ATTACHMENT B-3
UCL OUTPUT - NORTH PARCEL SOIL
TOTAL PCBS 5-15FT BGS

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	6/17/2015 8:32:28 AM
From File	North Total PCBs 5-15ft UCL Input.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Total-PCBs

General Statistics

Total Number of Observations	449	Number of Distinct Observations	161
		Number of Missing Observations	4
Number of Detects	191	Number of Non-Detects	258
Number of Distinct Detects	157	Number of Distinct Non-Detects	7
Minimum Detect	0.05	Minimum Non-Detect	0.02
Maximum Detect	22.44	Maximum Non-Detect	0.2
Variance Detects	18.61	Percent Non-Detects	57.46%
Mean Detects	2.603	SD Detects	4.314
Median Detects	0.595	CV Detects	1.657
Skewness Detects	2.54	Kurtosis Detects	6.633
Mean of Logged Detects	-0.342	SD of Logged Detects	1.737

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.631	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.277	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0641	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	1.12	Standard Error of Mean	0.146
SD	3.083	95% KM (BCA) UCL	1.361
95% KM (t) UCL	1.36	95% KM (Percentile Bootstrap) UCL	1.367
95% KM (z) UCL	1.36	95% KM Bootstrap t UCL	1.392
90% KM Chebyshev UCL	1.558	95% KM Chebyshev UCL	1.756
97.5% KM Chebyshev UCL	2.031	99% KM Chebyshev UCL	2.571

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	5.302	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.823	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.134	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.0699	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)	0.491	k star (bias corrected MLE)	0.486
Theta hat (MLE)	5.307	Theta star (bias corrected MLE)	5.353
nu hat (MLE)	187.4	nu star (bias corrected)	185.8
MLE Mean (bias corrected)	2.603	MLE Sd (bias corrected)	3.733

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.132	nu hat (KM)	118.5
Approximate Chi Square Value (118.48, α)	94.35	Adjusted Chi Square Value (118.48, β)	94.28
95% Gamma Approximate KM-UCL (use when n>=50)	1.406	95% Gamma Adjusted KM-UCL (use when n<50)	1.407

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	1.113
Maximum	22.44	Median	0.01
SD	3.089	CV	2.775
k hat (MLE)	0.246	k star (bias corrected MLE)	0.246
Theta hat (MLE)	4.531	Theta star (bias corrected MLE)	4.534

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nu hat (MLE)	220.6	nu star (bias corrected)	220.5
MLE Mean (bias corrected)	1.113	MLE Sd (bias corrected)	2.247
		Adjusted Level of Significance (β)	0.0495
Approximate Chi Square Value (220.51, α)	187.1	Adjusted Chi Square Value (220.51, β)	187
95% Gamma Approximate UCL (use when n>=50)	1.312	95% Gamma Adjusted UCL (use when n<50)	1.312

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.0822	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0641	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1.118	Mean in Log Scale	-3.057
SD in Original Scale	3.087	SD in Log Scale	2.942
95% t UCL (assumes normality of ROS data)	1.358	95% Percentile Bootstrap UCL	1.368
95% BCA Bootstrap UCL	1.394	95% Bootstrap t UCL	1.413
95% H-UCL (Log ROS)	6.344		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.126	Mean in Log Scale	-2.198
SD in Original Scale	3.084	SD in Log Scale	1.988
95% t UCL (Assumes normality)	1.366	95% H-Stat UCL	1.067

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

Nonparametric Distribution Free UCL Statistics
Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	1.756

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.