	-1.02962		
13	4.34381	2.77259	-1.57122		

Sum of b values = 1.64525
Sample Standard Deviation = 0.506387
W Statistic = 0.879662
5% Critical value of 0.866 is less than 0.879662
Data is normally distributed at 95% level of significance
1% Critical value of 0.814 is less than 0.879662
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: Nickel, total

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL

Background mean = 3.57026
Background standard deviation = 0.506387
One-sided normal tolerance factor at 95% confidence = 2.67
Tolerance factor calculation follows USEPA 1989 Guidance
Upper tolerance limit = 4.92231

Well	Date	Result	Impacted
MW-3	12/15/1997	ND<3.21888	FALSE
	1/26/1998	ND<3.21888	FALSE
	3/16/1998	ND<3.21888	FALSE
	4/20/1998	ND<3.21888	FALSE
	10/20/1998	ND<3.21888	FALSE
	5/19/1999	3.3673	FALSE
	10/19/1999	3.71357	FALSE
	4/18/2000	3.13549	FALSE
	10/24/2000	5.52146	TRUE
	4/26/2001	5.34711	TRUE
	10/15/2001	4.57471	FALSE
	2/18/2002	2.28238	FALSE
	8/20/2002	6.19441	TRUE
MW-4	12/15/1997	ND<3.21888	FALSE
	1/26/1998	ND<3.21888	FALSE
	3/16/1998	ND<3.21888	FALSE
	4/20/1998	ND<3.21888	FALSE
	10/20/1998	ND<3.21888	FALSE
	5/19/1999	3.73767	FALSE
	10/19/1999	4.11087	FALSE
	4/18/2000	3.95124	FALSE
	10/24/2000	5.19296	TRUE
	4/26/2001	5.01064	TRUE
	10/15/2001	5.1358	TRUE
	2/18/2002	5.19296	TRUE
	8/20/2002	5.66988	TRUE

Non-Parametric Tolerance Interval

Parameter: Thallium, total

Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL

Total Percent Non-Detects = 69.2308%
Background Samples (n) = 13
Maximum Background Concentration = 3
Minimum Coverage = 79.4%
Average Coverage = 92.8571%

Well	Sample	Result	Impacted
MW-3	12/15/1997	2	FALSE
MW-3	1/26/1998	2	FALSE
MW-3	3/16/1998	ND<0.5	FALSE
MW-3	4/20/1998	ND<0.5	FALSE
MW-3	10/20/1998	ND<0.5	FALSE
MW-3	5/19/1999	6	TRUE
MW-3	10/19/1999	5	TRUE
MW-3	4/18/2000	2	FALSE
MW-3	10/24/2000	ND<1	FALSE
MW-3	4/26/2001	ND<1	FALSE
MW-3	10/15/2001	ND<1	FALSE
MW-3	2/18/2002	ND<1	FALSE
MW-3	8/20/2002	4.6	TRUE

Shapiro-Wilks Test of Normality
Parameter: Vanadium
Background Wells
Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL
K = 6; Samples = 13

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	2.5	110	107.5	0.5359	57.6093
2	2.5	89	86.5	0.3325	28.7613
3	2.5	81	78.5	0.2412	18.9342
4	15	56	41	0.1707	6.9987
5	21	39	18	0.1099	1.9782
6	23	32	9	0.0539	0.4851
7	26	26	0		
8	32	23	-9		
9	39	21	-18		
10	56	15	-41		
11	81	2.5	-78.5		
12	89	2.5	-86.5		
13	110	2.5	-107.5		

Sum of b values = 114.767
Sample Standard Deviation = 35.3087
W Statistic = 0.880416
5% Critical value of 0.866 is less than 0.880416
Data is normally distributed at 95% level of significance
1% Critical value of 0.814 is less than 0.880416
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: Vanadium

Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL

Background mean = 38.4231
Background standard deviation = 35.3087
One-sided normal tolerance factor at 95% confidence = 2.67
Tolerance factor calculation follows USEPA 1989 Guidance
Upper tolerance limit = 132.697

Well	Date	Result	Impacted
MW-3	12/15/1997	ND<10	FALSE
	1/26/1998	7	FALSE
	3/16/1998	ND<2.5	FALSE
	4/20/1998	ND<2.5	FALSE
	10/20/1998	ND<2.5	FALSE
	5/19/1999	19	FALSE
	10/19/1999	30	FALSE
	4/18/2000	19	FALSE
	10/24/2000	250	TRUE
	4/26/2001	190	TRUE
	10/15/2001	91	FALSE
	2/18/2002	ND<2.5	FALSE
	8/20/2002	480	TRUE
MW-4	12/15/1997	ND<10	FALSE
	1/26/1998	ND<2.5	FALSE
	3/16/1998	ND<2.5	FALSE
	4/20/1998	ND<2.5	FALSE
	10/20/1998	5	FALSE
	5/19/1999	23	FALSE
	10/19/1999	36	FALSE
	4/18/2000	31	FALSE
	10/24/2000	120	FALSE
	4/26/2001	95	FALSE
	10/15/2001	130	FALSE
	2/18/2002	110	FALSE
	8/20/2002	190	TRUE

Shapiro-Wilks Test of Normality
Parameter: Zinc, total
Background Wells
Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL
K = 6; Samples = 13

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	27	320	293	0.5359	157.019
2	35	260	225	0.3325	74.8125
3	55	190	135	0.2412	32.562
4	60	180	120	0.1707	20.484
5	100	170	70	0.1099	7.693
6	110	170	60	0.0539	3.234
7	140	140	0		
8	170	110	-60		
9	170	100	-70		
10	180	60	-120		
11	190	55	-135		
12	260	35	-225		
13	320	27	-293		

Sum of b values = 295.804
Sample Standard Deviation = 87.8532
W Statistic = 0.944739
5% Critical value of 0.866 is less than 0.944739
Data is normally distributed at 95% level of significance
1% Critical value of 0.814 is less than 0.944739
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: Zinc, total

Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL

Background mean = 139.769
Background standard deviation = 87.8532
One-sided normal tolerance factor at 95% confidence = 2.67
Tolerance factor calculation follows USEPA 1989 Guidance
Upper tolerance limit = 374.337

Well	Date	Result	Impacted
MW-3	12/15/1997	70	FALSE
	1/26/1998	100	FALSE
	3/16/1998	70	FALSE
	4/20/1998	70	FALSE
	10/20/1998	80	FALSE
	5/19/1999	65	FALSE
	10/19/1999	110	FALSE
	4/18/2000	87	FALSE
	10/24/2000	980	TRUE
	4/26/2001	780	TRUE
	10/15/2001	350	FALSE
	2/18/2002	22	FALSE
	8/20/2002	2000	TRUE
MW-4	12/15/1997	60	FALSE
	1/26/1998	50	FALSE
	3/16/1998	100	FALSE
	4/20/1998	80	FALSE
	10/20/1998	70	FALSE
	5/19/1999	77	FALSE
	10/19/1999	120	FALSE
	4/18/2000	130	FALSE
	10/24/2000	440	TRUE
	4/26/2001	400	TRUE
	10/15/2001	480	TRUE
	2/18/2002	440	TRUE
	8/20/2002	730	TRUE