TABLE K1
Summary Statistics and MTCA Statistical Comparisons for Chemicals of Concern
Unocal Edmonds Bulk Fuel Terminal Lower Yard
Phase II Remedial Implementation
11720 Unoco Road
Edmonds, Washington

Summary statistics				
	Chemical Group	**N of Cases**	**Maximum**	**Average**
	cPAH[a]	41	0.21	0.03
	TPH[b]	73	2,020	171

95% UCL Mean < Cleanup Criteria?				
			95% UCL	**Result**
Chebyshev (Mean, Sd) UCL	**cPAH**		0.06	**0.14** **PASS**
Chebyshev (Mean, Sd) UCL	**TPH**		339	**2,975** **PASS**
(95% UCL calculations from EPA's ProUCL)				

More than 10% of samples greater than cleanup criteria?			
		90%	**Soil Cleanup Result**
	cPAH	0.06	**0.14** **PASS**
	TPH	410	**2,975** **PASS**

Any sample values greater than 2x cleanup criteria?			
Sample		**cPAH**	**2 x Criterion Result**
Max		0.21	**0.28** **PASS**
Sample		**TPH**	**2 x Criterion**
Max		2,020	**5950** **PASS**

Notes:

[a]: Carcinogenic PAHs, summed by toxicity equivalence to benzo-a-pyrene.

[b]: Total petroleum hydrocarbons, summed from gasoline, diesel, and heavy oil analyses.

TABLE K2
Summary Statistics and MTCA Statistical Comparisons for Chemicals of Concern
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Phase II Remedial Implementation
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ProUCL output
USEPA ProUCL Version 4.0 (Version 4.00.02)
22-Mar-09

From File: C:\Project\Chevron\Edmonds\new\Phase II In 20Mar09.wst

Summary Statistics for Raw Full Dataset

Variable	NumObs	Minimum	Maximum	Mean	Median	Variance	SD	Skewness	Kurtosis
TPH	73	20.8	2020	171.1	63.3	107895	328.5	4.321	20.93
cPAH	41	0.00793	0.212	0.031	0.0172	0.00141	0.0375	3.343	13.74

cPAH

General Statistics

Number of Valid Data	41	Number of Detected Data	32
Number of Distinct Detected Data	31	Number of Non-Detect Data	9
Number of Missing Values	40	Percent Non-Detects	21.95%

Raw Statistics

Minimum Detected	0.00842	Minimum Non-detect	0.00793
Maximum Detected	0.212	Maximum Non-detect	0.0414
Mean of Detected Data	0.0354	SD of Detected Data	0.0409

Log-Transformed Statistics

Mean of Detected Data	-3.73	SD of Detected Data	0.833

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.924	5% Shapiro Wilk Critical Value	0.93

Data not Lognormal at 5% Significance Level

DL/2 Substitution Method

Mean	0.0293	95% H-Stat (DL/2) UCL	0.0316
SD	0.038		
Mean (in Log Scale)	-4.038		
SD (in Log Scale)	0.987		

Log ROS Method

Mean	0.0225	95% Percentile Bootstrap UCL	0.0328
SD	0.0383	95% BCA Bootstrap UCL	0.0367
Mean (in Log Scale)	-4.439		
SD (in Log Scale)	0.998		

Kaplan Meier (KM) Method

Mean	0.0298	95% KM (t) UCL	0.0397
SD	0.0372	95% KM (BCA) UCL	0.0406
SE of Mean	0.0059	95% KM (% Bootstrap) UCL	0.0403
		95% KM (Chebyshev) UCL	0.0555
		97.5% KM (Chebyshev) UCL	0.0667
		99% KM (Chebyshev) UCL	0.0885

Potential UCL to Use	**Data do not follow a Discernable Distribution (0.05)**
	May want to try Nonparametric UCLs

Note: DL/2 is not a recommended method.

TABLE K2
Summary Statistics and MTCA Statistical Comparisons for Chemicals of Concern
Unocal Edmonds Bulk Fuel Terminal Lower Yard
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TPH

General Statistics

Number of Valid Data	73	Number of Detected Data	50
Number of Distinct Detected Data	48	Number of Non-Detect Data	23
Number of Missing Values	9	Percent Non-Detects	31.51%

Raw Statistics

Minimum Detected	26.3	Minimum Non-detect	20.8
Maximum Detected	2020	Maximum Non-detect	93
Mean of Detected Data	236.2	SD of Detected Data	380.4

Log-Transformed Statistics

Mean of Detected Data	4.79	SD of Detected Data	1.094

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.0997	5% Lilliefors Critical Value	0.125
Data appear Lognormal at 5% Significance Level			

DL/2 Substitution Method

Mean	166.4	95% H-Stat (DL/2) UCL	168.9
SD	330.5		
Mean (in Log Scale)	4.098		
SD (in Log Scale)	1.385		

Log ROS Method

Mean	102	95% Percentile Bootstrap UCL	150.5
SD	225	95% BCA Bootstrap UCL	176.8
Mean (in Log Scale)	3.791		
SD (in Log Scale)	1.173		

Kaplan Meier (KM) Method

Mean	170.3	95% KM (t) UCL	234.6
SD	326.4	95% KM (BCA) UCL	236.2
SE of Mean	38.59	95% KM (% Bootstrap) UCL	244.1
		95% KM (Chebyshev) UCL	338.5
		97.5% KM (Chebyshev) UCL	411.3
		99% KM (Chebyshev) UCL	554.3

Potential UCL to Use	**95% KM (Chebyshev) UCL**	**338.5**

Note: DL/2 is not a recommended method.

cPAH

Number of Valid Observations	41
Number of Distinct Observations	40
Minimum	0.00793
Maximum	0.212
Mean	0.031
Median	0.0172
SD	0.0375
Variance	0.00141
Coefficient of Variation	1.209
Skewness	3.343
Mean of log data	-3.886
SD of log data	0.847

Data do not follow a Discernable Distribution

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95% Useful UCLs	
Student's-t UCL	0.0409
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL	0.0439
95% Modified-t UCL	0.0414
Non-Parametric UCLs	
95% CLT UCL	0.0406
95% Jackknife UCL	0.0409
95% Standard Bootstrap UCL	0.0406
95% Bootstrap-t UCL	0.0486
95% Hall's Bootstrap UCL	0.0847
95% Percentile Bootstrap UCL	0.041
95% BCA Bootstrap UCL	0.0449
95% Chebyshev(Mean, Sd) UCL	0.0565
97.5% Chebyshev(Mean, Sd) UCL	0.0676
99% Chebyshev(Mean, Sd) UCL	0.0893

Potential UCL to Use
Use 95% Chebyshev (Mean, Sd) UCL   0.0565