ATTACHMENT B-1
UCL OUTPUT - NORTH PARCEL SOIL
AROCLOR 1254 0-15FT BGS

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	6/17/2015 8:26:17 AM
From File	North Aroclor 1254 0-15ft UCL Input.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aroclor 1254

General Statistics

Total Number of Observations	1017	Number of Distinct Observations	39
		Number of Missing Observations	8
Number of Detects	36	Number of Non-Detects	981
Number of Distinct Detects	29	Number of Distinct Non-Detects	13
Minimum Detect	0.027	Minimum Non-Detect	0.02
Maximum Detect	1.5	Maximum Non-Detect	2
Variance Detects	0.131	Percent Non-Detects	96.46%
Mean Detects	0.283	SD Detects	0.362
Median Detects	0.15	CV Detects	1.277
Skewness Detects	2.477	Kurtosis Detects	5.631
Mean of Logged Detects	-1.784	SD of Logged Detects	0.992

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.634	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.935	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.293	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.148	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.0298	Standard Error of Mean	0.00265
SD	0.0831	95% KM (BCA) UCL	0.0346
95% KM (t) UCL	0.0342	95% KM (Percentile Bootstrap) UCL	0.0344
95% KM (z) UCL	0.0342	95% KM Bootstrap t UCL	0.0363
90% KM Chebyshev UCL	0.0377	95% KM Chebyshev UCL	0.0414
97.5% KM Chebyshev UCL	0.0464	99% KM Chebyshev UCL	0.0562

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.443	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.774	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.193	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.151	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.093	k star (bias corrected MLE)	1.02
Theta hat (MLE)	0.259	Theta star (bias corrected MLE)	0.278
nu hat (MLE)	78.67	nu star (bias corrected)	73.45
MLE Mean (bias corrected)	0.283	MLE Sd (bias corrected)	0.281

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.128	nu hat (KM)	261.3
Approximate Chi Square Value (261.26, α)	224.8	Adjusted Chi Square Value (261.26, β)	224.8
95% Gamma Approximate KM-UCL (use when n>=50)	0.0346	95% Gamma Adjusted KM-UCL (use when n<50)	0.0346

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.0197
Maximum	1.5	Median	0.01
SD	0.0841	CV	4.272
k hat (MLE)	1	k star (bias corrected MLE)	0.998
Theta hat (MLE)	0.0197	Theta star (bias corrected MLE)	0.0197

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nu hat (MLE)	2034	nu star (bias corrected)	2030
MLE Mean (bias corrected)	0.0197	MLE Sd (bias corrected)	0.0197
		Adjusted Level of Significance (β)	0.0498
Approximate Chi Square Value (N/A, α)	1926	Adjusted Chi Square Value (N/A, β)	1926
95% Gamma Approximate UCL (use when n>=50)	0.0207	95% Gamma Adjusted UCL (use when n<50)	0.0207

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.961	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.935	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.115	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.148	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0133	Mean in Log Scale	-7.583
SD in Original Scale	0.0852	SD in Log Scale	2.616
95% t UCL (assumes normality of ROS data)	0.0177	95% Percentile Bootstrap UCL	0.0179
95% BCA Bootstrap UCL	0.019	95% Bootstrap t UCL	0.0202
95% H-UCL (Log ROS)	N/A		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-3.823	95% H-UCL (KM -Log)	N/A
KM SD (logged)	0.443	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.0158		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0426	Mean in Log Scale	-3.571
SD in Original Scale	0.0951	SD in Log Scale	0.669
95% t UCL (Assumes normality)	0.0475	95% H-Stat UCL	N/A

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics
Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.0342	95% KM (% Bootstrap) UCL	0.0344

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.