APPENDIX B

95% UCL CALCULATIONS OUTPUT FILE: INCLUDING UPDATED NOV-DEC 2015 SOIL/ SEDIMENT DATA; 0-1 ft BGS and 0-3 ft BGS CRITERA

EAST WHITE LAKE, VERMILION PARISH, LA

Analysis using 0-1 ft BGS Criteria

ProUCL Descriptive Statistics

					Suggested UCLs				
Analyte	**Total Samples**	**Minimum**	**Maximum**	**Standard Deviation**	**95% UCL**	**Primary Method**	**UCL**	**Secondary Method**	**UCL**	**Tertiary Method**
arsenic	69	0.911	22	2.912	6.59	95% Approximate Gamma UCL				
barium	68	136	15700	2040	2076	95% Chebyshev (Mean, Sd) UCL				
cadmium	44	0.219	2.7	0.366	0.69	95% Student-t's UCLS	0.696	95% Modified-t UCL		
chromium	46	7.73	57.8	7.601	16.96	95% Student-t's UCLS	17.06	95% Modified-t UCL		
lead	48	8.11	125	22.15	39.25	95% Chebyshev (Mean, Sd) UCL				
mercury	67	0.0705	7.589	1.31	1.19	95% Chebyshev (Mean, Sd) UCL				
selenium	53	1.408	9.14	0.171	1.688	95% KM (t) UCL	1.682	95% KM (Percentile Bootstrap) UCL		
zinc	30	20.4	1780	280.8	321.1	95% Chebyshev (Mean, Sd) UCL				

1. 95UCL calculations only included samples from 0 - 1' and used dry weight concentrations (Nov-Dec 2015 sample data in addition to previously reported data [Rodgers 2015; Appendix B]). Samples that were closest to surface were used when available and deeper non-biologically relevent depths were excluded from that same location.
2. All non-detects were treated at full MDL.
3. Spilt samples were averaged if both detect or if 1 detect and 1 ND. The lowest MDL was used if both split samples were ND.
4. Split samples with both detect or 1 detect and 1 ND were treated as a detect (coded as '1') in ProUCL. Split samples with 2 NDs were treated as NDs (coded as '0') in ProUCL.
5. The following samples were excluded from 95UCL calculations because these samples have been excavated: SED15 (0-2'), SED15 (0-0.5').
6. The following samples were excluded from 95UCL calculations due to erroneous lab reporting: B17 (0-3'), B4 Rerun (0-1'), B9 Rerun (0-0.5'), B5 (0-1.5').

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	1/20/2016 1:04:14 PM
From File	0-1 ft COECs.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Arsenic

General Statistics

Total Number of Observations	69	Number of Distinct Observations	69
		Number of Missing Observations	0
Minimum	0.911	Mean	6.033
Maximum	22	Median	5.51
SD	2.912	Std. Error of Mean	0.351
Coefficient of Variation	0.483	Skewness	2.694

Normal GOF Test

Shapiro Wilk Test Statistic	0.82	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	2.247E-11	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.138	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.107	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	6.618	95% Adjusted-CLT UCL (Chen-1995)	6.731
		95% Modified-t UCL (Johnson-1978)	6.637

Gamma GOF Test

A-D Test Statistic	0.682	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.754	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0804	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.107	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	5.524	k star (bias corrected MLE)	5.293
Theta hat (MLE)	1.092	Theta star (bias corrected MLE)	1.14
nu hat (MLE)	762.3	nu star (bias corrected)	730.5
MLE Mean (bias corrected)	6.033	MLE Sd (bias corrected)	2.622
		Approximate Chi Square Value (0.05)	668.8
Adjusted Level of Significance	0.0465	Adjusted Chi Square Value	667.5

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	6.59	95% Adjusted Gamma UCL (use when n<50)	6.602

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.964	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.126	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0713	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.107	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-0.0932	Mean of logged Data	1.704
Maximum of Logged Data	3.091	SD of logged Data	0.439

Assuming Lognormal Distribution

95% H-UCL	6.673	90% Chebyshev (MVUE) UCL	7.042
95% Chebyshev (MVUE) UCL	7.494	97.5% Chebyshev (MVUE) UCL	8.122
99% Chebyshev (MVUE) UCL	9.355		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	6.61	95% Jackknife UCL	6.618
95% Standard Bootstrap UCL	6.599	95% Bootstrap-t UCL	6.791
95% Hall's Bootstrap UCL	6.96	95% Percentile Bootstrap UCL	6.636
95% BCA Bootstrap UCL	6.75		
90% Chebyshev(Mean, Sd) UCL	7.085	95% Chebyshev(Mean, Sd) UCL	7.561
97.5% Chebyshev(Mean, Sd) UCL	8.222	99% Chebyshev(Mean, Sd) UCL	9.521

Suggested UCL to Use

95% Approximate Gamma UCL	6.59

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	1/20/2016 1:06:14 PM
From File	0-1 ft COECs_a.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Barium

General Statistics

Total Number of Observations	68	Number of Distinct Observations	68
		Number of Missing Observations	0
Minimum	136	Mean	997.4
Maximum	15700	Median	596.4
SD	2040	Std. Error of Mean	247.4
Coefficient of Variation	2.045	Skewness	6.24

Normal GOF Test

Shapiro Wilk Test Statistic	0.34	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.362	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.107	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1410	95% Adjusted-CLT UCL (Chen-1995)	1604
		95% Modified-t UCL (Johnson-1978)	1441

