Groundwater Sampling Report and Statistical Analysis

Prepared for

Cherokee County Subtitle D Landfill
Marble, North Carolina

February, 2006

Permit Number: 20-01
MESCO Project Number: G06007.0

Completed on August 17, 2006

Municipal Services Garner, NC
Engineering Company, P.A. Boone, NC

Municipal Engineering Services Company, P.A.
Garner, Boone and Morehead City, North Carolina

OPERATION/CONSTRUCTION MANAGERS

Municipal Services

CIVIL/SANITARY ENGINEERS

Engineering Company, P.A.

August 14, 2006

Mr. Ethan Brown
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 Report and Statistical Analysis
Cherokee County Subtitle D Landfill
Permit No. 20-02
MESC0 Project No. G06007.0

Dear Mr. Brown:

The Cherokee County Subtitle D Landfill located in Marble NC was sampled and analyzed as part of the semi-annual detection monitoring program on February 23, 2006. Pace Analytical (PACE) of Asheville, NC sampled and analyzed the background well MW-1 and compliance wells MW-2, MW-3, MW-4, MW-5, MW-6S, MW-6D, MW-7, MW-8, MW-9 as well as recently installed P-18. The surface waters for both the lined facility and the closed facility are all along the Valley River that separates the 2 landfills. All of the surface waters were sampled concurrently with SW-2 and SW-4 reported as part of the lined landfill and SW-1 reported as the closed landfill for this event. The leachate lagoon was also sampled by PACE during this event for all of the required parameters. The laboratory analyses consisted of the complete Appendix II list of metals and VOCs for MW-6S, MW-6D, and background MW-1. The remaining monitoring locations were analyzed for the Appendix I list of metals and VOCs.

The aquifer downgradient of the phase 1 lined landfill along the Valley river bank which has historically been found to be impacted with VOCs was further investigated in January 2006. Three (3) shallow piezometers were installed along the compliance boundary downgradient of the cluster pair MW-6S/D by Engineering Tectonics Inc. of Winston Salem NC. These piezometers were installed in order to determine the characterization/delineation of the contaminants within the upper aquifer 50 feet from the property boundary. The piezometer locations were chosen based on a complete review of historical flow directions of impacted MW-6S in order to be assured that a potential plume would be intercepted prior to entering the discharge feature. All 3 of the newly installed piezometers were sampled for the Appendix I list of VOCs by MESCO on January 19, 2006 and the laboratory analyses was completed by Environmental Conservation Laboratories (ENCO) of Cary NC. The piezometers were surveyed and it was determined that the centrally located piezometers P-18 was the most directly downgradient of the impacted MW-6S according to the calculated flow direction. Therefore P-18 was chosen to be sampled again by PACE during the routine semi-annual event on February 23, 2006. The results of all of the lab analysis and subsequent statistical analysis are included herein.

All detected constituents were analyzed for regulatory exceedance with reference to North Carolina Groundwater Standards. The results are shown in the enclosed table titled "Exceedance Scan". The following table summarize those constituents that exceeded the Standard.

Table 1. Exceedance Summary (Metals & VOCs)

Well	Chromium	Lead	Benzene	1,4-dichlorobenzene
MW-1	x	x		
MW-3		x		
MW-6S			x	x
MW-8	x	x		
MW-9		x		

x=concentration greater than NCGW2L Standard

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Low levels of Inorganic constituents (Metals) continue to be detected within several of the monitoring locations. Lead was detected within downgradient well MW-3, MW-8, and MW-9 as well as background well MW-1 above the Standard. Downgradient well MW-8 and background well MW-1 also contained levels of chromium above the Standard. However, the presence of metals is not attributed to leachate originating from the lined landfill but from the natural geochemistry of the aquifer. As previously speculated inadequate purging prior to sampling yields turbid water samples that have been found to contain elevated total metals.

Volatile organic constituents (VOCs) continue to be detected within the phase 1 downgradient cluster wells MW-6S and MW-6D. Water samples obtained from MW-6S continues to contain both purgeable aromatics and a single chlorinated purgeable halocarbon. During the routine semi-annual sampling event conducted by PACE three (3) VOCs were detected with a concentration of the aromatics benzene and 1,4-dichlorobenzene found above the Standard. The number and concentrations of VOCs within MW-6S remain consistent and are within the historical range. The adjacent deeper counterpart MW-6D has contained a single VOC detection each of the last 5 sampling events. Cis-1,2-dichloroethene has been found within MW-6D since February 2004 and the concentration was found above the historical range but well below the MCL. Cis-1,2-dichloroethene is likely an intermediate compound originating from the degradation of tetrachloroethylene and trichloroethylene which has historically been detected within MW-6S. The presence of the intermediate breakdown product and the absence of the parent compounds within both MW-6S and MW-6D may be an indication that the DNAPLs are undergoing natural attenuation in the immediate vicinity. The newly installed piezometers P-17, P-18, and P-19 located along the compliance boundary downgradient of the impacted region monitored by MW-6S/D were found to not contain any detectable VOC concentrations. Results of the second sampling event conducted for P-18 also yielded no detectable parameters indicating that the contaminants are isolated and have not reached the compliance boundary.

Water levels were obtained from piezometers P2-5S, P2-5D, and P-4 to supplement the water elevations from the monitoring wells to construct a more accurate potentiometric surface.

MESCO also completed the statistical analysis as required by the Solid Waste Section. The purpose of these analyses is to determine, in comparison to background levels, statistical significance of constituents detected during this sampling event.

Statistical Analysis Methodology

Metals

An inter-well statistical analysis was conducted upon metals detected during this sampling event. Monitoring 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% level of confidence. For each tested constituent, 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 preliminary data screening was conducted upon the metals detected in all monitoring locations. Detected metals with concentrations found below that of the background well MW-1 were eliminated and a statistical analysis was not conducted upon these wells. A total of 9 metals were tested for statistical significance. For arsenic, and cobalt the non-parametric tolerance limit with 1/2 ND adjustment was used on the original data because the data was not normally distributed within the background well. For the remaining metals, the parametric tolerance limit with ND substituted with either ½ ND or Cohen's adjustment was utilized on the data as its %ND was less than 50% and the data was normal or "log-normally" distributed.

VOCs

All historical VOC detections in the background well MW-1 was 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^*) was derived by utilizing the Poisson prediction interval. The parameter y^* is defined by the following equation:

$$y^* = cy + \frac{t^2 c}{2} + tc\sqrt{y\left(1+\frac{1}{c}\right)+\frac{t^2}{4}}$$

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^* = 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

Intrawell Analyses were conducted only upon those constituents that were initially found to be statistically significant by interwell analysis. In general, intrawell analysis is conducted in order to differentiate true contamination from spatial variability. Baseline levels in this context are defined as the background level derived from the data in a given downgradient well. Intrawell analyses through Shewhart-CUSUM control charts require a minimum of eight independent historical sampling events and a detection rate greater than 25% (%ND≤75%). Due to the lack of sampling events for the phase 2 monitoring wells intrawell analysis could not be conducted upon compliance wells MW-8, MW-9, for all constituents nor MW-6S for the Appendix II metal mercury.

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 to have increased in concentration according to interwell comparison analyses.

Table 3. Interwell Analyses Summary

Well	Arsenic	Beryllium	Chromium	Lead	Mercury	Nickel	Vanadium
MW-6S					x		x
MW-8	x	x	x	x		x	x

x=level significantly higher than the background level

Inorganic constituents continue to be detected within several of the monitoring wells and although concentrations are all within the historical identified range several have been found to have increased according to interwell analysis. Downgradient well MW-8, located south of phase 2, was found to contain all of the metals with the exception of one to have increased according to interwell analyses. MW-8 is one of the youngest wells upon the site therefore full development likely has not been established. Although turbidity observations are not made available the sample obtained from MW-8 was likely very turbid since the water extracted during the slug test completed by MESCO in September 2005 was found to be extremely turbid even after several purging events. Although several metal concentrations were found to have increased according to interwell analysis none of them were able to undergo further intrawell analysis since Shewhart-CUSUM chart formulation requires a minimum of 8 independent historical sampling events and this was only the seventh.

Volatile Organic Compounds (VOCs) continue to be detected within the cluster wells MW-6S and MW-6D located south east of the phase 1 landfill. The shallower well MW-6S contained 3 VOCs during this routine semiannual event. The deeper counterpart continues to contain only cis-1,2-dichloroethene in a concentration below the Standard. Based upon the historical VOC detections within the background well every well that contained 2 or more VOC detection is considered to be statistically significant according to the Poisson Prediction Interval at a 95% confidence level. Therefore the groundwater in the region monitored by MW-6S is considered to be impacted at a 95% confidence level. The VOC concentrations within MW-6S are within historical levels and an upward trend is not evident at this time. The contaminates appear to be isolated within the immediate MW-6S region based upon the complete absence of detected parameters recently installed along the compliance boundary.

MW-7 located south of the phase 1 landfill also contained a low level concentration of cis-1,2-dichloroethene. MW-7 has contained the same intermediate chlorinated hydrocarbon in comparable levels during the August 2003 and 2004 sampling events. However, according to the Poisson Prediction Interval the detection is not considered statistically significant at a 95% confidence level.

Conclusion

The metals found within the monitoring locations are very likely of natural origin and the elevated concentrations may be attributed to sampling methodology. Evidence of the metals being natural in origin can be demonstrated by several factors. Elevated metals have historically been detected within all of the pre-operation baseline samples, the current background well, and no metals were found within the sample obtained from the leachate lagoon.

However the aquifer monitored by MW-6S continues to contain statistically significant concentrations of VOCs. The impacted well is located south of phase 1 and the leachate migration appears to be isolated from the discharge feature. There is also no potential groundwater receptors located downgradient between the landfill and the Valley River. The discharge feature separates the landfill property from the closest residences and at residential pumping rates none of the supply wells are to be considered at risk of significant contamination by groundwater originating from the Subtitle D Landfill facility. Further the residential supply wells located across the river and the river itself (SW-4) are sampled semiannually and will continue to be as part of the assessment monitoring program for the Cherokee County Closed Landfill facility. Based upon the information gathered so far there does not appear to be an immanent threat that humans will come into contact with the groundwater in this region. The Subtitle D landfill is to continue semi-annual sampling with the the next event scheduled for August 2006. During the February 2006 event MESCO recommends sampling for the complete Appendix I list of constituents for P-18 in addition to all of the monitoring locations contained in the detection monitoring program.

MESCO completed a single day potentiometric map based upon water level readings obtained during the sampling event. The ground water flow rates and directions were also calculated and are found in the attached table. The boring logs for the newly installed piezometers P-17, P-18, and P-19 located along the compliance boundary on the river bank are also enclosed. Please contact me by phone at (919) 772-5393 or by email at jpfohl@mesco.com if you have any questions or comments regarding this facility.

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

Jonathan Pfohl
Environmental Specialist

Enclosures
cc: Mr. Robert Allen
Cherokee County

Exceedance Scan (Unfiltered based upon lab using MDL values NOT the Section's recommended PQL)
Cherokee County Subtitle D Landfill

Well ID	Parameter Name[1]	Sample Date	Result	Unit	PQL[2]	NCGW2L[3]	Exceedance
LEACHATE	Barium	02/22/2006	0.17	mg/l	0.0050	2	
LEACHATE	Zinc	02/22/2006	0.013	mg/l	0.010	1.05	
MW-1	**Lead**	**02/23/2006**	**0.023**	**mg/l**	**0.0050**	**0.015**	**0.008**
MW-1	Cobalt	02/23/2006	0.044	mg/l	0.0050		
MW-1	Barium	02/23/2006	0.13	mg/l	0.0050	2	
MW-1	Nickel	02/23/2006	0.034	mg/l	0.0050	0.1	
MW-1	Zinc	02/23/2006	0.098	mg/l	0.010	1.05	
MW-1	Copper	02/23/2006	0.069	mg/l	0.0020	1	
MW-1	Beryllium	02/23/2006	0.002	mg/l	0.0010		
MW-1	**Chromium**	**02/23/2006**	**0.058**	**mg/l**	**0.0020**	**0.05**	**0.008**
MW-1	Vanadium	02/23/2006	0.036	mg/l	0.0050		
MW-1	Tin	02/23/2006	0.032	mg/l	0.0050		
MW-2	Lead	02/23/2006	0.0086	mg/l	0.0050	0.015	
MW-2	Chromium	02/23/2006	0.019	mg/l	0.0020	0.05	
MW-2	Beryllium	02/23/2006	0.001	mg/l	0.0010		
MW-2	Zinc	02/23/2006	0.047	mg/l	0.010	1.05	
MW-2	Copper	02/23/2006	0.006	mg/l	0.0020	1	
MW-2	Nickel	02/23/2006	0.013	mg/l	0.0050	0.1	
MW-2	Barium	02/23/2006	0.087	mg/l	0.0050	2	
MW-2	Cobalt	02/23/2006	0.011	mg/l	0.0050		
MW-2	Vanadium	02/23/2006	0.0099	mg/l	0.0050		
MW-3	Nickel	02/23/2006	0.027	mg/l	0.0050	0.1	
MW-3	Copper	02/23/2006	0.016	mg/l	0.0020	1	
MW-3	**Lead**	**02/23/2006**	**0.026**	**mg/l**	**0.0050**	**0.015**	**0.011**
MW-3	Cobalt	02/23/2006	0.032	mg/l	0.0050		
MW-3	Zinc	02/23/2006	0.13	mg/l	0.010	1.05	
MW-3	Vanadium	02/23/2006	0.024	mg/l	0.0050		
MW-3	Barium	02/23/2006	0.31	mg/l	0.0050	2	
MW-3	Chromium	02/23/2006	0.048	mg/l	0.0020	0.05	
MW-3	Beryllium	02/23/2006	0.0038	mg/l	0.0010		
MW-4	Lead	02/23/2006	0.015	mg/l	0.0050	0.015	
MW-4	Chromium	02/23/2006	0.046	mg/l	0.0020	0.05	
MW-4	Beryllium	02/23/2006	0.0029	mg/l	0.0010		
MW-4	Nickel	02/23/2006	0.037	mg/l	0.0050	0.1	
MW-4	Copper	02/23/2006	0.012	mg/l	0.0020	1	
MW-4	Cobalt	02/23/2006	0.012	mg/l	0.0050		
MW-4	Zinc	02/23/2006	0.12	mg/l	0.010	1.05	
MW-4	Barium	02/23/2006	0.31	mg/l	0.0050	2	
MW-4	Vanadium	02/23/2006	0.022	mg/l	0.0050		
MW-5	Zinc	02/23/2006	0.026	mg/l	0.010	1.05	
MW-5	Barium	02/23/2006	0.018	mg/l	0.0050	2	
MW-5	Nickel	02/23/2006	0.0062	mg/l	0.0050	0.1	
MW-5	Copper	02/23/2006	0.0081	mg/l	0.0020	1	
MW-5	Chromium	02/23/2006	0.0024	mg/l	0.0020	0.05	
MW-6D	Barium	02/23/2006	0.01	mg/l	0.0050	2	
MW-6D	Zinc	02/23/2006	0.013	mg/l	0.010	1.05	
MW-6D	Nickel	02/23/2006	0.0051	mg/l	0.0050	0.1	
MW-6S	Mercury	02/23/2006	0.0007	mg/l	0.00020	0.0011	
MW-6S	Cobalt	02/23/2006	0.023	mg/l	0.0050		
MW-6S	Barium	02/23/2006	0.18	mg/l	0.0050	2	
MW-6S	Zinc	02/23/2006	0.037	mg/l	0.010	1.05	

MW-6S	Selenium	02/23/2006	0.006 mg/l	0.0050		0.05	
MW-6S	Nickel	02/23/2006	0.016 mg/l	0.0050		0.1	
MW-7	Zinc	02/23/2006	0.051 mg/l	0.010		1.05	
MW-7	Vanadium	02/23/2006	0.011 mg/l	0.0050			
MW-7	Copper	02/23/2006	0.0062 mg/l	0.0020		1	
MW-7	Barium	02/23/2006	0.081 mg/l	0.0050		2	
MW-7	Chromium	02/23/2006	0.0092 mg/l	0.0020		0.05	
MW-7	Nickel	02/23/2006	0.0066 mg/l	0.0050		0.1	
MW-7	Lead	02/23/2006	0.009 mg/l	0.0050		0.015	
MW-7	Cobalt	02/23/2006	0.035 mg/l	0.0050			
MW-8	Barium	02/23/2006	0.47 mg/l	0.0050		2	
MW-8	Beryllium	02/23/2006	0.016 mg/l	0.0010			
MW-8	**Lead**	**02/23/2006**	**0.13 mg/l**	**0.0050**		**0.015**	**0.115**
MW-8	Cobalt	02/23/2006	0.099 mg/l	0.0050			
MW-8	Tin	02/23/2006	0.005 mg/l	0.0050			
MW-8	**Chromium**	**02/23/2006**	**0.2 mg/l**	**0.0020**		**0.05**	**0.15**
MW-8	Copper	02/23/2006	0.12 mg/l	0.0020		1	
MW-8	Nickel	02/23/2006	0.1 mg/l	0.0050		0.1	
MW-8	Vanadium	02/23/2006	0.18 mg/l	0.0050			
MW-8	Arsenic	02/23/2006	0.018 mg/l	0.0050		0.05	
MW-8	Zinc	02/23/2006	0.58 mg/l	0.010		1.05	
MW-9	Barium	02/23/2006	0.35 mg/l	0.0050		2	
MW-9	**Lead**	**02/23/2006**	**0.016 mg/l**	**0.0050**		**0.015**	**0.001**
MW-9	Chromium	02/23/2006	0.016 mg/l	0.0020		0.05	
MW-9	Beryllium	02/23/2006	0.0013 mg/l	0.0010			
MW-9	Cobalt	02/23/2006	0.016 mg/l	0.0050			
MW-9	Zinc	02/23/2006	0.13 mg/l	0.010		1.05	
MW-9	Vanadium	02/23/2006	0.0099 mg/l	0.0050			
MW-9	Nickel	02/23/2006	0.017 mg/l	0.0050		0.1	
MW-9	Copper	02/23/2006	0.014 mg/l	0.0020		1	
SW-2	Barium	02/22/2006	0.0075 mg/l	0.0050		2	
SW-4	Barium	02/22/2006	0.0068 mg/l	0.0050		2	
LEACHATE	Xylenes	02/22/2006	25 ug/l		10	530	
LEACHATE	Toluene	02/22/2006	8.8 ug/l	5.0		1000	
LEACHATE	Ethylbenzene	02/22/2006	20 ug/l	5.0		550	
MW-6D	cis-1,2-Dichloroethene	02/23/2006	23 ug/l	5.0		70	
MW-6S	**Benzene**	**02/23/2006**	**5.5 ug/l**	**5.0**		**1**	**4.5**
MW-6S	cis-1,2-Dichloroethene	02/23/2006	28 ug/l	5.0		70	
MW-6S	**1,4-Dichlorobenzene**	**02/23/2006**	**15 ug/l**	**5.0**		**1.4**	**13.6**
MW-7	cis-1,2-Dichloroethene	02/23/2006	8.5 ug/l	5.0		70	

[1] Table only contains detected constituents.