Gamma GOF Test

A-D Test Statistic	5.116	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.777	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.225	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.111	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.146	k star (bias corrected MLE)	1.105
Theta hat (MLE)	870.8	Theta star (bias corrected MLE)	902.9
nu hat (MLE)	155.8	nu star (bias corrected)	150.2
MLE Mean (bias corrected)	997.4	MLE Sd (bias corrected)	949
		Approximate Chi Square Value (0.05)	122.9
Adjusted Level of Significance	0.0465	Adjusted Chi Square Value	122.4

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1219	95% Adjusted Gamma UCL (use when n<50)	1225

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.918	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	1.4949E-4	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.134	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.107	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	4.913	Mean of logged Data	6.409
Maximum of Logged Data	9.661	SD of logged Data	0.806

Assuming Lognormal Distribution

95% H-UCL	1034	90% Chebyshev (MVUE) UCL	1112
95% Chebyshev (MVUE) UCL	1237	97.5% Chebyshev (MVUE) UCL	1411
99% Chebyshev (MVUE) UCL	1753		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	1404	95% Jackknife UCL	1410
95% Standard Bootstrap UCL	1407	95% Bootstrap-t UCL	2563
95% Hall's Bootstrap UCL	3213	95% Percentile Bootstrap UCL	1447
95% BCA Bootstrap UCL	1691		
90% Chebyshev(Mean, Sd) UCL	1740	95% Chebyshev(Mean, Sd) UCL	2076
97.5% Chebyshev(Mean, Sd) UCL	2542	99% Chebyshev(Mean, Sd) UCL	3459

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 2076

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	1/20/2016 1:07:07 PM
From File	0-1 ft COECs_b.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cadmium

General Statistics

Total Number of Observations	44	Number of Distinct Observations	27
		Number of Missing Observations	0
Minimum	0.219	Mean	0.597
Maximum	2.7	Median	0.496
SD	0.366	Std. Error of Mean	0.0552
Coefficient of Variation	0.614	Skewness	4.651

Normal GOF Test

Shapiro Wilk Test Statistic	0.52	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.944	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.278	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.134	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.69	95% Adjusted-CLT UCL (Chen-1995)	0.729
		95% Modified-t UCL (Johnson-1978)	0.696

Gamma GOF Test

A-D Test Statistic	4.158	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.28	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.134	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	5.367	k star (bias corrected MLE)	5.016
Theta hat (MLE)	0.111	Theta star (bias corrected MLE)	0.119
nu hat (MLE)	472.3	nu star (bias corrected)	441.4
MLE Mean (bias corrected)	0.597	MLE Sd (bias corrected)	0.266
		Approximate Chi Square Value (0.05)	393.7
Adjusted Level of Significance	0.0445	Adjusted Chi Square Value	392.2

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.669	95% Adjusted Gamma UCL (use when n<50)	0.672

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.805	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.944	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.299	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.134	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-1.519	Mean of logged Data	-0.612
Maximum of Logged Data	0.993	SD of logged Data	0.403

Assuming Lognormal Distribution

95% H-UCL	0.658	90% Chebyshev (MVUE) UCL	0.697
95% Chebyshev (MVUE) UCL	0.747	97.5% Chebyshev (MVUE) UCL	0.817
99% Chebyshev (MVUE) UCL	0.953		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	0.688	95% Jackknife UCL	0.69
95% Standard Bootstrap UCL	0.685	95% Bootstrap-t UCL	0.803
95% Hall's Bootstrap UCL	1.108	95% Percentile Bootstrap UCL	0.696
95% BCA Bootstrap UCL	0.735		
90% Chebyshev(Mean, Sd) UCL	0.762	95% Chebyshev(Mean, Sd) UCL	0.837
97.5% Chebyshev(Mean, Sd) UCL	0.942	99% Chebyshev(Mean, Sd) UCL	1.146

Suggested UCL to Use

95% Student's-t UCL	0.69	or 95% Modified-t UCL	0.696

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	1/20/2016 1:07:59 PM
From File	0-1 ft COECs_c.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Chromium

General Statistics

Total Number of Observations	46	Number of Distinct Observations	46
		Number of Missing Observations	0
Minimum	7.73	Mean	15.18
Maximum	57.8	Median	13.87
SD	7.601	Std. Error of Mean	1.064
Coefficient of Variation	0.501	Skewness	4.075

Normal GOF Test

Shapiro Wilk Test Statistic	0.597	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	2.220E-16	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.297	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.124	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	16.96	95% Adjusted-CLT UCL (Chen-1995)	17.58
		95% Modified-t UCL (Johnson-1978)	17.06

Gamma GOF Test

A-D Test Statistic	3.173	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.752	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.246	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.124	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	7.365	k star (bias corrected MLE)	6.944
Theta hat (MLE)	2.061	Theta star (bias corrected MLE)	2.185
nu hat (MLE)	751.2	nu star (bias corrected)	708.3
MLE Mean (bias corrected)	15.18	MLE Sd (bias corrected)	5.759
		Approximate Chi Square Value (0.05)	647.6
Adjusted Level of Significance	0.0453	Adjusted Chi Square Value	645.9

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	16.6	95% Adjusted Gamma UCL (use when n<50)	16.64

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.863	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	3.8620E-6	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.213	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.124	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.045	Mean of logged Data	2.65
Maximum of Logged Data	4.057	SD of logged Data	0.337