[2] PQL = Practical Quantitation Limit

[3] NCGW2L = North Carolina Ground Water 2L Standard

Exceedance Scan (Filtered based upon Section's recommended PQL)
Cherokee County Subtitle D Landfill

Well ID	Parameter Name[1]	Sample Date	Result	Unit	PQL[2]	NCGW2L[3]	Exceedance
MW-1	**Chromium**	**02/23/2006**	**0.058**	**mg/l**	**0.0020**	**0.05**	**0.008**
MW-1	Cobalt	02/23/2006	0.044	mg/l	0.0050		
MW-1	**Lead**	**02/23/2006**	**0.023**	**mg/l**	**0.0050**	**0.015**	**0.008**
MW-1	Tin	02/23/2006	0.032	mg/l	0.0050		
MW-1	Zinc	02/23/2006	0.098	mg/l	0.010	1.05	
MW-2	Chromium	02/23/2006	0.019	mg/l	0.0020	0.05	
MW-2	Cobalt	02/23/2006	0.011	mg/l	0.0050		
MW-3	Beryllium	02/23/2006	0.0038	mg/l	0.0010		
MW-3	Chromium	02/23/2006	0.048	mg/l	0.0020	0.05	
MW-3	Cobalt	02/23/2006	0.032	mg/l	0.0050		
MW-3	**Lead**	**02/23/2006**	**0.026**	**mg/l**	**0.0050**	**0.015**	**0.011**
MW-3	Zinc	02/23/2006	0.13	mg/l	0.010	1.05	
MW-4	Beryllium	02/23/2006	0.0029	mg/l	0.0010		
MW-4	Chromium	02/23/2006	0.046	mg/l	0.0020	0.05	
MW-4	Cobalt	02/23/2006	0.012	mg/l	0.0050		
MW-4	Lead	02/23/2006	0.015	mg/l	0.0050	0.015	
MW-4	Zinc	02/23/2006	0.12	mg/l	0.010	1.05	
MW-6S	Cobalt	02/23/2006	0.023	mg/l	0.0050		
MW-6S	Mercury	02/23/2006	0.0007	mg/l	0.00020	0.0011	
MW-7	Chromium	02/23/2006	0.0092	mg/l	0.0020	0.05	
MW-7	Cobalt	02/23/2006	0.035	mg/l	0.0050		
MW-7	Zinc	02/23/2006	0.051	mg/l	0.010	1.05	
MW-8	Arsenic	02/23/2006	0.018	mg/l	0.0050	0.05	
MW-8	Beryllium	02/23/2006	0.016	mg/l	0.0010		
MW-8	**Chromium**	**02/23/2006**	**0.2**	**mg/l**	**0.0020**	**0.05**	**0.15**
MW-8	Cobalt	02/23/2006	0.099	mg/l	0.0050		
MW-8	**Lead**	**02/23/2006**	**0.13**	**mg/l**	**0.0050**	**0.015**	**0.115**
MW-8	Nickel	02/23/2006	0.1	mg/l	0.0050	0.1	
MW-8	Tin	02/23/2006	0.005	mg/l	0.0050		
MW-8	Vanadium	02/23/2006	0.18	mg/l	0.0050		
MW-8	Zinc	02/23/2006	0.58	mg/l	0.010	1.05	
MW-9	Chromium	02/23/2006	0.016	mg/l	0.0020	0.05	
MW-9	Cobalt	02/23/2006	0.016	mg/l	0.0050		
MW-9	**Lead**	**02/23/2006**	**0.016**	**mg/l**	**0.0050**	**0.015**	**0.001**
MW-9	Zinc	02/23/2006	0.13	mg/l	0.010	1.05	
LEACHATE	Xylenes	02/22/2006	25	ug/l	10	530	
LEACHATE	Toluene	02/22/2006	8.8	ug/l	5.0	1000	
LEACHATE	Ethylbenzene	02/22/2006	20	ug/l	5.0	550	
MW-6D	cis-1,2-Dichloroethene	02/23/2006	23	ug/l	5.0	70	
MW-6S	**Benzene**	**02/23/2006**	**5.5**	**ug/l**	**5.0**	**1**	**4.5**
MW-6S	cis-1,2-Dichloroethene	02/23/2006	28	ug/l	5.0	70	
MW-6S	**1,4-Dichlorobenzene**	**02/23/2006**	**15**	**ug/l**	**5.0**	**1.4**	**13.6**
MW-7	cis-1,2-Dichloroethene	02/23/2006	8.5	ug/l	5.0	70	

[1] Table only contains detected constituents.
[2] PQL = Practical Quantitation Limit
[3] NCGW2L = North Carolina Ground Water 2L Standard

Hydrologic Properties at Monitoring Well Locations
Cherokee County Subtitle D Landfill

Monitoring Well	Hydraulic Conductivity (cm/sec)	Effective Porosity (%)	Hydraulic Gradient	Flow Rate (ft/yr)	Flow Direction	Water Table Depth (ft)	Water Table Elev. (ft)
MW-1	3.04E-06	5.00	0.10	6	S36E	98.8	1704.8
MW-2	1.97E-04	16.00	0.08	103	N74E	56.02	1635.32
MW-3	1.18E-04	10.00	0.15	180	S84E	34.7	1654.71
MW-4	1.71E-04	16.00	0.05	54	S78E	16.64	1646.7
MW-5	1.66E-03	15.00	0.06	632	S80E	5.55	1632.59
MW-6S	4.15E-05	15.00	0.15	43	S18E	14.64	1646.53
MW-7	5.80E-05	16.00	0.26	97	S6W	19.08	1630.54
MW-8	1.27E-04	14.00	0.10	93	S8E	11.35	1630.67
MW-9	2.84E-04	14.00	0.07	141	S10E	23.18	1641.7

NOTE: Effective Porosity value for MW-5 & MW-6S taken from table in Applied Hydrogeology of Fractured Rocks, Singhal & Gupta (1999)
All other values for effective porosity are derived from the Design Hydrogeologic Study for the Cherokee County Subtitle D Landfill.
Hydraulic Conductivities were obtained from slug tests performed by Municipal Engineering on each monitoring well and data from the Design Hydrogeologic Study.
Hydrologic Gradient taken from the February 23, 2006 sampling event.

Flow rate (Q) is defined by the equation:

$$Q = -\frac{K}{n_e} \cdot \frac{dh}{dl}$$

where

K = hydraulic conductivity
ne = effective porosity
dh = head difference
dl = horizontal distance

Groundwater Elevations at Monitoring Locations
Cherokee County Subtitle D Landfill

WELL #	TOP OF PIPE ELEVATION (FT)	DEPTH TO WATER (FT)	WATER ELEVATION (FT)
MW-1	1803.6	98.8	1704.8
MW-2	1691.34	56.02	1635.32
MW-3	1689.41	34.7	1654.71
MW-4	1663.34	16.64	1646.7
MW-5	1638.14	5.55	1632.59
MW-6S	1661.17	14.64	1646.53
MW-6D	1658.12	25.93	1632.19
MW-7	1649.62	19.08	1630.54
MW-8	1642.02	11.35	1630.67
MW-9	1664.88	23.18	1641.7
P2-5S	1780.18	86.97	1693.21
P-4	1679.2	6.64	1672.56
P-17	1638.09	11.23	1626.86
P-18	1636.98	9.3	1627.68
P-19	1636.29	7.93	1628.36

Statistical Analysis Results Summary

Inter-Well Analysis Summary
Cherokee County Subtitle D Lined Landfill

Background Well: MW-1

Arsenic, total

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

Well	Result	Significance
MW-8	18	Yes

Beryllium, total

%ND	Normality	Method	ND Adj.	Upper Limit (a = 95%)	Unit
35.00	log normal	Parametric Tolerance interval	1/2ND	2.361	log[ug/l]

Well	Result	Significance
MW-3	1.34	no
MW-4	1.06	no
MW-8	2.77	Yes

Chromium, total

%ND	Normality	Method	ND Adj.	Upper Limit (a = 95%)	Unit
5.00	normal	Parametric Tolerance interval	1/2ND	97.912	ug/l

Well	Result	Significance
MW-8	200	Yes

Cobalt, total

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

Well	Result	Significance
MW-8	99	no

Lead, total

%ND	Normality	Method	ND Adj.	Upper Limit (a = 95%)	Unit
20.00	log normal	Parametric Tolerance interval	1/2ND	4.77800	log[ug/l]

Well	Result	Significance
MW-3	3.26	no
MW-8	4.87	Yes

Mercury, total

%ND	Normality	Method	ND Adj.	Upper Limit (a = 95%)	Unit
100.00	normal	Parametric Tolerance interval	1/2ND	0.10000	ug/l

Well	Result	Significance
MW-6S	0.7	Yes

Nickel, total

%ND	Normality	Method	ND Adj.	Upper Limit (a = 95%)	Unit
25.00	log normal	Parametric Tolerance interval	1/2ND	4.345	log[ug/l]

Well	Result	Significance
MW-8	4.61	Yes

Vanadium

%ND	Normality	Method	ND Adj.	Upper Limit (a = 95%)	Unit
20.00	log normal	Parametric Tolerance interval	Cohen	3.576	log[ug/l]

Well	Result	Significance
MW-8	5.44	Yes

Zinc, total

%ND	Normality	Method	ND Adj.	Upper Limit (a = 95%)	Unit
5.00	normal	Parametric Tolerance interval	1/2ND	259.448	ug/l

Well	Result	Significance
MW-3	130	no
MW-4	120	no
MW-8	580	Yes
MW-9	130	no

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	Arsenic	Beryllium	Chromium	Lead	Mercury	Nickel	Vanadium
MW-6S					n/a		
MW-8	n/a	n/a	**n/a**	**n/a**		n/a	n/a

Unable to determine if Metal Concentrations have increased according to Intra-Well Analysis

EXPLANATION

Bold=detected levels above Standard

n/a=Significant by interwell analysis but Intrawell analysis could not be conducted due to lack of sampling events

no= detection not statistically significant by intrawell analysis

yes=detection statistically significant by intrawell analysis

Summary of Pooled Appendix I VOCs in Background Well (MW-1)
Cherokee County Subtitle D Lined Landfill

Constituent	Samples	NDs	% NDs
1,1,1,2-Tetrachloroethane	20	20	100.00
1,1,1-Trichloroethane	20	20	100.00
1,1,2,2-Tetrachloroethane	20	20	100.00
1,1,2-Trichloroethane	20	20	100.00
1,1-Dichloroethane	20	20	100.00
1,1-Dichloroethene	20	20	100.00
1,2,3-Trichloropropane	20	20	100.00
1,2-Dibromo-3-chloropropane	20	20	100.00
1,2-Dibromoethane	20	20	100.00
1,2-Dichlorobenzene	20	20	100.00
1,2-Dichloroethane	20	20	100.00
1,2-Dichloropropane	20	20	100.00
1,4-Dichlorobenzene	20	20	100.00
2-Butanone	20	20	100.00
2-Hexanone	20	20	100.00
4-Methyl-2-Pentanone	20	20	100.00
Acetone	20	20	100.00
Acrylonitrile	20	20	100.00
Benzene	20	20	100.00
Bromochloromethane	20	20	100.00
Bromodichloromethane	20	20	100.00
Bromoform	20	20	100.00
Bromomethane	20	19	95.00
Carbon disulfide	20	17	85.00
Carbon tetrachloride	20	20	100.00
Chlorobenzene	20	20	100.00
Chloroethane	20	20	100.00
Chloroform	20	20	100.00
Chloromethane	20	20	100.00
cis-1,2-Dichloroethene	20	20	100.00
cis-1,3-Dichloropropene	20	20	100.00
Chlorodibromomethane	20	20	100.00
Dibromomethane	20	20	100.00
Ethylbenzene	20	20	100.00
Iodomethane	20	20	100.00
Dichloromethane	20	20	100.00
Styrene	20	20	100.00
Tetrachloroethylene	20	20	100.00
Toluene	20	20	100.00
trans-1,2-Dichloroethene	20	20	100.00
trans-1,3-Dichloropropene	20	20	100.00
trans-1,4-Dichloro-2-butene	20	20	100.00
Trichloroethylene	20	20	100.00
Trichlorofluoromethane	20	20	100.00
Vinyl acetate	20	20	100.00
Vinyl chloride	20	20	100.00
Xylene	20	20	100.00
Total	**940**	**936**	**99.57**

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

All detected VOCs (Background Well: MW-1)

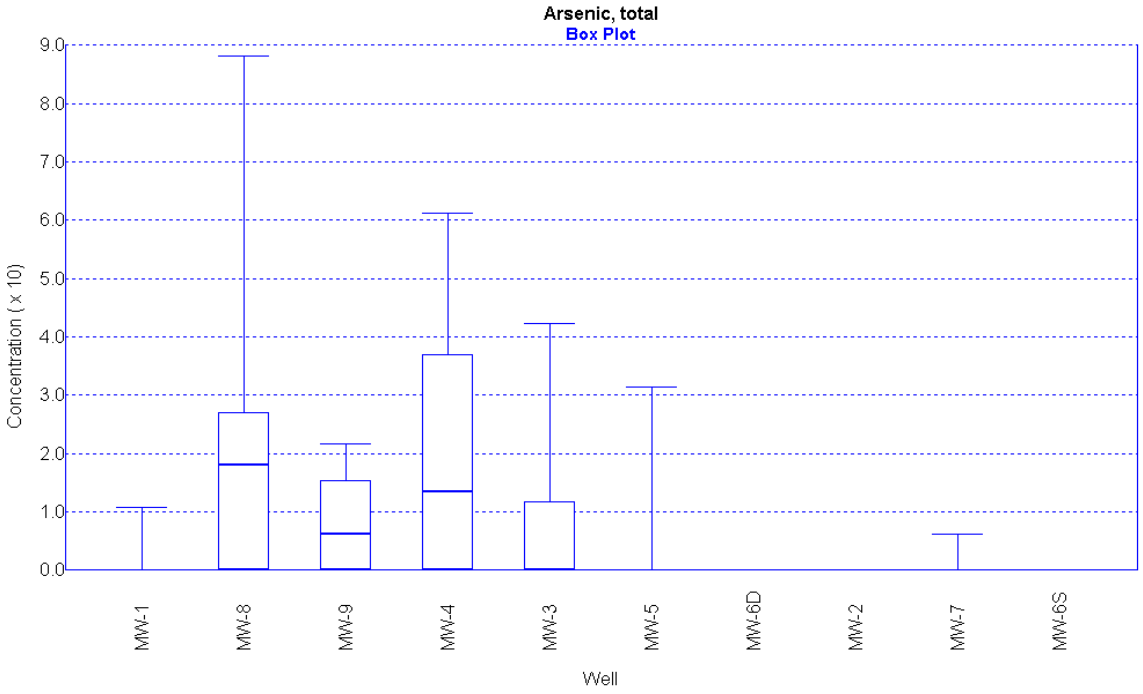
Constituent	MW-6S	MW-6D	MW-7
Benzene	**x**		
1,4-Dichlorobenzene	**x**		
cis-1,2-Dichloroethene	x	x	x
Detection(s) per Scan	3.00	1.00	1.00

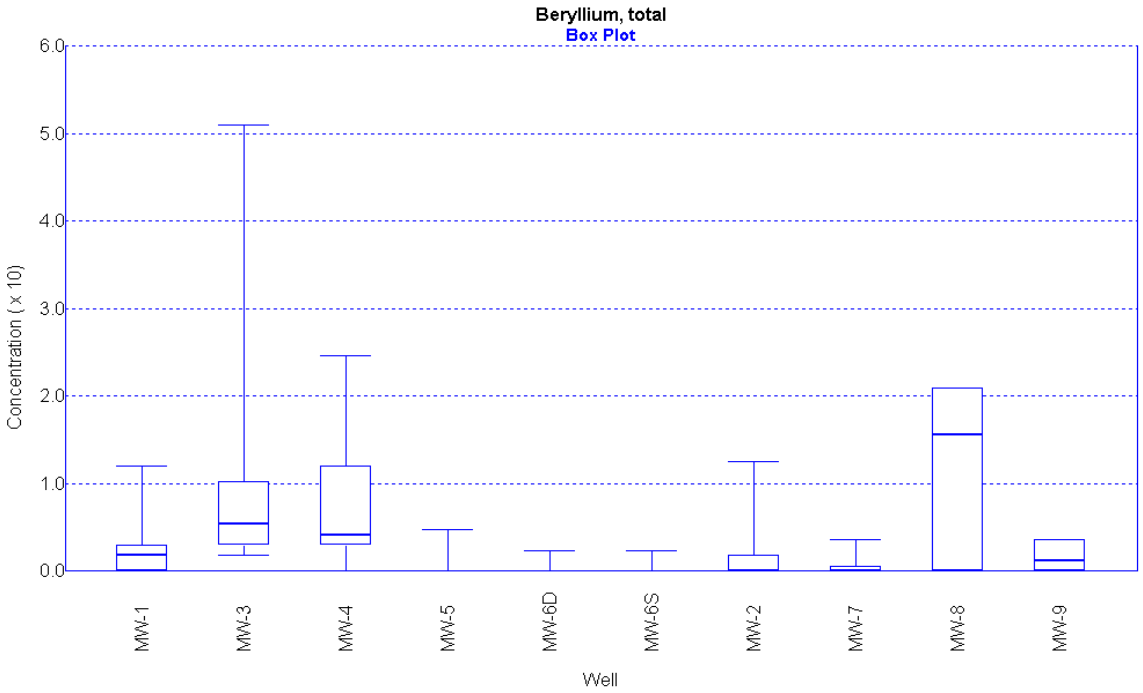
*=Detected only from the confirmation event of 9/15/05.

Total number of sampling events [n] = 20
Total number of detections in background wells [y] = 4
Number of comparisons (downgradient wells) [k] = 10
One-sided value of Student's t-statistic (95% confidence) [t] = 2.86
Expected number of detections in a single future sample [y*] = **1.7310**

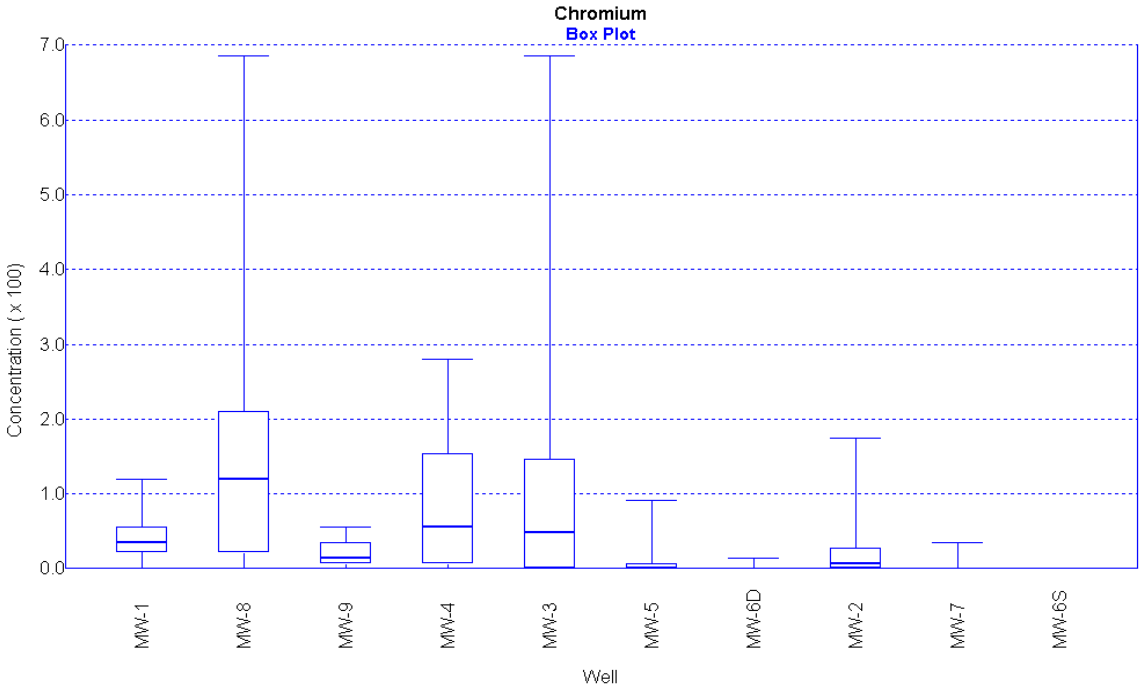
Statistically Significant VOC detections within MW-6S at a 95% confidence level

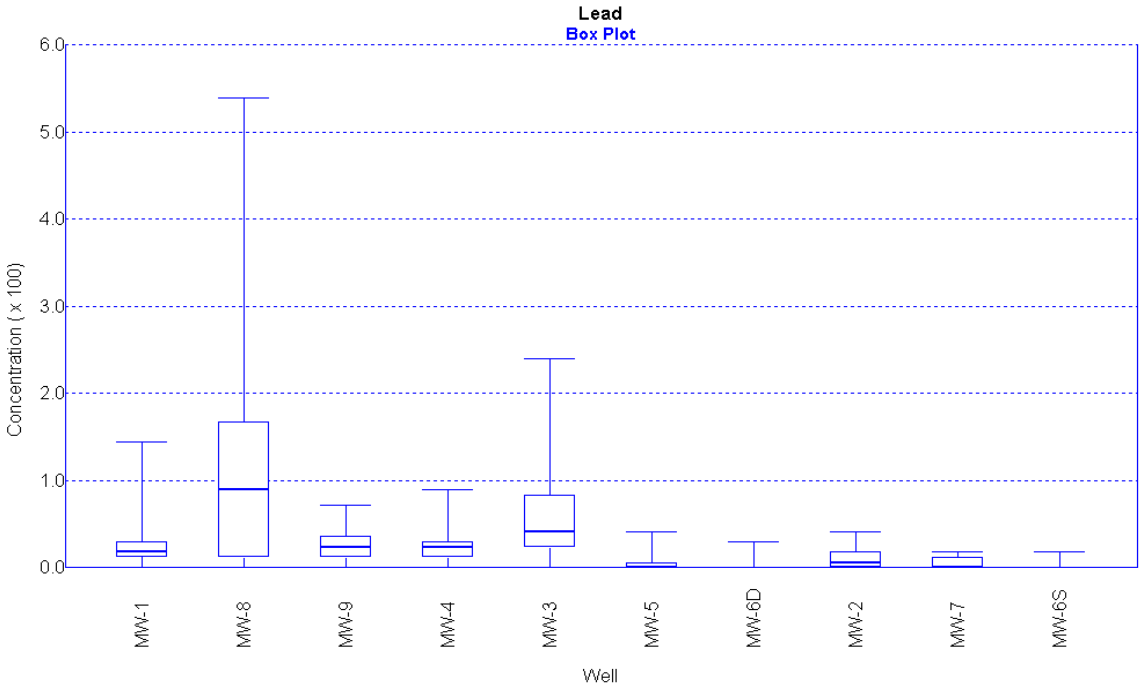
Box Plots for Select Constituents (Metals)
Cherokee County Subtitle D Lined Landfill



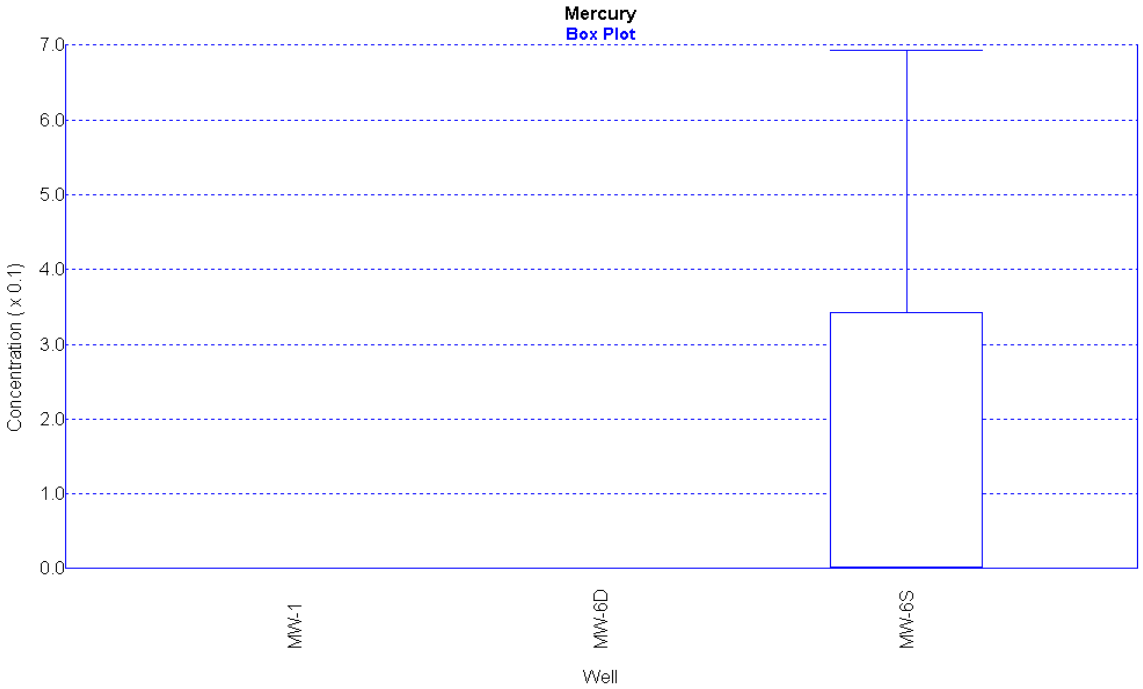


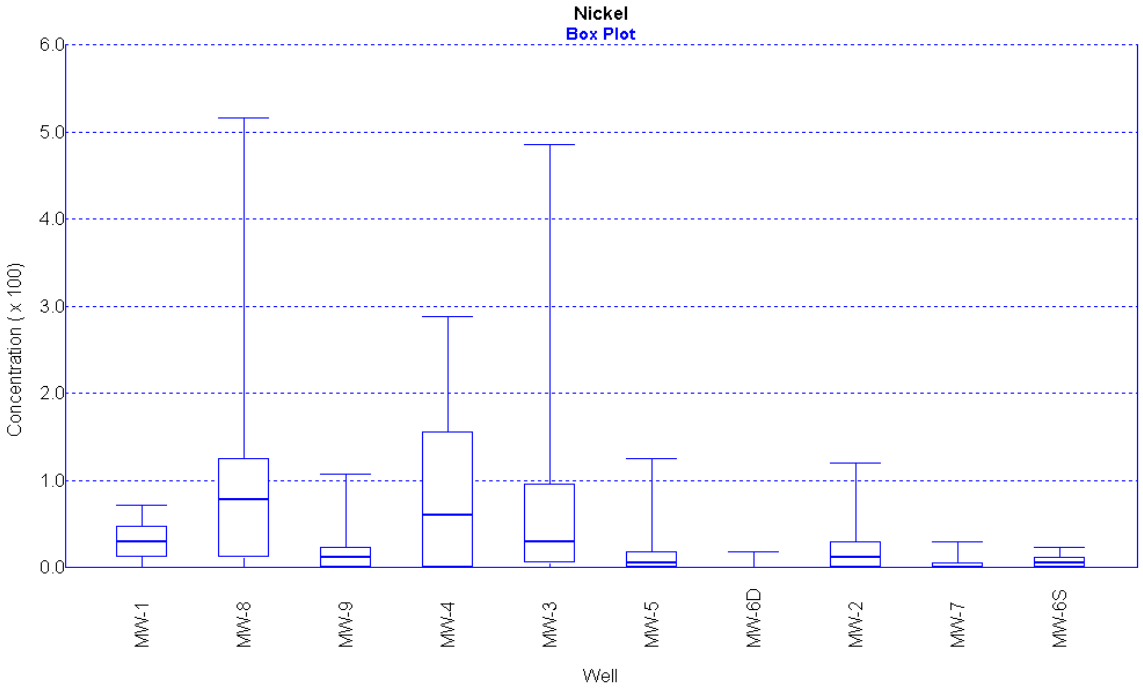
Box Plots for Select Constituents (Metals)
Cherokee County Subtitle D Lined Landfill



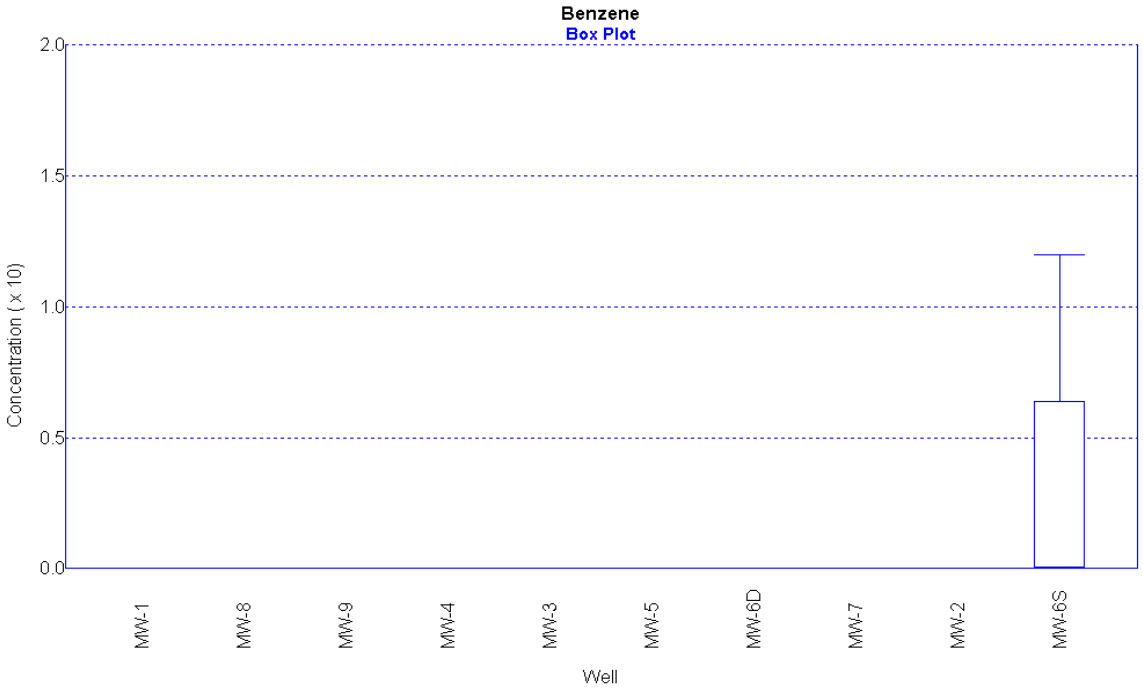


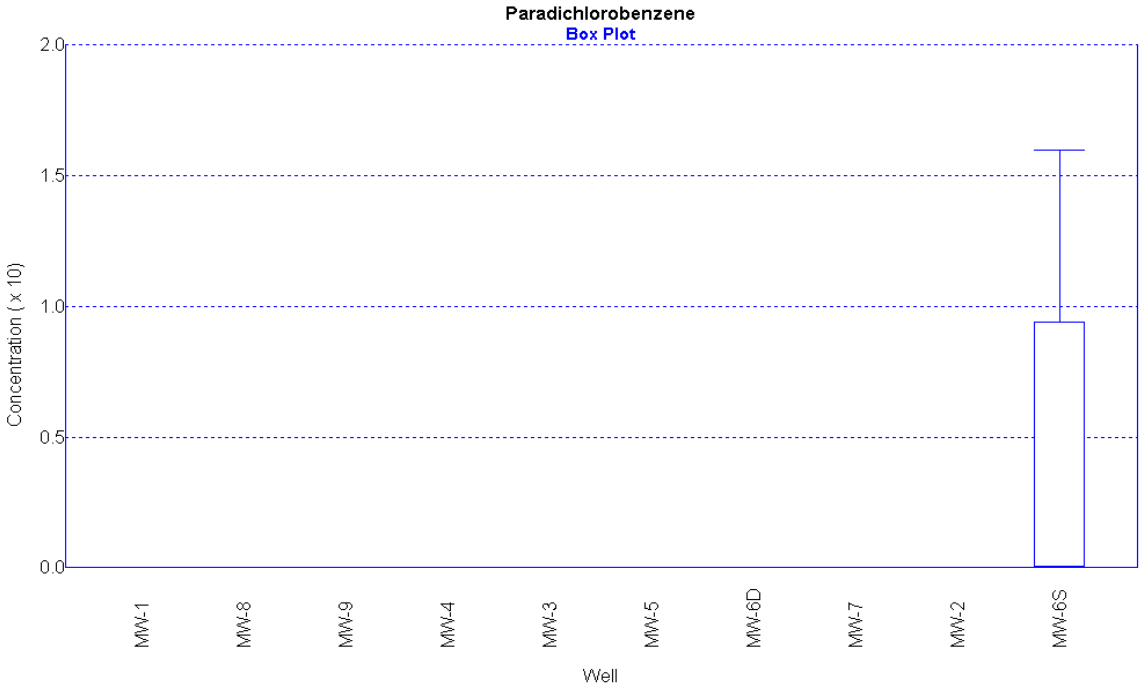
Box Plots for Select Constituents (Metals)
Cherokee County Subtitle D Lined Landfill



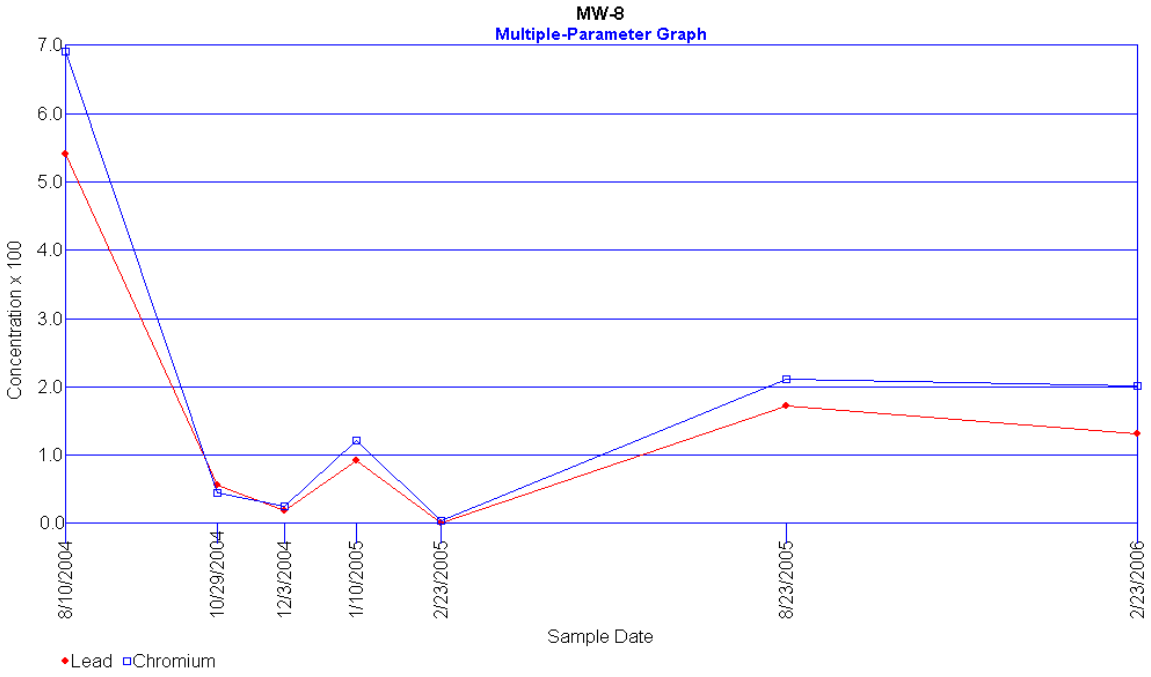


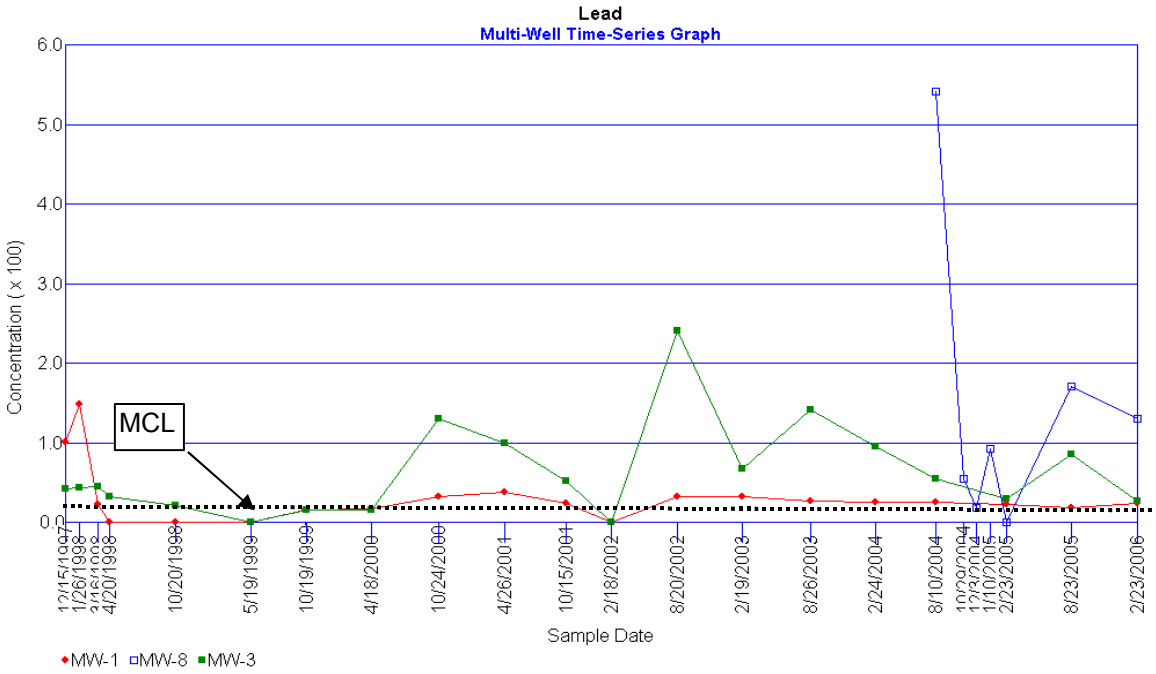
Box Plots for Select Constituents (VOCs)
Cherokee County Subtitle D Lined Landfill



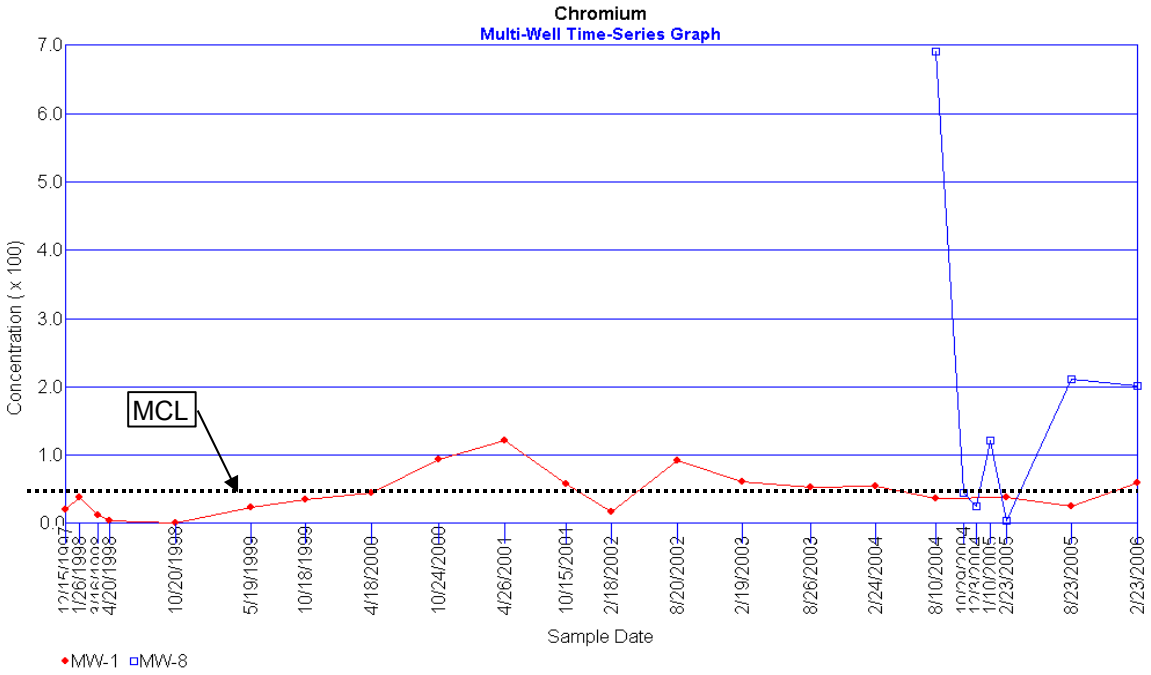


Time Series Plots for Select Constituents (Metals)
Cherokee County Subtitle D Lined Landfill