Assuming Lognormal Distribution

95% H-UCL	16.28	90% Chebyshev (MVUE) UCL	17.14
95% Chebyshev (MVUE) UCL	18.12	97.5% Chebyshev (MVUE) UCL	19.49
99% Chebyshev (MVUE) UCL	22.17		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	16.93	95% Jackknife UCL	16.96
95% Standard Bootstrap UCL	16.93	95% Bootstrap-t UCL	18.55
95% Hall's Bootstrap UCL	25.3	95% Percentile Bootstrap UCL	17.15
95% BCA Bootstrap UCL	17.83		
90% Chebyshev(Mean, Sd) UCL	18.37	95% Chebyshev(Mean, Sd) UCL	19.81
97.5% Chebyshev(Mean, Sd) UCL	21.82	99% Chebyshev(Mean, Sd) UCL	25.77

Suggested UCL to Use

95% Student's-t UCL	16.96	or 95% Modified-t UCL	17.06

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	1/20/2016 1:13:17 PM
From File	0-1 ft COECs_d.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Lead

General Statistics

Total Number of Observations	48	Number of Distinct Observations	48
		Number of Missing Observations	0
Minimum	8.11	Mean	25.99
Maximum	125	Median	20.07
SD	22.15	Std. Error of Mean	3.043
Coefficient of Variation	0.853	Skewness	3.349

Normal GOF Test

Shapiro Wilk Test Statistic	0.583	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.289	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.122	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	31.08	95% Adjusted-CLT UCL (Chen-1995)	32.49
		95% Modified-t UCL (Johnson-1978)	31.32

Gamma GOF Test

A-D Test Statistic	3.504	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.758	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.225	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.123	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.851	k star (bias corrected MLE)	2.702
Theta hat (MLE)	9.114	Theta star (bias corrected MLE)	9.616
nu hat (MLE)	302.2	nu star (bias corrected)	286.4
MLE Mean (bias corrected)	25.99	MLE Sd (bias corrected)	15.81
		Approximate Chi Square Value (0.05)	248.2
Adjusted Level of Significance	0.0455	Adjusted Chi Square Value	247.3

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	29.98	95% Adjusted Gamma UCL (use when n<50)	30.1

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.89	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	4.5418E-5	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.174	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.122	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.093	Mean of logged Data	3.072
Maximum of Logged Data	4.828	SD of logged Data	0.543

Assuming Lognormal Distribution

95% H-UCL	28.89	90% Chebyshev (MVUE) UCL	30.86
95% Chebyshev (MVUE) UCL	33.54	97.5% Chebyshev (MVUE) UCL	37.26
99% Chebyshev (MVUE) UCL	44.56		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	30.99	95% Jackknife UCL	31.08
95% Standard Bootstrap UCL	30.99	95% Bootstrap-t UCL	35.22
95% Hall's Bootstrap UCL	38.59	95% Percentile Bootstrap UCL	31.18
95% BCA Bootstrap UCL	32.58		
90% Chebyshev(Mean, Sd) UCL	35.11	95% Chebyshev(Mean, Sd) UCL	39.25
97.5% Chebyshev(Mean, Sd) UCL	44.99	99% Chebyshev(Mean, Sd) UCL	56.26

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 39.25

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	1/20/2016 1:15:34 PM
From File	0-1 ft COECs_e.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Mercury

General Statistics

Total Number of Observations	67	Number of Distinct Observations	67
		Number of Missing Observations	0
Minimum	0.0705	Mean	0.493
Maximum	7.589	Median	0.155
SD	1.31	Std. Error of Mean	0.16
Coefficient of Variation	2.659	Skewness	4.503

Normal GOF Test

Shapiro Wilk Test Statistic	0.325	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.41	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.108	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.76	95% Adjusted-CLT UCL (Chen-1995)	0.85
		95% Modified-t UCL (Johnson-1978)	0.774

Gamma GOF Test

A-D Test Statistic	10.48	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.799	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.279	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.114	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.678	k star (bias corrected MLE)	0.657
Theta hat (MLE)	0.727	Theta star (bias corrected MLE)	0.75
nu hat (MLE)	90.79	nu star (bias corrected)	88.06
MLE Mean (bias corrected)	0.493	MLE Sd (bias corrected)	0.608
		Approximate Chi Square Value (0.05)	67.42
Adjusted Level of Significance	0.0464	Adjusted Chi Square Value	67.03

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.643	95% Adjusted Gamma UCL (use when n<50)	0.647

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.767	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	2.764E-14	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.177	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.108	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-2.652	Mean of logged Data	-1.604
Maximum of Logged Data	2.027	SD of logged Data	0.969

Assuming Lognormal Distribution

95% H-UCL	0.42	90% Chebyshev (MVUE) UCL	0.451
95% Chebyshev (MVUE) UCL	0.512	97.5% Chebyshev (MVUE) UCL	0.596
99% Chebyshev (MVUE) UCL	0.76		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	0.756	95% Jackknife UCL	0.76
95% Standard Bootstrap UCL	0.753	95% Bootstrap-t UCL	0.949
95% Hall's Bootstrap UCL	0.714	95% Percentile Bootstrap UCL	0.795
95% BCA Bootstrap UCL	0.883		
90% Chebyshev(Mean, Sd) UCL	0.973	95% Chebyshev(Mean, Sd) UCL	1.19
97.5% Chebyshev(Mean, Sd) UCL	1.492	99% Chebyshev(Mean, Sd) UCL	2.085

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 1.19

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	1/20/2016 1:15:57 PM
From File	0-1 ft COECs_f.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Selenium