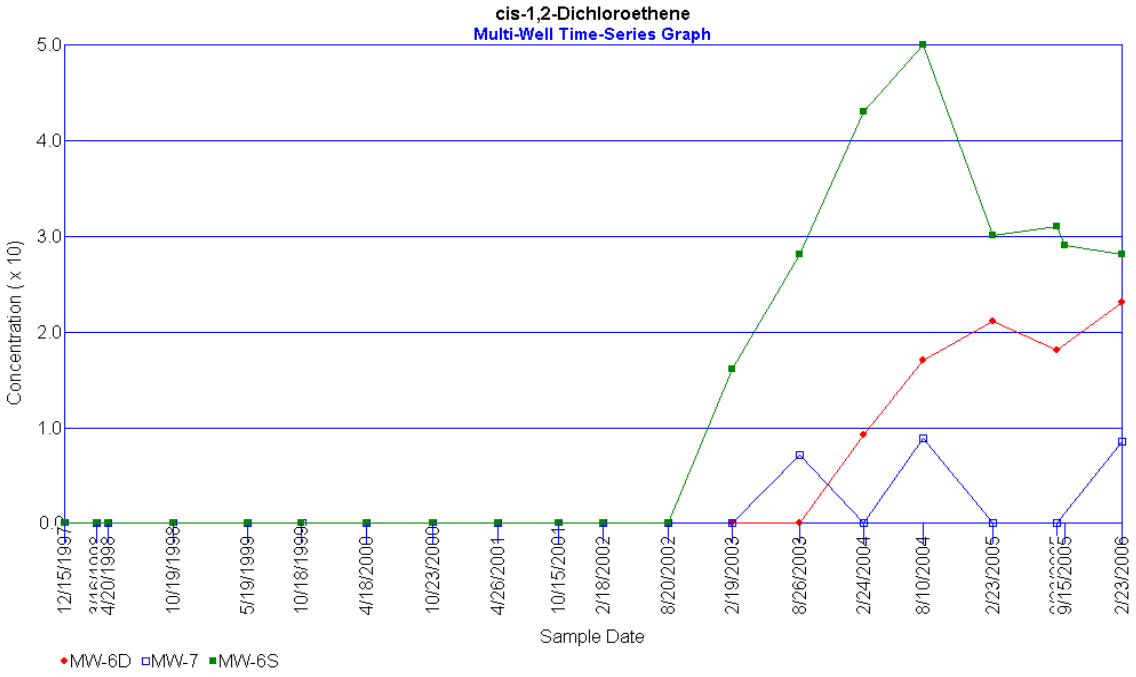




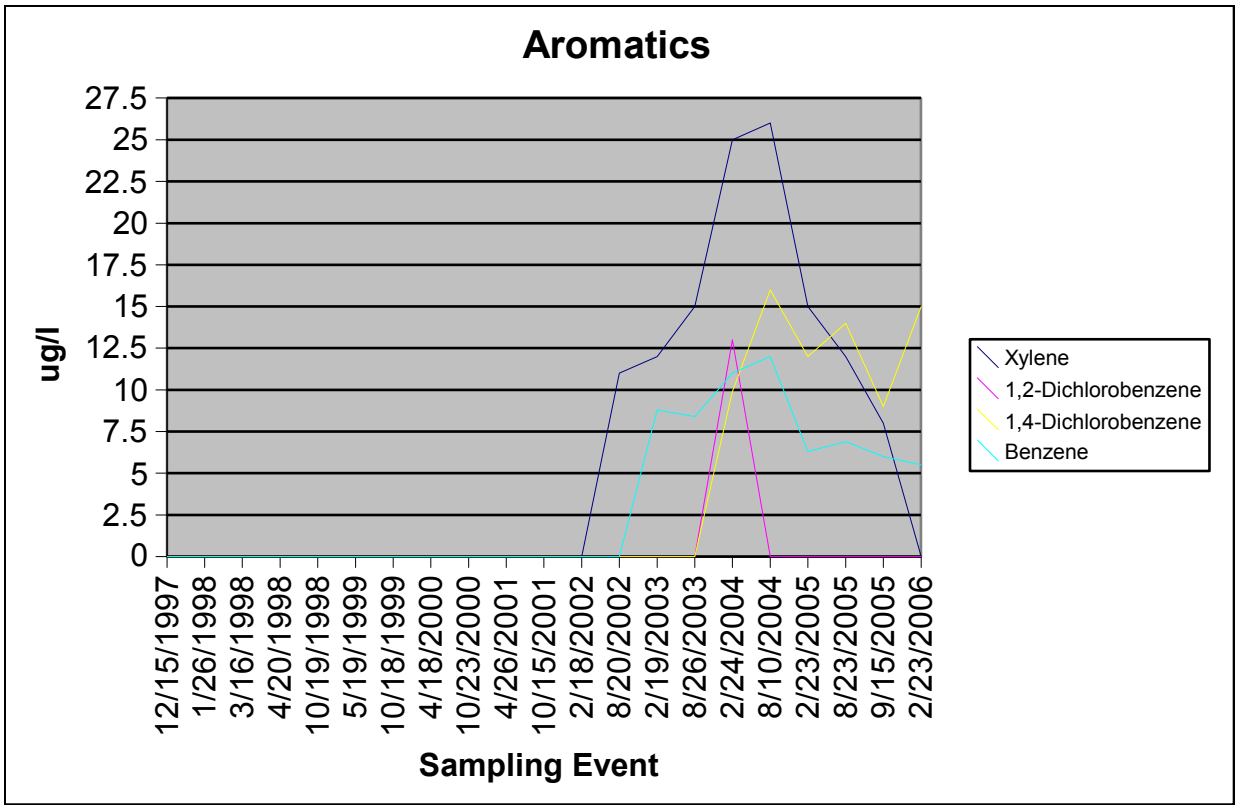
Time Series Plots for Select Constituents (Metals)
Cherokee County Subtitle D Lined Landfill



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



Time Series Plots for All Historical Detected Aromatic VOCs (MW-6S)
Cherokee County Subtitle D Landfill



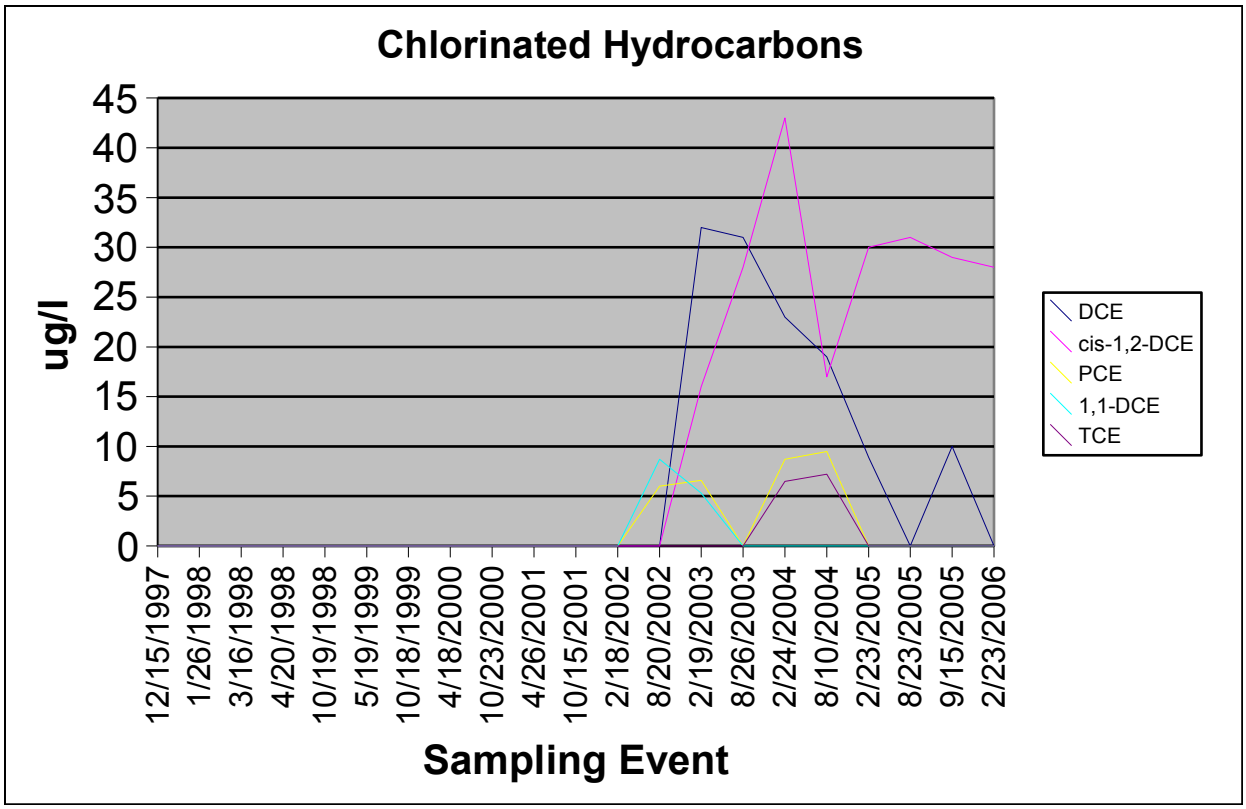
Aromatics

Sample Date	Xylene	1,2-Dichlorobenzene	1,4-Dichlorobenzene	Benzene
12/15/1997	ND	ND	ND	ND
1/26/1998	ND	ND	ND	ND
3/16/1998	ND	ND	ND	ND
4/20/1998	ND	ND	ND	ND
10/19/1998	ND	ND	ND	ND
5/19/1999	ND	ND	ND	ND
10/18/1999	ND	ND	ND	ND
4/18/2000	ND	ND	ND	ND
10/23/2000	ND	ND	ND	ND
4/26/2001	ND	ND	ND	ND
10/15/2001	ND	ND	ND	ND
2/18/2002	ND	ND	ND	ND
8/20/2002	11	ND	ND	ND
2/19/2003	12	ND	ND	**8.8**
8/26/2003	15	ND	ND	**8.4**
2/24/2004	25	13	**9.9**	**11**
8/10/2004	26	ND	**16**	**12**
2/23/2005	15	ND	**12**	**6.3**
8/23/2005	12	ND	**14**	**6.9**
09/15/2005*	8	ND	**9**	**6**
2/23/2006	ND	ND	**15**	**5.5**

Bold = Above NCGW2L

*=confirmation resample event conducted by MESCO

Time Series Plots for All Historical Detected Chlorinated VOCs (MW-6S)
Cherokee County Subtitle D Landfill



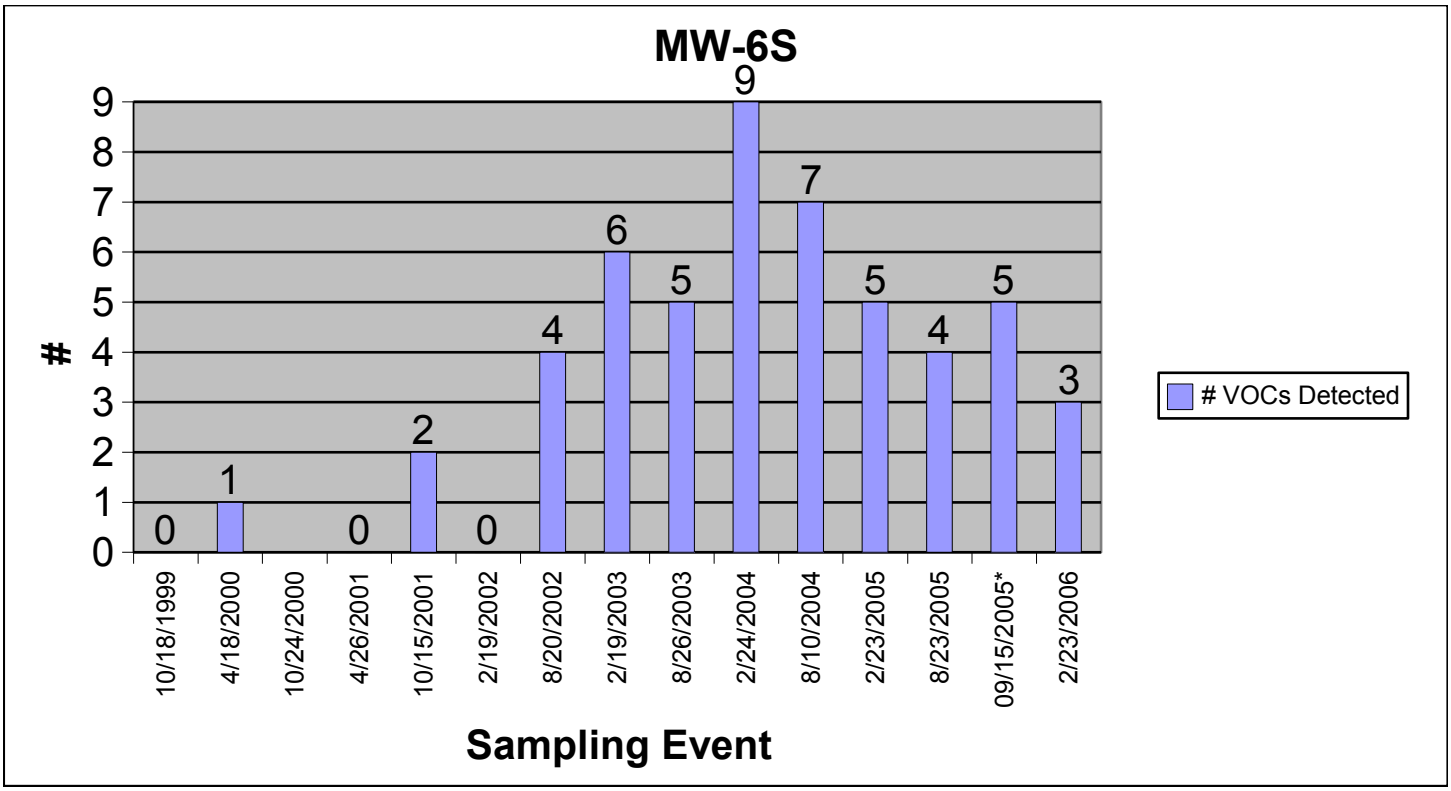
Chlorinated Hydrocarbons

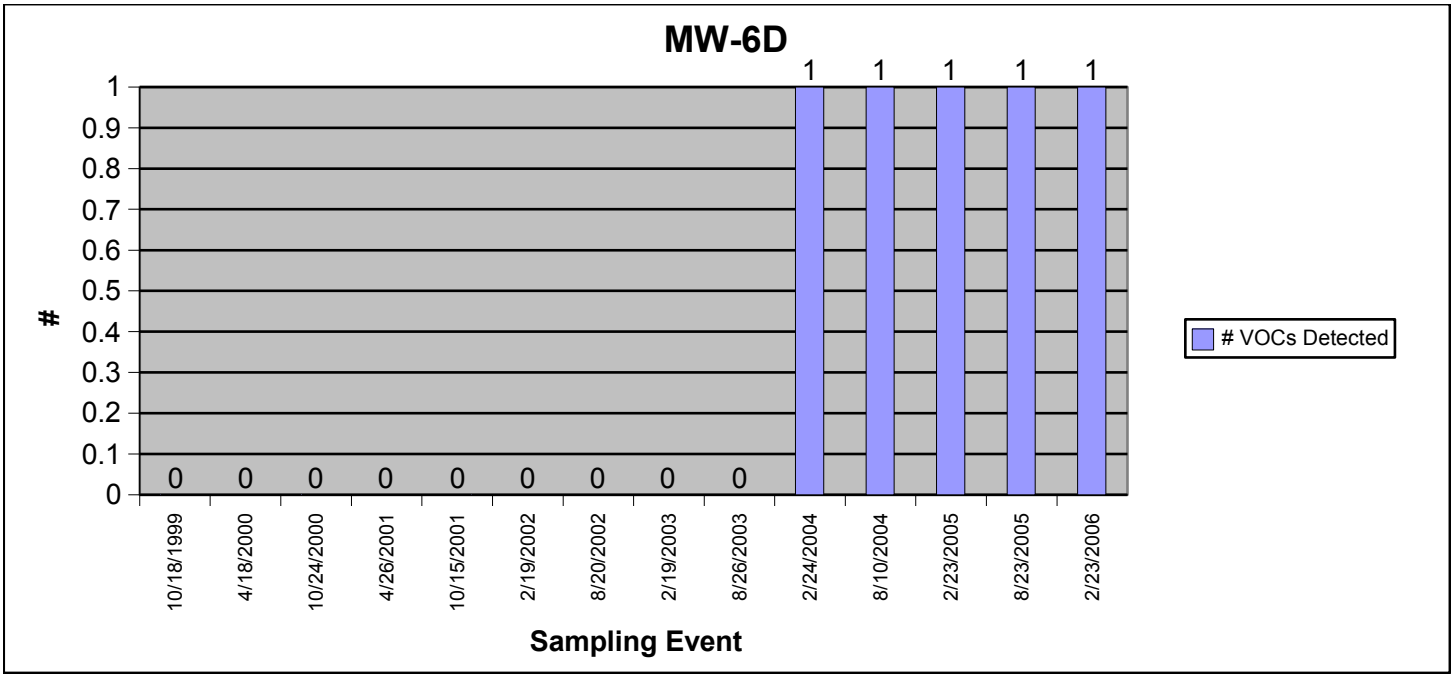
Sample Date	DCE	cis-1,2-DCE	PCE	1,1-DCE	TCE
12/15/1997	ND	ND	ND	ND	ND
1/26/1998	ND	ND	ND	ND	ND
3/16/1998	ND	ND	ND	ND	ND
4/20/1998	ND	ND	ND	ND	ND
10/19/1998	ND	ND	ND	ND	ND
5/19/1999	ND	ND	ND	ND	ND
10/18/1999	ND	ND	ND	ND	ND
4/18/2000	ND	ND	ND	ND	ND
10/23/2000	ND	ND	ND	ND	ND
4/26/2001	ND	ND	ND	ND	ND
10/15/2001	ND	ND	ND	ND	ND
2/18/2002	ND	ND	ND	ND	ND
8/20/2002	ND	ND	**6**	8.7	ND
2/19/2003	**32**	16	**6.6**	5.3	ND
8/26/2003	**31**	28	ND	ND	ND
2/24/2004	**23**	43	**8.7**	ND	**6.5**
8/10/2004	**19**	17	**9.5**	ND	**7.2**
2/23/2005	**8.9**	30	ND	ND	ND
8/23/2005	0	31	ND	ND	ND
09/15/2005*	**10**	29	ND	ND	ND
2/23/2006	ND	28	ND	ND	ND

Bold = Above NCGW2L

*=confirmation resample event conducted by MESCO

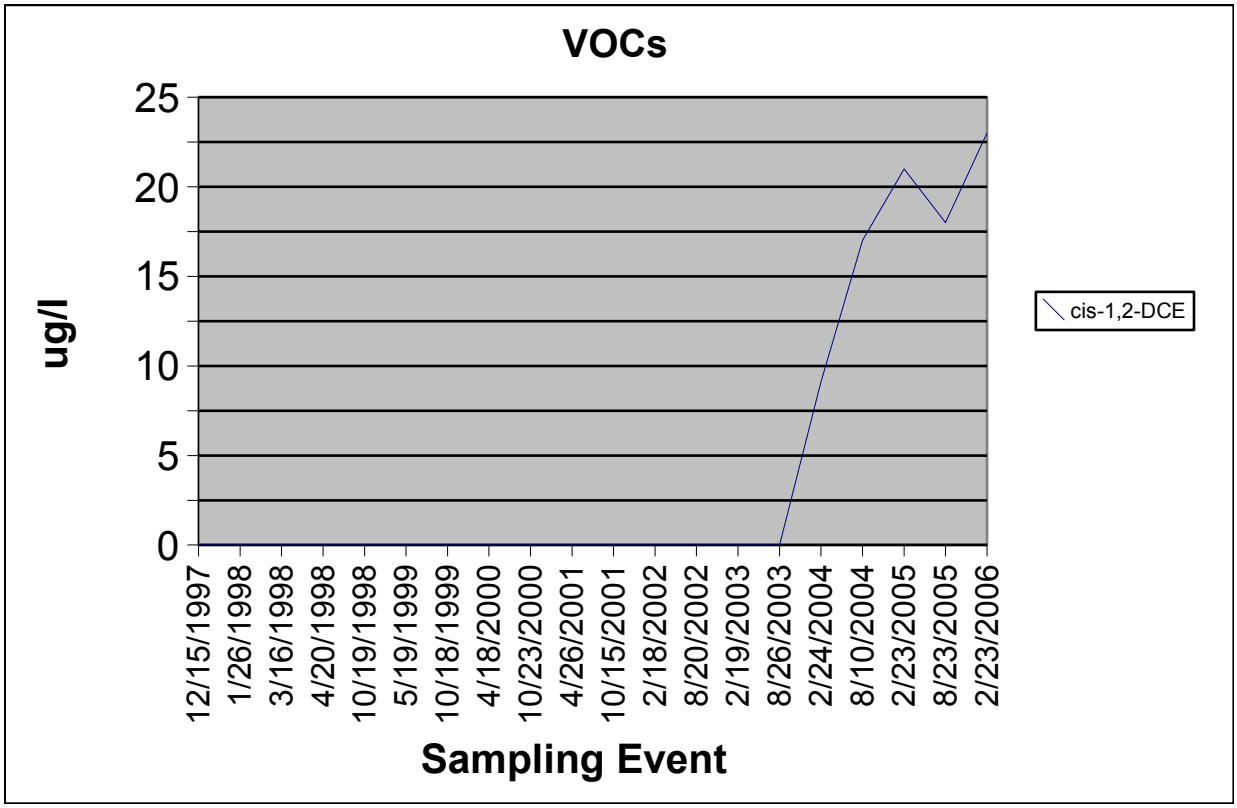
Time Series Plots for All Historical Detected VOCs (MW-6S & MW-6D)
Cherokee County Subtitle D Landfill





*=confirmation resample event conducted by MESCO

Time Series Plots for All Historical Detected VOCs (MW-6D)
Cherokee County Subtitle D Landfill



All Detected VOCs

Sample Date	cis-1,2-DCE
12/15/1997	ND
1/26/1998	ND
3/16/1998	ND
4/20/1998	ND
10/19/1998	ND
5/19/1999	ND
10/18/1999	ND
4/18/2000	ND
10/23/2000	ND
4/26/2001	ND
10/15/2001	ND
2/18/2002	ND
8/20/2002	ND
2/19/2003	ND
8/26/2003	ND
2/24/2004	9.1
8/10/2004	17
2/23/2005	21
8/23/2005	18
2/23/2006	23

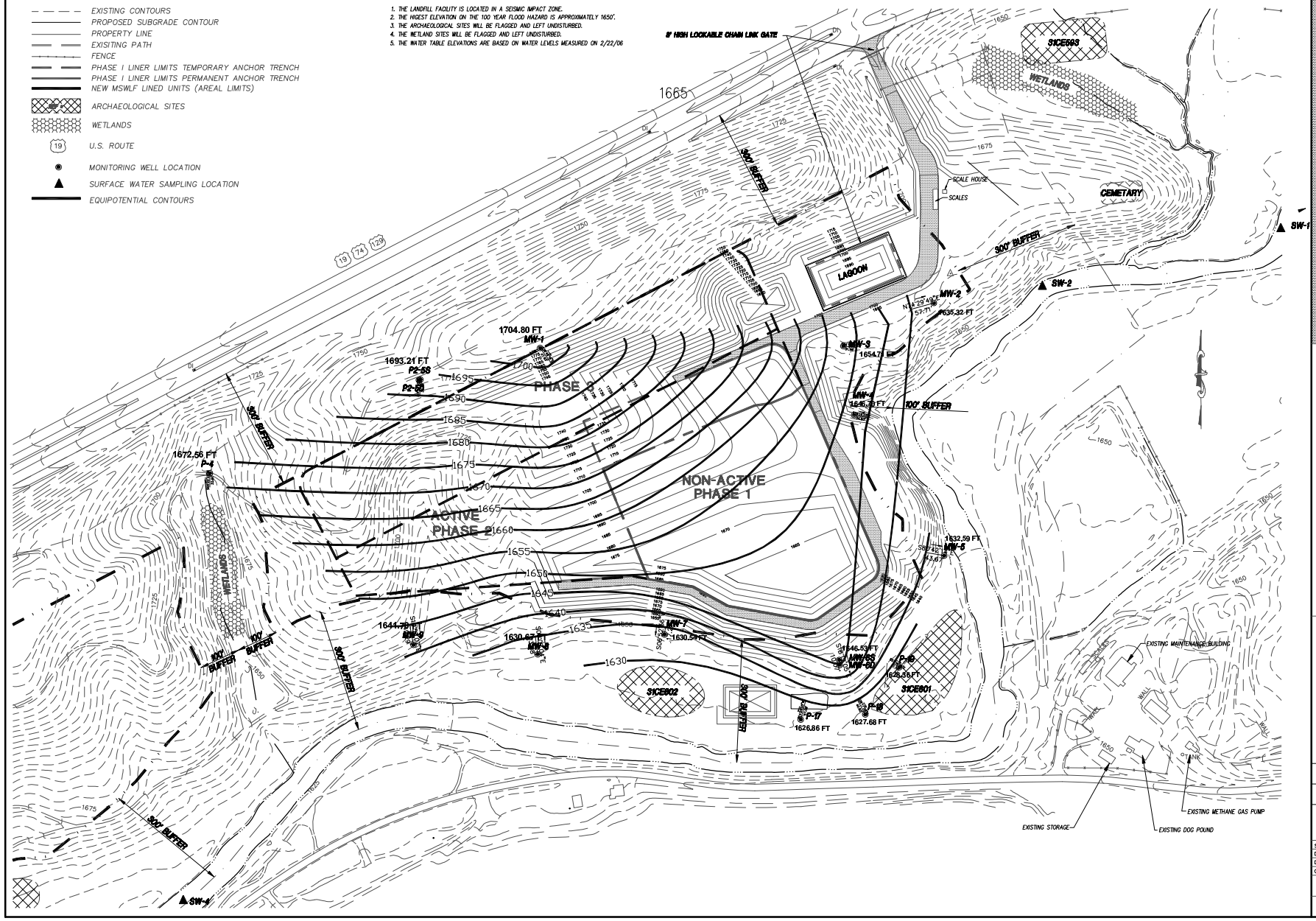
Bold = Above NCGW2L

LEGEND

- EXISTING CONTOURS
- PROPOSED SUBGRADE CONTOUR
- PROPERTY LINE
- EXISITING PATH
- FENCE
- PHASE I LINER LIMITS TEMPORARY ANCHOR TRENCH
- PHASE I LINER LIMITS PERMANENT ANCHOR TRENCH
- NEW MSWLF LINED UNITS (AREAL LIMITS)
- ARCHAEOLOGICAL SITES
- WETLANDS
- U.S. ROUTE
- MONITORING WELL LOCATION
- SURFACE WATER SAMPLING LOCATION
- EQUIPOTENTIAL CONTOURS

NOTES

1. THE LANDFILL FACILITY IS LOCATED IN A SEISMIC IMPACT ZONE.
2. THE HIGEST ELEVATION ON THE 100 YEAR FLOOD HAZARD IS APPROXIMATELY 1650'.
3. THE ARCHAEOLOGICAL SITES WILL BE FLAGGED AND LEFT UNDISTURBED.
4. THE WETLAND SITES WILL BE FLAGGED AND LEFT UNDISTURBED.
5. THE WATER TABLE ELEVATIONS ARE BASED ON WATER LEVELS MEASURED ON 2/22/06



Municipal Services Engineering Company, P.A.

P.O. BOX 97 GARNER, N.C. 27529 (919) 772-5393

P.O. BOX 340 BOONE, N.C. 27607 (704) 262-1707

SAMPLING AND ANALYSIS PLAN
SOLID WASTE LANDFILL FACILITY
CHEROKEE COUNTY
NORTH CAROLINA

DATE	BY	REV.	DESCRIPTION
2/27/98	LCH	1	CORRECTED WELL LOCATIONS ,ADDED M. WELL CHART

SINGLE DAY POTENTIOMETRIC MAP
WITH FLOW DIRECTIONS 2/22/06

SCALE: 1"=100'
DATE: 6/29/2001
DRWN. BY: L. HAMPTON
CHKD. BY: K. YOSHIDA
PROJECT NUMBER: G01009.0
DRAWING NO.
SHEET NO.

Basic Statistics

Basic Statistics

Parameter: Arsenic, total

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

	Total Observations
174	
Total Non-Detects	136
Pooled Mean	7.54943
Pooled Std Dev	11.4538
Background Mean	4.52
Background Std Dev	2.34242

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	20	16	80	90.4

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	4.52	2.34242	0	1675	83.75

Compliance Wells

There are 9 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-3	20	13	65	178.8
MW-4	21	8	38.0952	420.4
MW-5	20	17	85	104.5
MW-6D	20	20	100	70
MW-6S	20	20	100	70
MW-2	20	20	100	70
MW-7	19	17	89.4737	75.6
MW-9	7	3	42.8571	60.1
MW-8	7	2	28.5714	173.8

Well	Mean	Std Dev	Dif From Bkg	Std Err	Rank Sum	Rank Mean
MW-3	8.94	9.91694	4.42	3.10159	1977.5	98.875
MW-4	20.019	18.8439	15.499	3.06444	2658	126.571
MW-5	5.225	6.47366	0.705	3.10159	1610.5	80.525
MW-6D	3.5	1.25656	-1.02	3.10159	1370	68.5
MW-6S	3.5	1.25656	-1.02	3.10159	1370	68.5
MW-2	3.5	1.25656	-1.02	3.10159	1370	68.5
MW-7	3.97895	1.51825	-0.541053	3.14213	1442.5	75.9211
MW-9	8.58571	7.63117	4.06571	4.30727	807.5	115.357
MW-8	24.8286	30.0686	20.3086	4.30727	944	134.857

Analysis of Variance Statistics

SS Wells	6919.19
SS Total	22695.8

Kruskal-Wallis Statistics

Non-Detect Rank	68.5
Background Rank Sum	1675
Background Rank Mean	83.75
H Statistic	32.0152
H Adjusted for Ties	61.2714

Basic Statistics

Parameter: Beryllium, total

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

	Total Observations
174	
Total Non-Detects	88
Pooled Mean	3.8954
Pooled Std Dev	7.3622
Background Mean	3.005
Background Std Dev	3.41783

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	20	7	35	60.1

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	3.005	3.41783	0	1879.5	93.975

Compliance Wells

There are 9 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-3	20	0	0	198.5
MW-4	21	2	9.52381	166.3
MW-5	20	17	85	23.4
MW-6D	20	19	95	16.6
MW-6S	20	15	75	20.2
MW-2	20	11	55	39.8
MW-7	19	14	73.6842	22.8
MW-9	7	2	28.5714	16.2
MW-8	7	1	14.2857	113.9

Well	Mean	Std Dev	Dif From Bkg	Std Err	Rank Sum	Rank Mean
MW-3	9.925	11.7013	6.92	1.9894	2820	141
MW-4	7.91905	6.29695	4.91405	1.96558	2873	136.81
MW-5	1.17	1.18593	-1.835	1.9894	1140.5	57.025
MW-6D	0.83	0.48569	-2.175	1.9894	961.5	48.075
MW-6S	1.01	0.526058	-1.995	1.9894	1164.5	58.225
MW-2	1.99	2.78528	-1.015	1.9894	1528.5	76.425
MW-7	1.2	1.02578	-1.805	2.01541	1197	63
MW-9	2.31429	2.02355	-0.690714	2.76274	679	97
MW-8	16.2714	21.0033	13.2664	2.76274	981.5	140.214

Analysis of Variance Statistics

SS Wells	2886.27
SS Total	9376.94

Kruskal-Wallis Statistics

Non-Detect Rank	44.5
Background Rank Sum	1879.5
Background Rank Mean	93.975
H Statistic	82.7138
H Adjusted for Ties	95.0021

Basic Statistics

Parameter: Chromium

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

	Total Observations
174	
Total Non-Detects	53
Pooled Mean	43.6575
Pooled Std Dev	93.1178
Background Mean	42.775
Background Std Dev	31.1188

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	20	1	5	855.5

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	42.775	31.1188	0	2396	119.8

Compliance Wells

There are 9 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-3	20	0	0	2360.7
MW-4	21	1	4.7619	1903
MW-5	20	11	55	195
MW-6D	20	14	70	82.4
MW-6S	20	15	75	47.6
MW-2	20	2	10	534.2
MW-7	19	8	42.1053	163.8
MW-9	7	1	14.2857	164
MW-8	7	0	0	1290.2

Well	Mean	Std Dev	Dif From Bkg	Std Err	Rank Sum	Rank Mean
MW-3	118.035	167.814	75.26	25.7135	2545	127.25
MW-4	90.619	85.2264	47.844	25.4056	2670	127.143
MW-5	9.75	21.7032	-33.025	25.7135	1127	56.35
MW-6D	4.12	4.45038	-38.655	25.7135	900	45
MW-6S	2.38	1.30529	-40.395	25.7135	745	37.25
MW-2	26.71	40.6836	-16.065	25.7135	1979	98.95
MW-7	8.62105	13.1066	-34.1539	26.0497	1172	61.6842
MW-9	23.4286	19.9571	-19.3464	35.7092	718	102.571
MW-8	184.314	237.808	141.539	35.7092	973	139

Analysis of Variance Statistics

SS Wells	415727
SS Total	1.50007e+006

Kruskal-Wallis Statistics

Non-Detect Rank	27
Background Rank Sum	2396
Background Rank Mean	119.8
H Statistic	89.4356
H Adjusted for Ties	92.0358

Basic Statistics

Parameter: Cobalt, total

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

	Total Observations
174	
Total Non-Detects	36
Pooled Mean	44.6161
Pooled Std Dev	76.4112
Background Mean	86.95
Background Std Dev	133.07

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	20	0	0	1739

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	86.95	133.07	0	2442	122.1

Compliance Wells

There are 9 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-3	20	1	5	2074.5
MW-4	21	1	4.7619	1313
MW-5	20	8	40	256
MW-6D	20	16	80	62
MW-6S	20	0	0	392.8
MW-2	20	3	15	560.5
MW-7	19	5	26.3158	278.8
MW-9	7	1	14.2857	199.1
MW-8	7	1	14.2857	887.5

Well	Mean	Std Dev	Dif From Bkg	Std Err	Rank Sum	Rank Mean
MW-3	103.725	96.4411	16.775	21.5102	2756.5	137.825
MW-4	62.5238	37.7142	-24.4262	21.2526	2633.5	125.405
MW-5	12.8	23.8571	-74.15	21.5102	964	48.2
MW-6D	3.1	2.17981	-83.85	21.5102	492	24.6
MW-6S	19.64	11.1053	-67.31	21.5102	1621	81.05
MW-2	28.025	33.8676	-58.925	21.5102	1611.5	80.575
MW-7	14.6737	10.2141	-72.2763	21.7914	1227.5	64.6053
MW-9	28.4429	26.8764	-58.5071	29.8718	616.5	88.0714
MW-8	126.786	171.244	39.8357	29.8718	860.5	122.929

Analysis of Variance Statistics

SS Wells	251282
SS Total	1.01009e+006

Kruskal-Wallis Statistics

Non-Detect Rank	18.5
Background Rank Sum	2442
Background Rank Mean	122.1
H Statistic	92.7387
H Adjusted for Ties	93.5668

Basic Statistics

Parameter: Lead

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

	Total Observations
174	
Total Non-Detects	74
Pooled Mean	25.8149
Pooled Std Dev	51.5626
Background Mean	30.15
Background Std Dev	34.319

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	20	4	20	603

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	30.15	34.319	0	2203	110.15

Compliance Wells

There are 9 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-3	20	2	10	1230
MW-4	21	3	14.2857	566
MW-5	20	13	65	189
MW-6D	20	15	75	141.5
MW-6S	20	15	75	122
MW-2	20	8	40	268.3
MW-7	19	12	63.1579	159
MW-9	7	1	14.2857	208.5
MW-8	7	1	14.2857	1004.5

Well	Mean	Std Dev	Dif From Bkg	Std Err	Rank Sum	Rank Mean
MW-3	61.5	57.4204	31.35	13.7045	2717	135.85
MW-4	26.9524	19.7749	-3.19762	13.5404	2404.5	114.5
MW-5	9.45	10.7751	-20.7	13.7045	1231.5	61.575
MW-6D	7.075	6.94769	-23.075	13.7045	1065.5	53.275
MW-6S	6.1	4.87539	-24.05	13.7045	1020.5	51.025
MW-2	13.415	12.437	-16.735	13.7045	1602	80.1
MW-7	8.36842	6.29559	-21.7816	13.8836	1170	61.5789
MW-9	29.7857	23.0793	-0.364286	19.0318	829.5	118.5
MW-8	143.5	184.728	113.35	19.0318	981.5	140.214

Analysis of Variance Statistics

SS Wells	151942
SS Total	459956

Kruskal-Wallis Statistics

Non-Detect Rank	37.5
Background Rank Sum	2203
Background Rank Mean	110.15
H Statistic	69.2971
H Adjusted for Ties	75.0708

Basic Statistics

Parameter: Mercury

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

	Total Observations
6	
Total Non-Detects	5
Pooled Mean	0.2
Pooled Std Dev	0.244949
Background Mean	0.1
Background Std Dev	0

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	2	2	100	0.2

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	0.1	0	0	6	3

Compliance Wells

There are 2 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-6S	2	1	50	0.8
MW-6D	2	2	100	0.2

Well	Mean	Std Dev	Dif From Bkg	Std Err	Rank Sum	Rank Mean
MW-6S	0.4	0.424264	0.3	0.244949	9	4.5
MW-6D	0.1	0	0	0.244949	6	3

Analysis of Variance Statistics

SS Wells	0.12
SS Total	0.3

Kruskal-Wallis Statistics

Non-Detect Rank	3
Background Rank Sum	6
Background Rank Mean	3
H Statistic	0.857143
H Adjusted for Ties	2

Basic Statistics

Parameter: Nickel

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

	Total Observations
174	
Total Non-Detects	70
Pooled Mean	42.6494
Pooled Std Dev	69.0043
Background Mean	38.15
Background Std Dev	18.4285

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	20	5	25	763

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	38.15	18.4285	0	2133.5	106.675

Compliance Wells

There are 9 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-3	20	5	25	1816.8
MW-4	21	6	28.5714	1937
MW-5	20	8	40	478.9
MW-6D	20	16	80	215.1
MW-6S	20	7	35	328.2
MW-2	20	6	30	546.9
MW-7	19	14	73.6842	252.1
MW-9	7	2	28.5714	215.5
MW-8	7	1	14.2857	867.5

Well	Mean	Std Dev	Dif From Bkg	Std Err	Rank Sum	Rank Mean
MW-3	90.84	116.369	52.69	19.3781	2300.5	115.025
MW-4	92.2381	75.7924	54.0881	19.146	2530	120.476
MW-5	23.945	27.0835	-14.205	19.3781	1536	76.8
MW-6D	10.755	10.4431	-27.395	19.3781	901	45.05
MW-6S	16.41	7.69784	-21.74	19.3781	1451.5	72.575
MW-2	27.345	26.1906	-10.805	19.3781	1799	89.95
MW-7	13.2684	12.1925	-24.8816	19.6314	1028	54.1053
MW-9	30.7857	35.8398	-7.36429	26.9109	654	93.4286
MW-8	123.929	181.039	85.7786	26.9109	891.5	127.357