General Statistics

Total Number of Observations	53	Number of Distinct Observations	25
Number of Detects	17	Number of Non-Detects	36
Number of Distinct Detects	17	Number of Distinct Non-Detects	8
Minimum Detect	1.408	Minimum Non-Detect	1.37
Maximum Detect	2.049	Maximum Non-Detect	9.14
Variance Detects	0.0291	Percent Non-Detects	67.92%
Mean Detects	1.668	SD Detects	0.171
Median Detects	1.707	CV Detects	0.102
Skewness Detects	0.214	Kurtosis Detects	-0.0268
Mean of Logged Detects	0.507	SD of Logged Detects	0.102

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.939	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.172	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.215	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

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

Mean	1.624	Standard Error of Mean	0.0379
SD	0.165	95% KM (BCA) UCL	1.679
95% KM (t) UCL	1.688	95% KM (Percentile Bootstrap) UCL	1.682
95% KM (z) UCL	1.687	95% KM Bootstrap t UCL	1.687
90% KM Chebyshev UCL	1.738	95% KM Chebyshev UCL	1.79
97.5% KM Chebyshev UCL	1.861	99% KM Chebyshev UCL	2.002

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.491	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.185	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.208	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	101.7	k star (bias corrected MLE)	83.8
Theta hat (MLE)	0.0164	Theta star (bias corrected MLE)	0.0199
nu hat (MLE)	3458	nu star (bias corrected)	2849
MLE Mean (bias corrected)	1.668	MLE Sd (bias corrected)	0.182

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	97.12	nu hat (KM)	10295
Approximate Chi Square Value (N/A, α)	10060	Adjusted Chi Square Value (N/A, β)	10053
95% Gamma Approximate KM-UCL (use when n>=50)	1.662	95% Gamma Adjusted KM-UCL (use when n<50)	1.663

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	1.317	Mean	1.622
Maximum	2.049	Median	1.617
SD	0.157	CV	0.0967
k hat (MLE)	109	k star (bias corrected MLE)	102.8
Theta hat (MLE)	0.0149	Theta star (bias corrected MLE)	0.0158
nu hat (MLE)	11550	nu star (bias corrected)	10898
MLE Mean (bias corrected)	1.622	MLE Sd (bias corrected)	0.16
		Adjusted Level of Significance (β)	0.0455
Approximate Chi Square Value (N/A, α)	10656	Adjusted Chi Square Value (N/A, β)	10649
95% Gamma Approximate UCL (use when n>=50)	1.659	95% Gamma Adjusted UCL (use when n<50)	1.66

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.94	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.183	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.215	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	1.621	Mean in Log Scale	0.479
SD in Original Scale	0.156	SD in Log Scale	0.0964
95% t UCL (assumes normality of ROS data)	1.657	95% Percentile Bootstrap UCL	1.657
95% BCA Bootstrap UCL	1.656	95% Bootstrap t UCL	1.658
95% H-UCL (Log ROS)	N/A		

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

KM Mean (logged)	0.48	95% H-UCL (KM -Log)	1.664
KM SD (logged)	0.102	95% Critical H Value (KM-Log)	1.686
KM Standard Error of Mean (logged)	0.0237		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.31	Mean in Log Scale	0.202
SD in Original Scale	0.6	SD in Log Scale	0.344
95% t UCL (Assumes normality)	1.448	95% H-Stat UCL	1.411

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

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	1.688	95% KM (Percentile Bootstrap) UCL	1.682

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.

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	1/20/2016 1:16:28 PM
From File	0-1 ft COECs_g.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Zinc

General Statistics

Total Number of Observations	30	Number of Distinct Observations	30
		Number of Missing Observations	0
Minimum	20.4	Mean	125.2
Maximum	1780	Median	61.75
SD	280.8	Std. Error of Mean	44.96
Coefficient of Variation	2.244	Skewness	5.694

Normal GOF Test

Shapiro Wilk Test Statistic	0.316	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.939	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.355	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.142	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	201	95% Adjusted-CLT UCL (Chen-1995)	242.9
		95% Modified-t UCL (Johnson-1978)	207.8

Gamma GOF Test

A-D Test Statistic	4.492	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.778	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.275	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.145	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.025	k star (bias corrected MLE)	0.964
Theta hat (MLE)	122.1	Theta star (bias corrected MLE)	129.9
nu hat (MLE)	79.97	nu star (bias corrected)	75.16
MLE Mean (bias corrected)	125.2	MLE Sd (bias corrected)	127.5
		Approximate Chi Square Value (0.05)	56.19
Adjusted Level of Significance	0.0437	Adjusted Chi Square Value	55.54

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	167.4	95% Adjusted Gamma UCL (use when n<50)	169.4

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.851	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.939	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.214	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.142	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.016	Mean of logged Data	4.268
Maximum of Logged Data	7.484	SD of logged Data	0.808

Assuming Lognormal Distribution

95% H-UCL	132	90% Chebyshev (MVUE) UCL	140.3
95% Chebyshev (MVUE) UCL	159.5	97.5% Chebyshev (MVUE) UCL	186.2
99% Chebyshev (MVUE) UCL	238.5		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	199.1	95% Jackknife UCL	201
95% Standard Bootstrap UCL	197	95% Bootstrap-t UCL	492.7
95% Hall's Bootstrap UCL	472.2	95% Percentile Bootstrap UCL	211
95% BCA Bootstrap UCL	262.7		
90% Chebyshev(Mean, Sd) UCL	260	95% Chebyshev(Mean, Sd) UCL	321.1
97.5% Chebyshev(Mean, Sd) UCL	405.9	99% Chebyshev(Mean, Sd) UCL	572.5