Analysis of Variance Statistics

SS Wells	207919
SS Total	823756

Kruskal-Wallis Statistics

Non-Detect Rank	35.5
Background Rank Sum	2133.5
Background Rank Mean	106.675
H Statistic	47.6068
H Adjusted for Ties	50.9218

Basic Statistics

Parameter: Vanadium

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

	Total Observations
174	
Total Non-Detects	85
Pooled Mean	34.7368
Pooled Std Dev	72.2929
Background Mean	36.575
Background Std Dev	28.9247

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	20	4	20	731.5

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	36.575	28.9247	0	2307	115.35

Compliance Wells

There are 9 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-3	20	5	25	1577
MW-4	21	5	23.8095	1231.5
MW-5	20	12	60	305.7
MW-6D	20	16	80	116.5
MW-6S	20	20	100	75
MW-2	20	6	30	375.7
MW-7	19	14	73.6842	217.6
MW-9	7	2	28.5714	124.2
MW-8	7	1	14.2857	1289.5

Well	Mean	Std Dev	Dif From Bkg	Std Err	Rank Sum	Rank Mean
MW-3	78.85	117.33	42.275	19.6905	2324	116.2
MW-4	58.6429	54.5528	22.0679	19.4546	2503	119.19
MW-5	15.285	30.9952	-21.29	19.6905	1420	71
MW-6D	5.825	6.17353	-30.75	19.6905	1100	55
MW-6S	3.75	4.17543	-32.825	19.6905	860	43
MW-2	18.785	28.6249	-17.79	19.6905	1849	92.45
MW-7	11.4526	17.3294	-25.1224	19.9479	1229	64.6842
MW-9	17.7429	15.4997	-18.8321	27.3447	645	92.1429
MW-8	184.214	207.023	147.639	27.3447	988	141.143

Analysis of Variance Statistics

SS Wells	268294
SS Total	904145

Kruskal-Wallis Statistics

Non-Detect Rank	43
Background Rank Sum	2307
Background Rank Mean	115.35
H Statistic	59.084
H Adjusted for Ties	66.8798

Basic Statistics

Parameter: Zinc

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

	Total Observations
174	
Total Non-Detects	24
Pooled Mean	146.402
Pooled Std Dev	274.825
Background Mean	120.8
Background Std Dev	78.251

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	20	1	5	2416

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	120.8	78.251	0	2194.5	109.725

Compliance Wells

There are 9 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-3	20	0	0	7114
MW-4	21	1	4.7619	5452
MW-5	20	3	15	1747
MW-6D	20	10	50	277
MW-6S	20	1	5	783
MW-2	20	3	15	1277
MW-7	19	4	21.0526	877
MW-9	7	0	0	1692
MW-8	7	1	14.2857	3839

Well	Mean	Std Dev	Dif From Bkg	Std Err	Rank Sum	Rank Mean
MW-3	355.7	474.887	234.9	77.0439	2587	129.35
MW-4	259.619	211.567	138.819	76.1212	2707.5	128.929
MW-5	87.35	136.965	-33.45	77.0439	1601.5	80.075
MW-6D	13.85	12.3939	-106.95	77.0439	524	26.2
MW-6S	39.15	17.9598	-81.65	77.0439	1260.5	63.025
MW-2	63.85	73.9959	-56.95	77.0439	1475.5	73.775
MW-7	46.1579	42.5771	-74.6421	78.051	1186	62.4211
MW-9	241.714	240.153	120.914	106.993	851	121.571
MW-8	548.429	773.529	427.629	106.993	837.5	119.643

Analysis of Variance Statistics

SS Wells	3.3318e+006
SS Total	1.30664e+007

Kruskal-Wallis Statistics

Non-Detect Rank	12.5
Background Rank Sum	2194.5
Background Rank Mean	109.725
H Statistic	78.9214
H Adjusted for Ties	79.1287

Basic Statistics

Parameter: Benzene

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

	Total Observations
179	
Total Non-Detects	171
Pooled Mean	2.6838
Pooled Std Dev	1.30686
Background Mean	2.425
Background Std Dev	0.33541

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	20	20	100	48.5

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	2.425	0.33541	0	1720	86

Compliance Wells

There are 12 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-3	20	20	100	48.5
MW-4	20	20	100	48.5
MW-5	20	20	100	48.5
MW-6D	20	20	100	48.5
MW-6S	21	13	61.9048	95.9
MW-7	20	20	100	48.5
MW-2	20	20	100	48.5
MW-9	7	7	100	17.5
MW-8	7	7	100	17.5
P-17	1	1	100	2.5
P-18	2	2	100	5
P-19	1	1	100	2.5

Well	Mean	Std Dev	Dif From Bkg	Std Err	Rank Sum	Rank Mean
MW-3	2.425	0.33541	0	0.36369	1720	86
MW-4	2.425	0.33541	0	0.36369	1720	86
MW-5	2.425	0.33541	0	0.36369	1720	86
MW-6D	2.425	0.33541	0	0.36369	1720	86
MW-6S	4.56667	3.19849	2.14167	0.359334	2522	120.095
MW-7	2.425	0.33541	0	0.36369	1720	86
MW-2	2.425	0.33541	0	0.36369	1720	86
MW-9	2.5	0	0.075	0.505068	602	86
MW-8	2.5	0	0.075	0.505068	602	86
P-17	2.5	0	0.075	1.17849	86	86
P-18	2.5	0	0.075	0.852929	172	86
P-19	2.5	0	0.075	1.17849	86	86

Analysis of Variance Statistics

SS Wells	84.4339
SS Total	304.003

Kruskal-Wallis Statistics

Non-Detect Rank	86
Background Rank Sum	1720
Background Rank Mean	86
H Statistic	8.0254
H Adjusted for Ties	62.6115

Basic Statistics

Parameter: Paradichlorobenzene

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

	Total Observations
179	
Total Non-Detects	173
Pooled Mean	2.77318
Pooled Std Dev	1.92945
Background Mean	2.425
Background Std Dev	0.33541

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	20	20	100	48.5

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	2.425	0.33541	0	1740	87

Compliance Wells

There are 12 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-3	20	20	100	48.5
MW-4	20	20	100	48.5
MW-5	20	20	100	48.5
MW-6D	20	20	100	48.5
MW-6S	21	15	71.4286	111.9
MW-7	20	20	100	48.5
MW-2	20	20	100	48.5
MW-9	7	7	100	17.5
MW-8	7	7	100	17.5
P-17	1	1	100	2.5
P-18	2	2	100	5
P-19	1	1	100	2.5

Well	Mean	Std Dev	Dif From Bkg	Std Err	Rank Sum	Rank Mean
MW-3	2.425	0.33541	0	0.552762	1740	87
MW-4	2.425	0.33541	0	0.552762	1740	87
MW-5	2.425	0.33541	0	0.552762	1740	87
MW-6D	2.425	0.33541	0	0.552762	1740	87
MW-6S	5.32857	4.96106	2.90357	0.546141	2364	112.571
MW-7	2.425	0.33541	0	0.552762	1740	87
MW-2	2.425	0.33541	0	0.552762	1740	87
MW-9	2.5	0	0.075	0.767637	609	87
MW-8	2.5	0	0.075	0.767637	609	87
P-17	2.5	0	0.075	1.79115	87	87
P-18	2.5	0	0.075	1.29634	174	87
P-19	2.5	0	0.075	1.79115	87	87

Analysis of Variance Statistics

SS Wells	155.446
SS Total	662.651

Kruskal-Wallis Statistics

Non-Detect Rank	87
Background Rank Sum	1740
Background Rank Mean	87
H Statistic	4.51429
H Adjusted for Ties	46.4301

Basic Statistics

Parameter: cis-1,2-Dichloroethene

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

	Total Observations
179	
Total Non-Detects	163
Pooled Mean	4.26201
Pooled Std Dev	6.896
Background Mean	2.425
Background Std Dev	0.33541

Background Wells

There is 1 background well

Well	Samples	Non-Detects	% ND	Total
MW-1	20	20	100	48.5

Well	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-1	2.425	0.33541	0	1640	82

Compliance Wells

There are 12 compliance wells

Well	Samples	Non-Detects	% ND	Total
MW-3	20	20	100	48.5
MW-4	20	20	100	48.5
MW-5	20	20	100	48.5
MW-6D	20	15	75	124.1
MW-6S	21	13	61.9048	286
MW-7	20	17	85	65.3
MW-2	20	20	100	48.5
MW-9	7	7	100	17.5
MW-8	7	7	100	17.5
P-17	1	1	100	2.5
P-18	2	2	100	5
P-19	1	1	100	2.5

Well	Mean	Std Dev	Dif From Bkg	Std Err	Rank Sum	Rank Mean
MW-3	2.425	0.33541	0	1.92282	1640	82
MW-4	2.425	0.33541	0	1.92282	1640	82
MW-5	2.425	0.33541	0	1.92282	1640	82
MW-6D	6.205	7.19748	3.78	1.92282	2079	103.95
MW-6S	13.619	15.8996	11.194	1.89979	2466	117.429
MW-7	3.265	2.13351	0.84	1.92282	1889	94.45
MW-2	2.425	0.33541	0	1.92282	1640	82
MW-9	2.5	0	0.075	2.67027	574	82
MW-8	2.5	0	0.075	2.67027	574	82
P-17	2.5	0	0.075	6.23064	82	82
P-18	2.5	0	0.075	4.50941	164	82
P-19	2.5	0	0.075	6.23064	82	82

Analysis of Variance Statistics

SS Wells	2327.37
SS Total	8464.76

Kruskal-Wallis Statistics

Non-Detect Rank	82
Background Rank Sum	1640
Background Rank Mean	82
H Statistic	10.2938
H Adjusted for Ties	42.0318

Interwell Analyses for Metals

Non-Parametric Tolerance Interval

Parameter: Arsenic, total

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

Total Percent Non-Detects = 66.6667%
Background Samples (n) = 20
Maximum Background Concentration = 11
Minimum Coverage = 86.1%
Average Coverage = 95.2381%

Well	Sample	Result	Impacted
MW-8	8/10/2004	89	TRUE
MW-8	10/29/2004	8.8	FALSE
MW-8	12/3/2004	ND<2.5	FALSE
MW-8	1/10/2005	26	TRUE
MW-8	2/23/2005	ND<2.5	FALSE
MW-8	8/23/2005	27	TRUE
MW-8	2/23/2006	18	TRUE

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 = 10; Samples = 20

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	0.4734	1.50449
2	-0.693147	2.48491	3.17805	0.3211	1.02047
3	-0.693147	1.75786	2.45101	0.2565	0.628683
4	-0.693147	1.6864	2.37955	0.2085	0.496135
5	0	1.22378	1.22378	0.1686	0.206329
6	0	1.06471	1.06471	0.1334	0.142032
7	0	1.02962	1.02962	0.1013	0.1043
8	0.336472	0.788457	0.451985	0.0711	0.0321361
9	0.405465	0.693147	0.287682	0.0422	0.0121402
10	0.530628	0.693147	0.162519	0.014	0.00227527
11	0.693147	0.530628	-0.162519		
12	0.693147	0.405465	-0.287682		
13	0.788457	0.336472	-0.451985		
14	1.02962	0	-1.02962		
15	1.06471	0	-1.06471		
16	1.22378	0	-1.22378		
17	1.6864	-0.693147	-2.37955		
18	1.75786	-0.693147	-2.45101		
19	2.48491	-0.693147	-3.17805		
20	2.48491	-0.693147	-3.17805		

Sum of b values = 4.14899
Sample Standard Deviation = 0.982528
W Statistic = 0.938517
5% Critical value of 0.905 is less than 0.938517
Data is normally distributed at 95% level of significance
1% Critical value of 0.868 is less than 0.938517
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 = 0.620345
Background standard deviation = 0.982528
One-sided normal tolerance factor at 95% confidence = 1.77183
Tolerance factor calculation follows USEPA 1992 Guidance
Upper tolerance limit = 2.36122

Well	Date	Result	Impacted
MW-8	8/10/2004	4.11087	TRUE
	10/29/2004	1.70475	FALSE
	12/3/2004	1.335	FALSE
	1/10/2005	1.80829	FALSE
	2/23/2005	ND<-0.693147	FALSE
	8/23/2005	3.04452	TRUE
	2/23/2006	2.77259	TRUE
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	TRUE
	4/26/2001	3.04452	TRUE
	10/15/2001	2.30259	FALSE
	2/18/2002	0.741937	FALSE
	8/20/2002	3.93183	TRUE
	2/19/2003	2.07944	FALSE
	8/26/2003	2.63906	TRUE
	2/24/2004	2.30259	FALSE
	8/10/2004	1.64866	FALSE
	2/23/2005	1.30833	FALSE
	8/23/2005	2.48491	TRUE
	2/23/2006	1.335	FALSE
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	TRUE
	10/19/1999	1.06471	FALSE
	4/18/2000	1.36098	FALSE
	10/24/2000	2.48491	TRUE
	4/26/2001	2.48491	TRUE
	10/15/2001	2.56495	TRUE
	2/18/2002	2.48491	TRUE
	8/20/2002	2.89037	TRUE
	2/19/2003	2.30259	FALSE
	8/26/2003	2.63906	TRUE
	2/24/2004	2.30259	FALSE
	8/10/2004	1.41099	FALSE
	2/23/2005	1.43508	FALSE
	8/23/2005	1.91692	FALSE
	9/15/2005	ND<0	FALSE
	2/23/2006	1.06471	FALSE

Shapiro-Wilks Test of Normality

Parameter: Chromium

Background Wells

Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL
K = 10; Samples = 20

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	0.4734	56.5713
2	2	92	90	0.3211	28.899
3	10	90	80	0.2565	20.52
4	15	59	44	0.2085	9.174
5	19	58	39	0.1686	6.5754
6	22	57	35	0.1334	4.669
7	23	53	30	0.1013	3.039
8	34	51	17	0.0711	1.2087
9	35	43	8	0.0422	0.3376
10	36	36	0	0.014	0
11	36	36	0		
12	43	35	-8		
13	51	34	-17		
14	53	23	-30		
15	57	22	-35		
16	58	19	-39		
17	59	15	-44		
18	90	10	-80		
19	92	2	-90		
20	120	0.5	-119.5		

Sum of b values = 130.994
Sample Standard Deviation = 31.1188
W Statistic = 0.932616
5% Critical value of 0.905 is less than 0.932616
Data is normally distributed at 95% level of significance
1% Critical value of 0.868 is less than 0.932616
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: Chromium

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

Background mean = 42.775
Background standard deviation = 31.1188
One-sided normal tolerance factor at 95% confidence = 1.77183
Tolerance factor calculation follows USEPA 1992 Guidance
Upper tolerance limit = 97.9123

Well	Date	Result	Impacted
MW-8	8/10/2004	690	TRUE
	10/29/2004	44	FALSE
	12/3/2004	24	FALSE
	1/10/2005	120	TRUE
	2/23/2005	2.2	FALSE
	8/23/2005	210	TRUE
	2/23/2006	200	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 = 10; Samples = 20

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	18	531	513	0.4734	242.854
2	20	397	377	0.3211	121.055
3	22	120	98	0.2565	25.137
4	23	79	56	0.2085	11.676
5	26	76	50	0.1686	8.43
6	27	58	31	0.1334	4.1354
7	29	53	24	0.1013	2.4312
8	35	52	17	0.0711	1.2087
9	35	47	12	0.0422	0.5064
10	44	47	3	0.014	0.042
11	47	44	-3		
12	47	35	-12		
13	52	35	-17		
14	53	29	-24		
15	58	27	-31		
16	76	26	-50		
17	79	23	-56		
18	120	22	-98		
19	397	20	-377		
20	531	18	-513		

Sum of b values = 417.476
Sample Standard Deviation = 133.07
W Statistic = 0.518022
5% Critical value of 0.905 exceeds 0.518022
Evidence of non-normality at 95% level of significance
1% Critical value of 0.868 exceeds 0.518022
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 = 3.7037%
Background Samples (n) = 20
Maximum Background Concentration = 531
Minimum Coverage = 86.1%
Average Coverage = 95.2381%

Well	Sample	Result	Impacted
MW-8	8/10/2004	500	FALSE
MW-8	10/29/2004	47	FALSE
MW-8	12/3/2004	12	FALSE
MW-8	1/10/2005	97	FALSE
MW-8	2/23/2005	ND<2.5	FALSE
MW-8	8/23/2005	130	FALSE
MW-8	2/23/2006	99	FALSE

Shapiro-Wilks Test of Normality

Parameter: Lead

Background Wells

Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
K = 10; Samples = 20

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	0.4734	1.9287
2	0.916291	4.60517	3.68888	0.3211	1.1845
3	1.60944	3.61092	2.00148	0.2565	0.51338
4	1.60944	3.46574	1.8563	0.2085	0.387038
5	2.63906	3.46574	0.826679	0.1686	0.139378
6	2.77259	3.43399	0.661398	0.1334	0.0882306
7	2.83321	3.2581	0.424883	0.1013	0.0430407
8	3.04452	3.17805	0.133531	0.0711	0.00949408
9	3.04452	3.17805	0.133531	0.0422	0.00563502
10	3.13549	3.13549	0	0.014	0
11	3.13549	3.13549	0		
12	3.17805	3.04452	-0.133531		
13	3.17805	3.04452	-0.133531		
14	3.2581	2.83321	-0.424883		
15	3.43399	2.77259	-0.661398		
16	3.46574	2.63906	-0.826679		
17	3.46574	1.60944	-1.8563		
18	3.61092	1.60944	-2.00148		
19	4.60517	0.916291	-3.68888		
20	4.99043	0.916291	-4.07414		

Sum of b values = 4.29939
Sample Standard Deviation = 1.03614
W Statistic = 0.906192
5% Critical value of 0.905 is less than 0.906192
Data is normally distributed at 95% level of significance
1% Critical value of 0.868 is less than 0.906192
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: Lead

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

Background mean = 2.94213
Background standard deviation = 1.03614
One-sided normal tolerance factor at 95% confidence = 1.77183
Tolerance factor calculation follows USEPA 1992 Guidance
Upper tolerance limit = 4.778

Well	Date	Result	Impacted
MW-8	8/10/2004	6.29157	TRUE
	10/29/2004	3.98898	FALSE
	12/3/2004	2.83321	FALSE
	1/10/2005	4.51086	FALSE
	2/23/2005	ND<0.916291	FALSE
	8/23/2005	5.1358	TRUE
	2/23/2006	4.86753	TRUE
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	TRUE
	4/26/2001	4.58497	FALSE
	10/15/2001	3.93183	FALSE
	2/18/2002	ND<1.60944	FALSE
	8/20/2002	5.48064	TRUE
	2/19/2003	4.18965	FALSE
	8/26/2003	4.94164	TRUE
	2/24/2004	4.54329	FALSE
	8/10/2004	3.98898	FALSE
	2/23/2005	3.3322	FALSE
	8/23/2005	4.43082	FALSE
	2/23/2006	3.2581	FALSE

Shapiro-Wilks Test of Normality

Parameter: Mercury

Background Wells

Normality Test of Parameter Concentrations

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

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	0.1	0.1	0	0.7071	0
2	0.1	0.1	0		

Sum of b values = 0
Sample Standard Deviation = 0
W Statistic = -1.#IND
5% Critical value of 0 is less than -1.#IND
Data is normally distributed at 95% level of significance
1% Critical value of 0 is less than -1.#IND
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: Mercury

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

Background mean = 0.1
Background standard deviation = 0
One-sided normal tolerance factor at 95% confidence = 7.73273
Tolerance factor calculation follows USEPA 1992 Guidance
Upper tolerance limit = 0.1