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	321.1

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Analysis using 0-3 ft BGS Criteria

ProUCL Descriptive Statistics

Analyte	Total Samples	Minimum	Maximum	Standard Deviation	Suggested UCLs					
					95% UCL	Primary Method	UCL	Secondary Method	UCL	Tertiary Method
arsenic	72	0.911	22	3.049	6.772	95% Approximate Gamma UCL				
barium	72	136	15700	2010	2043	95% Chebyshev (Mean, Sd) UCL				
cadmium	47	0.219	2.7	0.356	0.681	95% Student-t's UCLS	0.687	95% Modified-t UCL		
chromium	49	7.73	57.8	7.601	16.96	95% Student-t's UCLS	17.06	95% Modified-t UCL		
lead	52	8.11	125	21.8	38.76	95% Chebyshev (Mean, Sd) UCL				
mercury	72	0.0705	7.589	2.659	1.19	95% Chebyshev (Mean, Sd) UCL				
selenium	65	1.408	9.14	0.176	1.688	95% KM (t) UCL	1.689	95% KM (Percentile Bootstrap) UCL		
zinc	35	1780	20.4	280.8	321.1	95% Chebyshev (Mean, Sd) UCL				

1. 95UCL calculations only included samples from 0 - 3' and used dry weight concentrations (Nov-Dec 2015 sample data in addition to previously reported data [Rodgers 2015; Appendix B]). Samples that were closest to surface were used when available and deeper non-biologically relevent depths were excluded from that same location.
2. All non-detects were treated at full MDL.
3. Spilt samples were averaged if both detect or if 1 detect and 1 ND. The lowest MDL was used if both split samples were ND.
4. Split samples with both detect or 1 detect and 1 ND were treated as a detect (coded as '1') in ProUCL. Split samples with 2 NDs were treated as NDs (coded as '0') in ProUCL.
5. The following samples were excluded from 95UCL calculations because these samples have been excavated: SED15 (0-2'), SED15 (0-0.5'), SED15 (0-0.5').
6. The following samples were excluded from 95UCL calculations due to erroneous lab reporting: B17 (0-3'), B4 Rerun (0-1'), B9 Rerun (0-0.5'), B5 (0-1.5').

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	1/20/2016 12:44:12 PM
From File	0-3 ft COECs.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Arsenic

General Statistics

Total Number of Observations	72	Number of Distinct Observations	70
		Number of Missing Observations	0
Minimum	0.911	Mean	6.144
Maximum	22	Median	5.576
SD	3.036	Std. Error of Mean	0.363
Coefficient of Variation	0.494	Skewness	2.478

Normal GOF Test

Shapiro Wilk Test Statistic	0.829	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	5.523E-11	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.147	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.106	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	6.749	95% Adjusted-CLT UCL (Chen-1995)	6.856
		95% Modified-t UCL (Johnson-1978)	6.767

Gamma GOF Test

A-D Test Statistic	0.763	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.754	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0864	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.107	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	5.247	k star (bias corrected MLE)	5.031
Theta hat (MLE)	1.171	Theta star (bias corrected MLE)	1.221
nu hat (MLE)	734.5	nu star (bias corrected)	704.4
MLE Mean (bias corrected)	6.144	MLE Sd (bias corrected)	2.739
		Approximate Chi Square Value (0.05)	643.8
Adjusted Level of Significance	0.0466	Adjusted Chi Square Value	642.6

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	6.722	95% Adjusted Gamma UCL (use when n<50)	6.735

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.968	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.192	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0713	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.106	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-0.0932	Mean of logged Data	1.717
Maximum of Logged Data	3.091	SD of logged Data	0.45

Assuming Lognormal Distribution

95% H-UCL	6.806	90% Chebyshev (MVUE) UCL	7.187
95% Chebyshev (MVUE) UCL	7.656	97.5% Chebyshev (MVUE) UCL	8.307
99% Chebyshev (MVUE) UCL	9.585		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	6.741	95% Jackknife UCL	6.749
95% Standard Bootstrap UCL	6.75	95% Bootstrap-t UCL	6.897
95% Hall's Bootstrap UCL	7.03	95% Percentile Bootstrap UCL	6.795
95% BCA Bootstrap UCL	6.854		
90% Chebyshev(Mean, Sd) UCL	7.233	95% Chebyshev(Mean, Sd) UCL	7.726
97.5% Chebyshev(Mean, Sd) UCL	8.41	99% Chebyshev(Mean, Sd) UCL	9.755

Suggested UCL to Use

95% Approximate Gamma UCL	6.722

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	1/20/2016 12:44:57 PM
From File	0-3 ft COECs_a.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Barium

General Statistics

Total Number of Observations	72	Number of Distinct Observations	72
		Number of Missing Observations	0
Minimum	136	Mean	1010
Maximum	15700	Median	596.4
SD	2010	Std. Error of Mean	236.9
Coefficient of Variation	1.99	Skewness	6.154

Normal GOF Test

Shapiro Wilk Test Statistic	0.364	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.357	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.104	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1405	95% Adjusted-CLT UCL (Chen-1995)	1583
		95% Modified-t UCL (Johnson-1978)	1434

Gamma GOF Test

A-D Test Statistic	4.849	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.778	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.221	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.108	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.113	k star (bias corrected MLE)	1.076
Theta hat (MLE)	907.9	Theta star (bias corrected MLE)	939.2
nu hat (MLE)	160.2	nu star (bias corrected)	154.9
MLE Mean (bias corrected)	1010	MLE Sd (bias corrected)	974.1
		Approximate Chi Square Value (0.05)	127.1
Adjusted Level of Significance	0.0467	Adjusted Chi Square Value	126.6

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1231	95% Adjusted Gamma UCL (use when n<50)	1236

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.93	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	5.5653E-4	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.123	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.104	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	4.913	Mean of logged Data	6.405
Maximum of Logged Data	9.661	SD of logged Data	0.84

Assuming Lognormal Distribution

95% H-UCL	1063	90% Chebyshev (MVUE) UCL	1146
95% Chebyshev (MVUE) UCL	1277	97.5% Chebyshev (MVUE) UCL	1459
99% Chebyshev (MVUE) UCL	1817		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	1400	95% Jackknife UCL	1405
95% Standard Bootstrap UCL	1403	95% Bootstrap-t UCL	2198
95% Hall's Bootstrap UCL	2962	95% Percentile Bootstrap UCL	1449
95% BCA Bootstrap UCL	1680		
90% Chebyshev(Mean, Sd) UCL	1721	95% Chebyshev(Mean, Sd) UCL	2043
97.5% Chebyshev(Mean, Sd) UCL	2490	99% Chebyshev(Mean, Sd) UCL	3367

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 2043

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	1/20/2016 12:45:33 PM
From File	0-3 ft COECs_b.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cadmium

General Statistics

Total Number of Observations	47	Number of Distinct Observations	30
		Number of Missing Observations	0
Minimum	0.219	Mean	0.595
Maximum	2.7	Median	0.496
SD	0.356	Std. Error of Mean	0.0514
Coefficient of Variation	0.599	Skewness	4.619

Normal GOF Test

Shapiro Wilk Test Statistic	0.556	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.947	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.245	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.128	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.681	95% Adjusted-CLT UCL (Chen-1995)	0.716
		95% Modified-t UCL (Johnson-1978)	0.687

Gamma GOF Test

A-D Test Statistic	3.406	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.25	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.128	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	5.44	k star (bias corrected MLE)	5.114
Theta hat (MLE)	0.109	Theta star (bias corrected MLE)	0.116
nu hat (MLE)	522.2	nu star (bias corrected)	490.9
MLE Mean (bias corrected)	0.595	MLE Sd (bias corrected)	0.263
		Approximate Chi Square Value (0.05)	440.5
Adjusted Level of Significance	0.045	Adjusted Chi Square Value	439.1

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.663	95% Adjusted Gamma UCL (use when n<50)	0.665

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.854	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.947	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.269	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.128	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-1.519	Mean of logged Data	-0.615
Maximum of Logged Data	0.993	SD of logged Data	0.403

Assuming Lognormal Distribution

95% H-UCL	0.653	90% Chebyshev (MVUE) UCL	0.691
95% Chebyshev (MVUE) UCL	0.739	97.5% Chebyshev (MVUE) UCL	0.806
99% Chebyshev (MVUE) UCL	0.936		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	0.679	95% Jackknife UCL	0.681
95% Standard Bootstrap UCL	0.678	95% Bootstrap-t UCL	0.766
95% Hall's Bootstrap UCL	1.064	95% Percentile Bootstrap UCL	0.685
95% BCA Bootstrap UCL	0.735		
90% Chebyshev(Mean, Sd) UCL	0.749	95% Chebyshev(Mean, Sd) UCL	0.819
97.5% Chebyshev(Mean, Sd) UCL	0.916	99% Chebyshev(Mean, Sd) UCL	1.106

Suggested UCL to Use

95% Student's-t UCL	0.681	or 95% Modified-t UCL	0.687

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	1/20/2016 12:46:02 PM
From File	0-3 ft COECs_c.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Chromium

General Statistics

Total Number of Observations	49	Number of Distinct Observations	49
		Number of Missing Observations	0
Minimum	7.73	Mean	15.18
Maximum	57.8	Median	13.87
SD	7.601	Std. Error of Mean	1.064
Coefficient of Variation	0.501	Skewness	4.075

Normal GOF Test

Shapiro Wilk Test Statistic	0.597	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	2.220E-16	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.297	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.124	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	16.96	95% Adjusted-CLT UCL (Chen-1995)	17.58
		95% Modified-t UCL (Johnson-1978)	17.06

Gamma GOF Test

A-D Test Statistic	3.173	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.752	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.246	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.124	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	7.365	k star (bias corrected MLE)	6.944
Theta hat (MLE)	2.061	Theta star (bias corrected MLE)	2.185
nu hat (MLE)	751.2	nu star (bias corrected)	708.3
MLE Mean (bias corrected)	15.18	MLE Sd (bias corrected)	5.759
		Approximate Chi Square Value (0.05)	647.6
Adjusted Level of Significance	0.0453	Adjusted Chi Square Value	645.9

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	16.6	95% Adjusted Gamma UCL (use when n<50)	16.64

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.863	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	3.8620E-6	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.213	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.124	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.045	Mean of logged Data	2.65
Maximum of Logged Data	4.057	SD of logged Data	0.337