Well	Date	Result	Impacted
MW-6S	8/10/2004	ND<0.1	FALSE
	2/23/2006	0.7	TRUE

Shapiro-Wilks Test of Normality

Parameter: Nickel

Background Wells

Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL
K = 10; Samples = 20

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	0.4734	0.743814
2	3.09104	4.2485	1.15745	0.3211	0.371658
3	3.13549	4.17439	1.03889	0.2565	0.266476
4	3.21888	4.09434	0.875469	0.2085	0.182535
5	3.21888	4.06044	0.841567	0.1686	0.141888
6	3.21888	3.85015	0.631272	0.1334	0.0842117
7	3.21888	3.85015	0.631272	0.1013	0.0639478
8	3.21888	3.52636	0.307485	0.0711	0.0218622
9	3.21888	3.49651	0.277632	0.0422	0.0117161
10	3.4012	3.43399	0.0327898	0.014	0.000459058
11	3.43399	3.4012	-0.0327898		
12	3.49651	3.21888	-0.277632		
13	3.52636	3.21888	-0.307485		
14	3.85015	3.21888	-0.631272		
15	3.85015	3.21888	-0.631272		
16	4.06044	3.21888	-0.841567		
17	4.09434	3.21888	-0.875469		
18	4.17439	3.13549	-1.03889		
19	4.2485	3.09104	-1.15745		
20	4.34381	2.77259	-1.57122		

Sum of b values = 1.88857
Sample Standard Deviation = 0.454595
W Statistic = 0.908371
5% Critical value of 0.905 is less than 0.908371
Data is normally distributed at 95% level of significance
1% Critical value of 0.868 is less than 0.908371
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: Nickel

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

Background mean = 3.53961
Background standard deviation = 0.454595
One-sided normal tolerance factor at 95% confidence = 1.77183
Tolerance factor calculation follows USEPA 1992 Guidance
Upper tolerance limit = 4.34508

Well	Date	Result	Impacted
MW-8	8/10/2004	6.25383	TRUE
	10/29/2004	3.21888	FALSE
	12/3/2004	2.48491	FALSE
	1/10/2005	4.35671	TRUE
	2/23/2005	ND<0.916291	FALSE
	8/23/2005	4.86753	TRUE
	2/23/2006	4.60517	TRUE

Shapiro-Wilks Test of Normality

Parameter: Vanadium

Background Wells

Normality Test of Parameter Concentrations

Natural Logarithm Transformation
Cohen's Adjustment
K = 10; Samples = 20

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	1.60944	4.70048	3.09104	0.4734	1.4633
2	1.60944	4.48864	2.8792	0.3211	0.924511
3	1.60944	4.39445	2.78501	0.2565	0.714355
4	2.70805	4.02535	1.3173	0.2085	0.274657
5	3.04452	3.91202	0.867501	0.1686	0.146261
6	3.04452	3.73767	0.693147	0.1334	0.0924658
7	3.13549	3.68888	0.553385	0.1013	0.0560579
8	3.17805	3.66356	0.485508	0.0711	0.0345196
9	3.2581	3.66356	0.405465	0.0422	0.0171106
10	3.46574	3.58352	0.117783	0.014	0.00164896
11	3.58352	3.46574	-0.117783		
12	3.66356	3.2581	-0.405465		
13	3.66356	3.17805	-0.485508		
14	3.68888	3.13549	-0.553385		
15	3.73767	3.04452	-0.693147		
16	3.91202	3.04452	-0.867501		
17	4.02535	2.70805	-1.3173		
18	4.39445	1.60944	-2.78501		
19	4.48864	1.60944	-2.8792		
20	4.70048	1.60944	-3.09104		

Sum of b values = 3.72489
Sample Standard Deviation = 0.896566
W Statistic = 0.908465
5% Critical value of 0.905 is less than 0.908465
Data is normally distributed at 95% level of significance
1% Critical value of 0.868 is less than 0.908465
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: Vanadium

Natural Logarithm Transformation
Cohen's Adjustment

Background mean = 3.11065
Background standard deviation = 1.04612
One-sided normal tolerance factor at 95% confidence = 1.77183
Tolerance factor calculation follows USEPA 1992 Guidance
Upper tolerance limit = 4.9642

Well	Date	Result	Impacted
MW-8	8/10/2004	6.41346	TRUE
	10/29/2004	4.20469	FALSE
	12/3/2004	2.99573	FALSE
	1/10/2005	5.19296	TRUE
	2/23/2005	ND<1.60944	FALSE
	8/23/2005	5.43808	TRUE
	2/23/2006	5.19296	TRUE

Shapiro-Wilks Test of Normality

Parameter: Zinc

Background Wells

Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL
K = 10; Samples = 20

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	25	320	295	0.4734	139.653
2	27	260	233	0.3211	74.8163
3	35	190	155	0.2565	39.7575
4	55	180	125	0.2085	26.0625
5	58	170	112	0.1686	18.8832
6	60	170	110	0.1334	14.674
7	74	160	86	0.1013	8.7118
8	89	140	51	0.0711	3.6261
9	95	110	15	0.0422	0.633
10	98	100	2	0.014	0.028
11	100	98	-2		
12	110	95	-15		
13	140	89	-51		
14	160	74	-86		
15	170	60	-110		
16	170	58	-112		
17	180	55	-125		
18	190	35	-155		
19	260	27	-233		
20	320	25	-295		

Sum of b values = 326.845
Sample Standard Deviation = 78.251
W Statistic = 0.918229
5% Critical value of 0.905 is less than 0.918229
Data is normally distributed at 95% level of significance
1% Critical value of 0.868 is less than 0.918229
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: Zinc

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

Background mean = 120.8
Background standard deviation = 78.251
One-sided normal tolerance factor at 95% confidence = 1.77183
Tolerance factor calculation follows USEPA 1992 Guidance
Upper tolerance limit = 259.448

Well	Date	Result	Impacted
MW-8	8/10/2004	2200	TRUE
	10/29/2004	100	FALSE
	12/3/2004	24	FALSE
	1/10/2005	270	TRUE
	2/23/2005	ND<5	FALSE
	8/23/2005	660	TRUE
	2/23/2006	580	TRUE
MW-9	8/10/2004	710	TRUE
	10/29/2004	340	TRUE
	12/3/2004	51	FALSE
	1/10/2005	140	FALSE
	2/23/2005	11	FALSE
	8/23/2005	310	TRUE
	2/23/2006	130	FALSE
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
	2/19/2003	340	TRUE
	8/26/2003	680	TRUE
	2/24/2004	430	TRUE
	8/10/2004	260	TRUE
	2/23/2005	180	FALSE
	8/23/2005	240	FALSE
	9/15/2005	ND<25	FALSE
	2/23/2006	120	FALSE
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	TRUE
	2/18/2002	22	FALSE
	8/20/2002	2000	TRUE
	2/19/2003	240	FALSE
	8/26/2003	750	TRUE
	2/24/2004	450	TRUE
	8/10/2004	250	FALSE
	2/23/2005	120	FALSE

8/23/2005	390	TRUE
2/23/2006	130	FALSE

Boring Logs

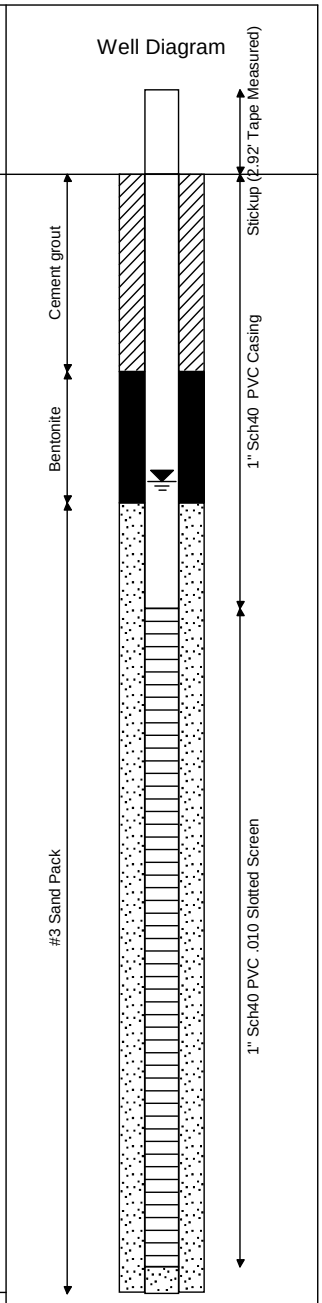
LOG OF BORING: P-18

Cherokee County Subtitle D LF Phase 1 Assessment **Project No. G05007.0**

Drilling contractor:	Engineering Tectonics	Date started:	1/10/2006	Surface elevation:	1634.06 ft (MSL)
Drill rig & method:	5.875"O.D Air Tricomb, NQ2 Core	Date ended:	1/17/2006	Top of pipe elevation:	1636.98 ft (MSL)
Logged by:	J. Pfohl	Completion depth:	17.00 ft	Depth to water (TOB):	6.75 ft
		Stickup height:	2.92 ft	Depth to water (24hrs):	4.66 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	9			SILTY SAND; Br. Yellow fine grained sand, light gray silt partings, fine root debris, dry.
	5			SILTY SAND; Same as above but with/out root debris.
5				
	23			HEAVILY WEATHERED ROCK;
10				
				RUN #1;(REC) 4'/4'=100%, (RQD)4'/4'=100%. (13'-17') Biotite Gneiss- Gray, highlycompetent, pyrite and some garnet and mica.
15				
				Boring terminated at 17.0 feet
20				

Well Diagram



Municipal Engineering Services Company, P.A.
Operation/Construction Managers Civil/Sanitary Engineers Environmental Studies
PO Box 97, Garner, North Carolina 27529 (919) 772-5393 *PO Box 349, Boone, North Carolina 28607 (828) 262-1767*

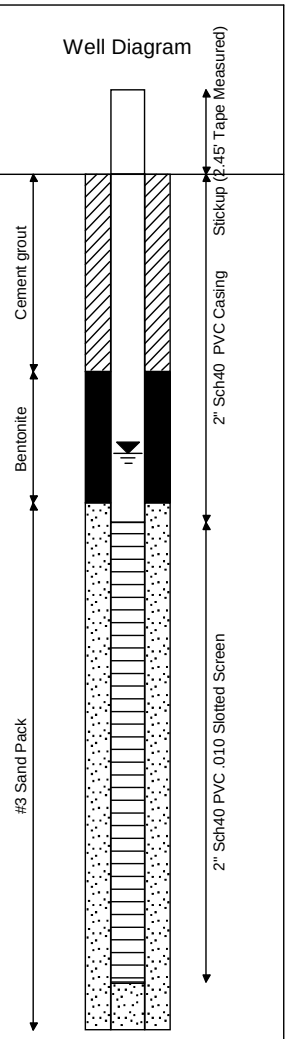
LOG OF BORING: P-17

Cherokee County Subtitle D LF Phase 1 Assessment **Project No. G05007.0**

Drilling contractor:	Engineering Tectonics	Date started:	1/10/2006	Surface elevation:	1635.64 ft (MSL)
Drill rig & method:	6.25"O.D Air Tricomb, 4" OD DTH	Date ended:	1/19/2006	Top of pipe elevation:	1638.09 ft (MSL)
Logged by:	J. Pfohl	Completion depth:	13.00 ft	Depth to water (TOB):	6.50 ft
		Stickup height:	2.45 ft	Depth to water (24hrs):	4.24 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	9			SILTY SAND; Br. Yellow fine grained sand, light gray silt partings, fine root debris, dry.
5	18			SILTY SAND; Same as above but with river gravel.
10				HEAVILY WEATHERED ROCK; Gray w/ rounded river gravel.
				Boring terminated at 13.0 feet
15				
20				

Well Diagram



Municipal Engineering Services Company, P.A.
Operation/Construction Managers Civil/Sanitary Engineers Environmental Studies
PO Box 97, Garner, North Carolina 27529 (919) 772-5393 *PO Box 349, Boone, North Carolina 28607 (828) 262-1767*

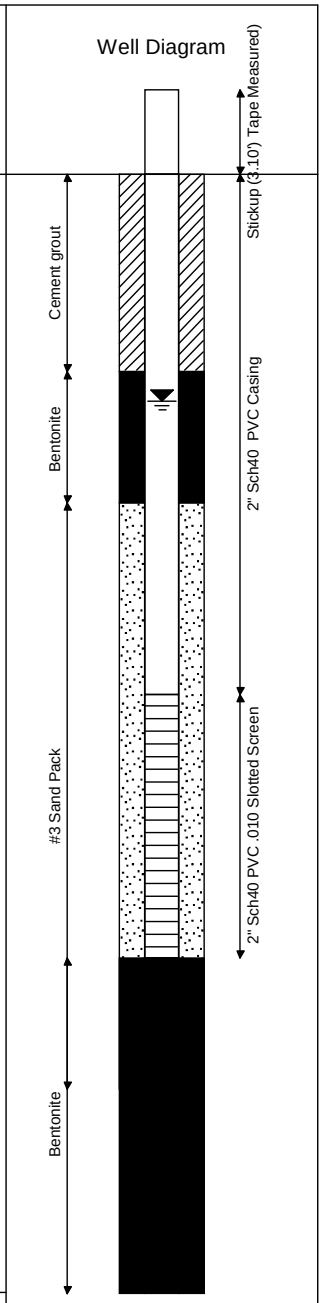
LOG OF BORING: P-19

Cherokee County Subtitle D LF Phase 1 Assessment **Project No. G05007.0**

Drilling contractor:	Engineering Tectonics	Date started:	1/18/2006	Surface elevation:	1633.19 ft (MSL)
Drill rig & method:	3.5"O.D Air Casing Advancer, NQ2 Core	Date ended:	1/18/2006	Top of pipe elevation:	1636.29 ft (MSL)
Logged by:	J. Pfohl	Completion depth:	17.00 ft	Depth to water (TOB):	3.50 ft
		Stickup height:	3.10 ft	Depth to water (24hrs):	3.44 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
				SILTY SAND; Br. Yellow fine grained sand, dry.
5				
				RUN #1;(REC) 1.75/2.5'=70%, (RQD) 0.25'/2.5'=10%. (6.5'-9') Quartzite, Brownish Gray, Highly weathered & fractured, fractures predominately parallel. Iron stained fractures, pyrite and some garnet and mica.
				RUN #2;(REC) 8'/8'=65.8%, (RQD) 8'/8"=100%. (9'-17') Biotite Schist; Gray,Very competent, pyrite and some garnet and mica.
10				
15				
				Boring terminated at 17.0 feet
20				

Well Diagram



Municipal Engineering Services Company, P.A.
Operation/Construction Managers Civil/Sanitary Engineers Environmental Studies
PO Box 97, Garner, North Carolina 27529 (919) 772-5393 *PO Box 349, Boone, North Carolina 28607 (828) 262-1767*

Laboratory Results

Environmental Conservation Laboratories, Inc.
1015 Passport Way
Cary NC, 27513
Phone: 919.677.1669 FAX: 919.677.9846
www.encolabs.com

February 07, 2006

Municipal Engineering Services (MU001)
Attn: Jonathan Pfohl
P.O. Box 97
Garner, NC 27529

RE: Project Number: G05007.0, Project Name/Desc: Cherokee Co. Subtitle D LF
ENCO Workorder: C600097

Dear Jonathan Pfohl,

Enclosed is a copy of your laboratory report for test samples received by our laboratory on 1/20/06 5:08:00PM.

Unless otherwise noted in an attached project narrative, all samples were received in acceptable condition and processed in accordance with the referenced methods/procedures. Results for these procedures apply only to the samples as submitted.

This data has been produced in accordance with NELAC standards (June, 2003). This report shall not be reproduced except in full, without the written approval of the Laboratory.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Robert George For Chuck Smith
Project Manager

Enclosure(s)

The total number of pages in this report, including this page is 13.

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SAMPLE SUMMARY/LABORATORY CHRONICLE

Client ID: P-17 **Lab ID:** C600097-01

Sampled: 01/19/06 10:00 **Received:** 01/20/06 17:08

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 8260B	02/02/06	01/25/06 10:08	1/26/2006 04:55

Client ID: P-18 **Lab ID:** C600097-02

Sampled: 01/19/06 11:00 **Received:** 01/20/06 17:08

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 8260B	02/02/06	01/25/06 10:08	1/26/2006 05:22

Client ID: P-19 **Lab ID:** C600097-03

Sampled: 01/19/06 12:00 **Received:** 01/20/06 17:08

Parameter	Hold Date/Time(s)	Prep Date/Time(s)	Analysis Date/Time(s)
EPA 8260B	02/02/06	01/25/06 10:08	1/26/2006 05:48

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ANALYTICAL REPORT

Sample ID:	P-17	Project:	Cherokee Co. Subtitle D LF
Lab #:	C600097-01	Work Order #:	C600097
Prep. Method:	EPA 5030B_MS	Matrix:	Surface Water
Analyzed:	01/26/06 By: spf	Unit:	ug/L
Anal. Method:	EPA 8260B	Dilution Factor:	1
Anal. Batch:			
QC Batch:	6A25002		

Volatile Organic Compounds by GCMS

Parameter	CAS Number	Analytical Results	MRL	Units
1,1,1,2-Tetrachloroethane	630-20-6	5 U	5	ug/L
1,1,1-Trichloroethane	71-55-6	5 U	5	ug/L
1,1,2,2-Tetrachloroethane	79-34-5	5 U	5	ug/L
1,1,2-Trichloroethane	79-00-5	5 U	5	ug/L
1,1-Dichloroethane	75-34-3	5 U	5	ug/L
1,1-Dichloroethene	75-35-4	5 U	5	ug/L
1,2,3-Trichloropropane	96-18-4	15 U	15	ug/L
1,2-Dibromo-3-chloropropane	96-12-8	25 U	25	ug/L
1,2-Dibromoethane	106-93-4	5 U	5	ug/L
1,2-Dichlorobenzene	95-50-1	5 U	5	ug/L
1,2-Dichloroethane	107-06-2	5 U	5	ug/L
1,2-Dichloropropane	78-87-5	5 U	5	ug/L
1,4-Dichlorobenzene	106-46-7	5 U	5	ug/L
2-Butanone	78-93-3	100 U	100	ug/L
2-Hexanone	591-78-6	50 U	50	ug/L
4-Methyl-2-pentanone	108-10-1	100 U	100	ug/L
Acetone	67-64-1	100 U	100	ug/L
Acrylonitrile	107-13-1	200 U	200	ug/L
Benzene	71-43-2	5 U	5	ug/L
Bromochloromethane	74-97-5	5 U	5	ug/L
Bromodichloromethane	75-27-4	5 U	5	ug/L
Bromoform	75-25-2	5 U	5	ug/L
Bromomethane	74-83-9	10 U	10	ug/L
Carbon disulfide	75-15-0	100 U	100	ug/L
Carbon tetrachloride	56-23-5	10 U	10	ug/L
Chlorobenzene	108-90-7	5 U	5	ug/L
Chloroethane	75-00-3	10 U	10	ug/L
Chloroform	67-66-3	5 U	5	ug/L
Chloromethane	74-87-3	10 U	10	ug/L
cis-1,2-Dichloroethene	156-59-4	5 U	5	ug/L
cis-1,3-Dichloropropene	10061-01-5	10 U	10	ug/L
Dibromochloromethane	124-48-1	5 U	5	ug/L
Dibromomethane	74-95-3	10 U	10	ug/L
Ethylbenzene	100-41-4	5 U	5	ug/L
Iodomethane	74-88-4	10 U	10	ug/L
m,p-Xylenes	108-38-3/106-42-3	10 U	10	ug/L

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ANALYTICAL REPORT

Sample ID:	P-17	Project:	Cherokee Co. Subtitle D LF
Lab #:	C600097-01	Work Order #:	C600097
Prep. Method:	EPA 5030B_MS	Matrix:	Surface Water
Analyzed:	01/26/06 By: spf	Unit:	ug/L
Anal. Method:	EPA 8260B	Dilution Factor:	1
Anal. Batch:			
QC Batch:	6A25002		