Assuming Lognormal Distribution

95% H-UCL	16.28	90% Chebyshev (MVUE) UCL	17.14
95% Chebyshev (MVUE) UCL	18.12	97.5% Chebyshev (MVUE) UCL	19.49
99% Chebyshev (MVUE) UCL	22.17		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	16.93	95% Jackknife UCL	16.96
95% Standard Bootstrap UCL	16.85	95% Bootstrap-t UCL	18.39
95% Hall's Bootstrap UCL	25.06	95% Percentile Bootstrap UCL	17.03
95% BCA Bootstrap UCL	17.87		
90% Chebyshev(Mean, Sd) UCL	18.37	95% Chebyshev(Mean, Sd) UCL	19.81
97.5% Chebyshev(Mean, Sd) UCL	21.82	99% Chebyshev(Mean, Sd) UCL	25.77

Suggested UCL to Use

95% Student's-t UCL	16.96	or 95% Modified-t UCL	17.06

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	1/20/2016 12:46:24 PM
From File	0-3 ft COECs_d.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Lead

General Statistics

Total Number of Observations	52	Number of Distinct Observations	52
		Number of Missing Observations	0
Minimum	8.11	Mean	26.06
Maximum	125	Median	20.05
SD	21.81	Std. Error of Mean	2.915
Coefficient of Variation	0.837	Skewness	3.317

Normal GOF Test

Shapiro Wilk Test Statistic	0.596	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.286	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.118	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	30.94	95% Adjusted-CLT UCL (Chen-1995)	32.23
		95% Modified-t UCL (Johnson-1978)	31.15

Gamma GOF Test

A-D Test Statistic	3.564	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.758	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.223	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.12	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.896	k star (bias corrected MLE)	2.752
Theta hat (MLE)	9	Theta star (bias corrected MLE)	9.468
nu hat (MLE)	324.3	nu star (bias corrected)	308.3
MLE Mean (bias corrected)	26.06	MLE Sd (bias corrected)	15.71
		Approximate Chi Square Value (0.05)	268.6
Adjusted Level of Significance	0.0457	Adjusted Chi Square Value	267.6

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	29.91	95% Adjusted Gamma UCL (use when n<50)	30.02

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.895	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	4.4332E-5	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.174	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.118	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.093	Mean of logged Data	3.078
Maximum of Logged Data	4.828	SD of logged Data	0.541

Assuming Lognormal Distribution

95% H-UCL	28.9	90% Chebyshev (MVUE) UCL	30.82
95% Chebyshev (MVUE) UCL	33.43	97.5% Chebyshev (MVUE) UCL	37.05
99% Chebyshev (MVUE) UCL	44.16		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	30.85	95% Jackknife UCL	30.94
95% Standard Bootstrap UCL	30.86	95% Bootstrap-t UCL	35.03
95% Hall's Bootstrap UCL	39.6	95% Percentile Bootstrap UCL	30.75
95% BCA Bootstrap UCL	32.9		
90% Chebyshev(Mean, Sd) UCL	34.8	95% Chebyshev(Mean, Sd) UCL	38.76
97.5% Chebyshev(Mean, Sd) UCL	44.26	99% Chebyshev(Mean, Sd) UCL	55.06

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	38.76

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	1/20/2016 12:47:25 PM
From File	0-3 ft COECs_f.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Mercury

General Statistics

Total Number of Observations	72	Number of Distinct Observations	72
		Number of Missing Observations	0
Minimum	0.0705	Mean	0.493
Maximum	7.589	Median	0.155
SD	1.31	Std. Error of Mean	0.16
Coefficient of Variation	2.659	Skewness	4.503

Normal GOF Test

Shapiro Wilk Test Statistic	0.325	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.41	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.108	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.76	95% Adjusted-CLT UCL (Chen-1995)	0.85
		95% Modified-t UCL (Johnson-1978)	0.774

Gamma GOF Test

A-D Test Statistic	10.48	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.799	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.279	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.114	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.678	k star (bias corrected MLE)	0.657
Theta hat (MLE)	0.727	Theta star (bias corrected MLE)	0.75
nu hat (MLE)	90.79	nu star (bias corrected)	88.06
MLE Mean (bias corrected)	0.493	MLE Sd (bias corrected)	0.608
		Approximate Chi Square Value (0.05)	67.42
Adjusted Level of Significance	0.0464	Adjusted Chi Square Value	67.03

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.643	95% Adjusted Gamma UCL (use when n<50)	0.647

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.767	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	2.764E-14	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.177	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.108	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-2.652	Mean of logged Data	-1.604
Maximum of Logged Data	2.027	SD of logged Data	0.969

Assuming Lognormal Distribution

95% H-UCL	0.42	90% Chebyshev (MVUE) UCL	0.451
95% Chebyshev (MVUE) UCL	0.512	97.5% Chebyshev (MVUE) UCL	0.596
99% Chebyshev (MVUE) UCL	0.76		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	0.756	95% Jackknife UCL	0.76
95% Standard Bootstrap UCL	0.748	95% Bootstrap-t UCL	1.739
95% Hall's Bootstrap UCL	0.717	95% Percentile Bootstrap UCL	0.775
95% BCA Bootstrap UCL	0.846		
90% Chebyshev(Mean, Sd) UCL	0.973	95% Chebyshev(Mean, Sd) UCL	1.19
97.5% Chebyshev(Mean, Sd) UCL	1.492	99% Chebyshev(Mean, Sd) UCL	2.085

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 1.19

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	1/20/2016 12:46:55 PM
From File	0-3 ft COECs_e.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Selenium