Volatile Organic Compounds by GCMS

Parameter	CAS Number	Analytical Results	MRL	Units
Methylene chloride	75-09-2	10 U	10	ug/L
o-Xylene	95-47-6	5 U	5	ug/L
Styrene	100-42-5	10 U	10	ug/L
Tetrachloroethene	127-18-4	5 U	5	ug/L
Toluene	108-88-3	5 U	5	ug/L
trans-1,2-Dichloroethene	156-60-5	5 U	5	ug/L
trans-1,3-Dichloropropene	10061-02-6	10 U	10	ug/L
trans-1,4-Dichloro-2-butene	110-57-6	100 U	100	ug/L
Trichloroethene	79-01-6	5 U	5	ug/L
Trichlorofluoromethane	75-69-4	5 U	5	ug/L
Vinyl acetate	108-05-4	50 U	50	ug/L
Vinyl chloride	75-01-4	10 U	10	ug/L

Surrogate Recovery		Result	Spike Level	% Recovery	% Recovery Limits
4-Bromofluorobenzene	460-00-4	57.3	50.0	115 %	70-130
Dibromofluoromethane	1868-53-7	44.9	50.0	90 %	73-138
Toluene-d8	2037-26-5	48.3	50.0	97 %	77-118

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ANALYTICAL REPORT

Sample ID:	P-18	Project:	Cherokee Co. Subtitle D LF
Lab #:	C600097-02	Work Order #:	C600097
Prep. Method:	EPA 5030B_MS	Matrix:	Surface Water
Analyzed:	01/26/06 By: spf	Unit:	ug/L
Anal. Method:	EPA 8260B	Dilution Factor:	1
Anal. Batch:			
QC Batch:	6A25002		

Volatile Organic Compounds by GCMS

Parameter	CAS Number	Analytical Results	MRL	Units
1,1,1,2-Tetrachloroethane	630-20-6	5 U	5	ug/L
1,1,1-Trichloroethane	71-55-6	5 U	5	ug/L
1,1,2,2-Tetrachloroethane	79-34-5	5 U	5	ug/L
1,1,2-Trichloroethane	79-00-5	5 U	5	ug/L
1,1-Dichloroethane	75-34-3	5 U	5	ug/L
1,1-Dichloroethene	75-35-4	5 U	5	ug/L
1,2,3-Trichloropropane	96-18-4	15 U	15	ug/L
1,2-Dibromo-3-chloropropane	96-12-8	25 U	25	ug/L
1,2-Dibromoethane	106-93-4	5 U	5	ug/L
1,2-Dichlorobenzene	95-50-1	5 U	5	ug/L
1,2-Dichloroethane	107-06-2	5 U	5	ug/L
1,2-Dichloropropane	78-87-5	5 U	5	ug/L
1,4-Dichlorobenzene	106-46-7	5 U	5	ug/L
2-Butanone	78-93-3	100 U	100	ug/L
2-Hexanone	591-78-6	50 U	50	ug/L
4-Methyl-2-pentanone	108-10-1	100 U	100	ug/L
Acetone	67-64-1	100 U	100	ug/L
Acrylonitrile	107-13-1	200 U	200	ug/L
Benzene	71-43-2	5 U	5	ug/L
Bromochloromethane	74-97-5	5 U	5	ug/L
Bromodichloromethane	75-27-4	5 U	5	ug/L
Bromoform	75-25-2	5 U	5	ug/L
Bromomethane	74-83-9	10 U	10	ug/L
Carbon disulfide	75-15-0	100 U	100	ug/L
Carbon tetrachloride	56-23-5	10 U	10	ug/L
Chlorobenzene	108-90-7	5 U	5	ug/L
Chloroethane	75-00-3	10 U	10	ug/L
Chloroform	67-66-3	5 U	5	ug/L
Chloromethane	74-87-3	10 U	10	ug/L
cis-1,2-Dichloroethene	156-59-4	5 U	5	ug/L
cis-1,3-Dichloropropene	10061-01-5	10 U	10	ug/L
Dibromochloromethane	124-48-1	5 U	5	ug/L
Dibromomethane	74-95-3	10 U	10	ug/L
Ethylbenzene	100-41-4	5 U	5	ug/L
Iodomethane	74-88-4	10 U	10	ug/L
m,p-Xylenes	108-38-3/106-42-3	10 U	10	ug/L

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ANALYTICAL REPORT

Sample ID:	P-18	Project:	Cherokee Co. Subtitle D LF
Lab #:	C600097-02	Work Order #:	C600097
Prep. Method:	EPA 5030B_MS	Matrix:	Surface Water
Analyzed:	01/26/06 By: spf	Unit:	ug/L
Anal. Method:	EPA 8260B	Dilution Factor:	1
Anal. Batch:			
QC Batch:	6A25002		

Volatile Organic Compounds by GCMS

Parameter	CAS Number	Analytical Results	MRL	Units
Methylene chloride	75-09-2	10 U	10	ug/L
o-Xylene	95-47-6	5 U	5	ug/L
Styrene	100-42-5	10 U	10	ug/L
Tetrachloroethene	127-18-4	5 U	5	ug/L
Toluene	108-88-3	5 U	5	ug/L
trans-1,2-Dichloroethene	156-60-5	5 U	5	ug/L
trans-1,3-Dichloropropene	10061-02-6	10 U	10	ug/L
trans-1,4-Dichloro-2-butene	110-57-6	100 U	100	ug/L
Trichloroethene	79-01-6	5 U	5	ug/L
Trichlorofluoromethane	75-69-4	5 U	5	ug/L
Vinyl acetate	108-05-4	50 U	50	ug/L
Vinyl chloride	75-01-4	10 U	10	ug/L

Surrogate Recovery		Result	Spike Level	% Recovery	% Recovery Limits
4-Bromofluorobenzene	460-00-4	56.0	50.0	112 %	70-130
Dibromofluoromethane	1868-53-7	45.4	50.0	91 %	73-138
Toluene-d8	2037-26-5	49.4	50.0	99 %	77-118

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ANALYTICAL REPORT

Sample ID:	P-19	Project:	Cherokee Co. Subtitle D LF
Lab #:	C600097-03	Work Order #:	C600097
Prep. Method:	EPA 5030B_MS	Matrix:	Surface Water
Analyzed:	01/26/06 By: spf	Unit:	ug/L
Anal. Method:	EPA 8260B	Dilution Factor:	1
Anal. Batch:			
QC Batch:	6A25002		

Volatile Organic Compounds by GCMS

Parameter	CAS Number	Analytical Results	MRL	Units
1,1,1,2-Tetrachloroethane	630-20-6	5 U	5	ug/L
1,1,1-Trichloroethane	71-55-6	5 U	5	ug/L
1,1,2,2-Tetrachloroethane	79-34-5	5 U	5	ug/L
1,1,2-Trichloroethane	79-00-5	5 U	5	ug/L
1,1-Dichloroethane	75-34-3	5 U	5	ug/L
1,1-Dichloroethene	75-35-4	5 U	5	ug/L
1,2,3-Trichloropropane	96-18-4	15 U	15	ug/L
1,2-Dibromo-3-chloropropane	96-12-8	25 U	25	ug/L
1,2-Dibromoethane	106-93-4	5 U	5	ug/L
1,2-Dichlorobenzene	95-50-1	5 U	5	ug/L
1,2-Dichloroethane	107-06-2	5 U	5	ug/L
1,2-Dichloropropane	78-87-5	5 U	5	ug/L
1,4-Dichlorobenzene	106-46-7	5 U	5	ug/L
2-Butanone	78-93-3	100 U	100	ug/L
2-Hexanone	591-78-6	50 U	50	ug/L
4-Methyl-2-pentanone	108-10-1	100 U	100	ug/L
Acetone	67-64-1	100 U	100	ug/L
Acrylonitrile	107-13-1	200 U	200	ug/L
Benzene	71-43-2	5 U	5	ug/L
Bromochloromethane	74-97-5	5 U	5	ug/L
Bromodichloromethane	75-27-4	5 U	5	ug/L
Bromoform	75-25-2	5 U	5	ug/L
Bromomethane	74-83-9	10 U	10	ug/L
Carbon disulfide	75-15-0	100 U	100	ug/L
Carbon tetrachloride	56-23-5	10 U	10	ug/L
Chlorobenzene	108-90-7	5 U	5	ug/L
Chloroethane	75-00-3	10 U	10	ug/L
Chloroform	67-66-3	5 U	5	ug/L
Chloromethane	74-87-3	10 U	10	ug/L
cis-1,2-Dichloroethene	156-59-4	5 U	5	ug/L
cis-1,3-Dichloropropene	10061-01-5	10 U	10	ug/L
Dibromochloromethane	124-48-1	5 U	5	ug/L
Dibromomethane	74-95-3	10 U	10	ug/L
Ethylbenzene	100-41-4	5 U	5	ug/L
Iodomethane	74-88-4	10 U	10	ug/L
m,p-Xylenes	108-38-3/106-42-3	10 U	10	ug/L

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ANALYTICAL REPORT

Sample ID:	P-19	Project:	Cherokee Co. Subtitle D LF
Lab #:	C600097-03	Work Order #:	C600097
Prep. Method:	EPA 5030B_MS	Matrix:	Surface Water
Analyzed:	01/26/06 By: spf	Unit:	ug/L
Anal. Method:	EPA 8260B	Dilution Factor:	1
Anal. Batch:			
QC Batch:	6A25002		

Volatile Organic Compounds by GCMS

Parameter	CAS Number	Analytical Results	MRL	Units
Methylene chloride	75-09-2	10 U	10	ug/L
o-Xylene	95-47-6	5 U	5	ug/L
Styrene	100-42-5	10 U	10	ug/L
Tetrachloroethene	127-18-4	5 U	5	ug/L
Toluene	108-88-3	5 U	5	ug/L
trans-1,2-Dichloroethene	156-60-5	5 U	5	ug/L
trans-1,3-Dichloropropene	10061-02-6	10 U	10	ug/L
trans-1,4-Dichloro-2-butene	110-57-6	100 U	100	ug/L
Trichloroethene	79-01-6	5 U	5	ug/L
Trichlorofluoromethane	75-69-4	5 U	5	ug/L
Vinyl acetate	108-05-4	50 U	50	ug/L
Vinyl chloride	75-01-4	10 U	10	ug/L

Surrogate Recovery		Result	Spike Level	% Recovery	% Recovery Limits
4-Bromofluorobenzene	460-00-4	58.7	50.0	117 %	70-130
Dibromofluoromethane	1868-53-7	48.0	50.0	96 %	73-138
Toluene-d8	2037-26-5	49.8	50.0	100 %	77-118

QUALITY CONTROL

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Volatile Organic Compounds by GCMS - Quality Control										
Batch 6A25002 - EPA 5030B_MS										
Blank (6A25002-BLK1)				Prepared & Analyzed: 25-Jan-06						
Acetone	100 U	100	ug/L							
Acrylonitrile	200 U	200	ug/L							
Benzene	5 U	5	ug/L							
2-Butanone	100 U	100	ug/L							
2-Hexanone	50 U	50	ug/L							
Iodomethane	10 U	10	ug/L							
Tetrachloroethene	5 U	5	ug/L							
4-Methyl-2-pentanone	100 U	100	ug/L							
Bromochloromethane	5 U	5	ug/L							
Trichloroethene	5 U	5	ug/L							
Bromodichloromethane	5 U	5	ug/L							
Bromoform	5 U	5	ug/L							
Bromomethane	10 U	10	ug/L							
Carbon disulfide	100 U	100	ug/L							
Carbon tetrachloride	10 U	10	ug/L							
Chlorobenzene	5 U	5	ug/L							
Chloroethane	10 U	10	ug/L							
Chloroform	5 U	5	ug/L							
Chloromethane	10 U	10	ug/L							
Dibromochloromethane	5 U	5	ug/L							
1,2-Dibromo-3-chloropropane	25 U	25	ug/L							
1,2-Dibromoethane	5 U	5	ug/L							
Dibromomethane	10 U	10	ug/L							
1,2-Dichlorobenzene	5 U	5	ug/L							
1,4-Dichlorobenzene	5 U	5	ug/L							
trans-1,4-Dichloro-2-butene	100 U	100	ug/L							
1,1-Dichloroethane	5 U	5	ug/L							
1,2-Dichloroethane	5 U	5	ug/L							
1,1-Dichloroethene	5 U	5	ug/L							
cis-1,2-Dichloroethene	5 U	5	ug/L							
trans-1,2-Dichloroethene	5 U	5	ug/L							
1,2-Dichloropropane	5 U	5	ug/L							
cis-1,3-Dichloropropene	10 U	10	ug/L							
trans-1,3-Dichloropropene	10 U	10	ug/L							
Ethylbenzene	5 U	5	ug/L							
Methylene chloride	10 U	10	ug/L							
Styrene	10 U	10	ug/L							
1,1,1,2-Tetrachloroethane	5 U	5	ug/L							
1,1,2,2-Tetrachloroethane	5 U	5	ug/L							
Toluene	5 U	5	ug/L							

QUALITY CONTROL

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Volatile Organic Compounds by GCMS - Quality Control										
Batch 6A25002 - EPA 5030B_MS										
Blank (6A25002-BLK1) Continued				Prepared & Analyzed: 25-Jan-06						
1,1,1-Trichloroethane	5 U	5	ug/L							
1,1,2-Trichloroethane	5 U	5	ug/L							
Trichlorofluoromethane	5 U	5	ug/L							
1,2,3-Trichloropropane	15 U	15	ug/L							
Vinyl acetate	50 U	50	ug/L							
Vinyl chloride	10 U	10	ug/L							
m,p-Xylenes	10 U	10	ug/L							
o-Xylene	5 U	5	ug/L							
Surrogate: Toluene-d8	*48.5*		*ug/L*	*50.0*		*97*	*77-118*			
Surrogate: 4-Bromofluorobenzene	*57.7*		*ug/L*	*50.0*		*115*	*70-130*			
Surrogate: Dibromofluoromethane	*45.2*		*ug/L*	*50.0*		*90*	*73-138*			
Blank (6A25002-BLK2)				Prepared & Analyzed: 25-Jan-06						
Acetone	2 U	2	ug/L							
Acrylonitrile	5 U	5	ug/L							
Benzene	1 U	1	ug/L							
2-Butanone	2 U	2	ug/L							
2-Hexanone	2 U	2	ug/L							
Iodomethane	2 U	2	ug/L							
Tetrachloroethene	1 U	1	ug/L							
4-Methyl-2-pentanone	2 U	2	ug/L							
Bromochloromethane	1 U	1	ug/L							
Trichloroethene	1 U	1	ug/L							
Bromodichloromethane	1 U	1	ug/L							
Bromoform	1 U	1	ug/L							
Bromomethane	1 U	1	ug/L							
Carbon disulfide	2 U	2	ug/L							
Carbon tetrachloride	1 U	1	ug/L							
Chlorobenzene	1 U	1	ug/L							
Chloroethane	1 U	1	ug/L							
Chloroform	1 U	1	ug/L							
Chloromethane	1 U	1	ug/L							
Dibromochloromethane	1 U	1	ug/L							
Dibromomethane	1 U	1	ug/L							
1,2-Dichlorobenzene	1 U	1	ug/L							
1,4-Dichlorobenzene	1 U	1	ug/L							
trans-1,4-Dichloro-2-butene	1 U	1	ug/L							
1,1-Dichloroethane	1 U	1	ug/L							
1,2-Dichloroethane	1 U	1	ug/L							
1,1-Dichloroethene	1 U	1	ug/L							
cis-1,2-Dichloroethene	1 U	1	ug/L							

QUALITY CONTROL

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Volatile Organic Compounds by GCMS - Quality Control										
Batch 6A25002 - EPA 5030B_MS										
Blank (6A25002-BLK2) Continued				Prepared & Analyzed: 25-Jan-06						
trans-1,2-Dichloroethene	1 U	1	ug/L							
1,2-Dichloropropane	1 U	1	ug/L							
cis-1,3-Dichloropropene	1 U	1	ug/L							
trans-1,3-Dichloropropene	1 U	1	ug/L							
Ethylbenzene	1 U	1	ug/L							
Methylene chloride	1 U	1	ug/L							
Styrene	1 U	1	ug/L							
1,1,1,2-Tetrachloroethane	1 U	1	ug/L							
1,1,2,2-Tetrachloroethane	1 U	1	ug/L							
Toluene	1 U	1	ug/L							
1,1,1-Trichloroethane	1 U	1	ug/L							
1,1,2-Trichloroethane	1 U	1	ug/L							
Trichlorofluoromethane	1 U	1	ug/L							
1,2,3-Trichloropropane	1 U	1	ug/L							
Vinyl acetate	2 U	2	ug/L							
Vinyl chloride	1 U	1	ug/L							
m,p-Xylenes	2 U	2	ug/L							
o-Xylene	1 U	1	ug/L							
Surrogate: Toluene-d8	*39.7*		*ug/L*	*50.0*		*79*	*77-118*			
Surrogate: 4-Bromofluorobenzene	*41.3*		*ug/L*	*50.0*		*83*	*70-130*			
Surrogate: Dibromofluoromethane	*38.0*		*ug/L*	*50.0*		*76*	*73-138*			
LCS (6A25002-BS1)				Prepared & Analyzed: 25-Jan-06						
Benzene	26.8	1	ug/L	25.0		107	69-115			
Trichloroethene	24.5	1	ug/L	25.0		98	74-118			
Chlorobenzene	25.4	1	ug/L	25.0		102	76-118			
1,1-Dichloroethene	28.7	1	ug/L	25.0		115	0-200			
Toluene	22.6	1	ug/L	25.0		90	77-117			
Surrogate: Toluene-d8	*51.6*		*ug/L*	*50.0*		*103*	*77-118*			
Surrogate: 4-Bromofluorobenzene	*59.5*		*ug/L*	*50.0*		*119*	*70-130*			
Surrogate: Dibromofluoromethane	*45.9*		*ug/L*	*50.0*		*92*	*73-138*			
Matrix Spike (6A25002-MS1)		**Source: C600094-02**		Prepared & Analyzed: 25-Jan-06						
Benzene	21.2	1	ug/L	20.0	1 U	106	53-150			
Trichloroethene	19.2	1	ug/L	20.0	1 U	96	64-124			
Chlorobenzene	20.9	1	ug/L	20.0	1 U	104	44-128			
1,1-Dichloroethene	22.6	1	ug/L	20.0	1 U	113	36-177			
Toluene	18.8	1	ug/L	20.0	1 U	94	40-161			
Surrogate: Toluene-d8	*43.1*		*ug/L*	*50.0*		*86*	*77-118*			
Surrogate: 4-Bromofluorobenzene	*52.5*		*ug/L*	*50.0*		*105*	*70-130*			
Surrogate: Dibromofluoromethane	*40.4*		*ug/L*	*50.0*		*81*	*73-138*			
Matrix Spike Dup (6A25002-MSD1)		**Source: C600094-02**		Prepared & Analyzed: 25-Jan-06						

QUALITY CONTROL

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Volatile Organic Compounds by GCMS - Quality Control										
Batch 6A25002 - EPA 5030B_MS										
Matrix Spike Dup (6A25002-MSD1) Continued		**Source: C600094-02**		Prepared & Analyzed: 25-Jan-06						
Benzene	21.8	1	ug/L	20.0	1 U	109	53-150	3	23	
Trichloroethene	19.8	1	ug/L	20.0	1 U	99	64-124	3	25	
Chlorobenzene	20.0	1	ug/L	20.0	1 U	100	44-128	4	22	
1,1-Dichloroethene	22.6	1	ug/L	20.0	1 U	113	36-177	0	30	
Toluene	18.2	1	ug/L	20.0	1 U	91	40-161	3	23	
Surrogate: Toluene-d8	*49.0*		*ug/L*	*50.0*		*98*	*77-118*			
Surrogate: 4-Bromofluorobenzene	*57.8*		*ug/L*	*50.0*		*116*	*70-130*			
Surrogate: Dibromofluoromethane	*45.4*		*ug/L*	*50.0*		*91*	*73-138*			

Notes and Definitions

U	Analyte included in the analysis, but not detected