General Statistics

Total Number of Observations	65	Number of Distinct Observations	30
Number of Detects	19	Number of Non-Detects	43
Number of Distinct Detects	19	Number of Distinct Non-Detects	11
Minimum Detect	1.408	Minimum Non-Detect	1.37
Maximum Detect	2.049	Maximum Non-Detect	9.14
Variance Detects	0.031	Percent Non-Detects	69.35%
Mean Detects	1.665	SD Detects	0.176
Median Detects	1.707	CV Detects	0.106
Skewness Detects	0.134	Kurtosis Detects	-0.457
Mean of Logged Detects	0.504	SD of Logged Detects	0.106

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.176	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

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

Mean	1.626	Standard Error of Mean	0.0373
SD	0.17	95% KM (BCA) UCL	1.686
95% KM (t) UCL	1.688	95% KM (Percentile Bootstrap) UCL	1.689
95% KM (z) UCL	1.687	95% KM Bootstrap t UCL	1.692
90% KM Chebyshev UCL	1.737	95% KM Chebyshev UCL	1.788
97.5% KM Chebyshev UCL	1.858	99% KM Chebyshev UCL	1.996

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.567	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.738	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.189	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.198	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	94.07	k star (bias corrected MLE)	79.25
Theta hat (MLE)	0.0177	Theta star (bias corrected MLE)	0.021
nu hat (MLE)	3575	nu star (bias corrected)	3012
MLE Mean (bias corrected)	1.665	MLE Sd (bias corrected)	0.187

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	91.68	nu hat (KM)	11369
Approximate Chi Square Value (N/A, α)	11122	Adjusted Chi Square Value (N/A, β)	11116
95% Gamma Approximate KM-UCL (use when n>=50)	1.662	95% Gamma Adjusted KM-UCL (use when n<50)	1.663

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	1.299	Mean	1.622
Maximum	2.049	Median	1.616
SD	0.158	CV	0.0977
k hat (MLE)	106.3	k star (bias corrected MLE)	101.1
Theta hat (MLE)	0.0153	Theta star (bias corrected MLE)	0.016
nu hat (MLE)	13178	nu star (bias corrected)	12542
MLE Mean (bias corrected)	1.622	MLE Sd (bias corrected)	0.161
		Adjusted Level of Significance (β)	0.0461
Approximate Chi Square Value (N/A, α)	12282	Adjusted Chi Square Value (N/A, β)	12276
95% Gamma Approximate UCL (use when n>=50)	1.656	95% Gamma Adjusted UCL (use when n<50)	1.657

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.933	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.188	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	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	1.621	Mean in Log Scale	0.478
SD in Original Scale	0.158	SD in Log Scale	0.0978
95% t UCL (assumes normality of ROS data)	1.654	95% Percentile Bootstrap UCL	1.655
95% BCA Bootstrap UCL	1.654	95% Bootstrap t UCL	1.656
95% H-UCL (Log ROS)	N/A		

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

KM Mean (logged)	0.48	95% H-UCL (KM -Log)	1.663
KM SD (logged)	0.105	95% Critical H Value (KM-Log)	1.681
KM Standard Error of Mean (logged)	0.0232		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.318	Mean in Log Scale	0.211
SD in Original Scale	0.582	SD in Log Scale	0.339
95% t UCL (Assumes normality)	1.442	95% H-Stat UCL	1.412

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

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	1.688	95% KM (Percentile Bootstrap) UCL	1.689

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.

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	1/20/2016 12:47:53 PM
From File	0-3 ft COECs_g.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Zinc

General Statistics

Total Number of Observations	35	Number of Distinct Observations	35
		Number of Missing Observations	0
Minimum	20.4	Mean	125.2
Maximum	1780	Median	61.75
SD	280.8	Std. Error of Mean	44.96
Coefficient of Variation	2.244	Skewness	5.694

Normal GOF Test

Shapiro Wilk Test Statistic	0.316	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.939	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.355	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.142	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	201	95% Adjusted-CLT UCL (Chen-1995)	242.9
		95% Modified-t UCL (Johnson-1978)	207.8

Gamma GOF Test

A-D Test Statistic	4.492	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.778	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.275	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.145	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.025	k star (bias corrected MLE)	0.964
Theta hat (MLE)	122.1	Theta star (bias corrected MLE)	129.9
nu hat (MLE)	79.97	nu star (bias corrected)	75.16
MLE Mean (bias corrected)	125.2	MLE Sd (bias corrected)	127.5
		Approximate Chi Square Value (0.05)	56.19
Adjusted Level of Significance	0.0437	Adjusted Chi Square Value	55.54

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	167.4	95% Adjusted Gamma UCL (use when n<50)	169.4

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.851	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.939	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.214	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.142	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.016	Mean of logged Data	4.268
Maximum of Logged Data	7.484	SD of logged Data	0.808

Assuming Lognormal Distribution

95% H-UCL	132	90% Chebyshev (MVUE) UCL	140.3
95% Chebyshev (MVUE) UCL	159.5	97.5% Chebyshev (MVUE) UCL	186.2
99% Chebyshev (MVUE) UCL	238.5		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	199.1	95% Jackknife UCL	201
95% Standard Bootstrap UCL	197.8	95% Bootstrap-t UCL	479.4
95% Hall's Bootstrap UCL	472.6	95% Percentile Bootstrap UCL	208
95% BCA Bootstrap UCL	269.5		
90% Chebyshev(Mean, Sd) UCL	260	95% Chebyshev(Mean, Sd) UCL	321.1
97.5% Chebyshev(Mean, Sd) UCL	405.9	99% Chebyshev(Mean, Sd) UCL	572.5

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 321.1

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.