

APPENDIX F

ProUCL Output

Table F-1
ProUCL Output - Area 1 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Area 1.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Number of Valid Observations	16	Number of Distinct Observations	15
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Raw Statistics

Minimum	0.089
Maximum	0.79
Mean	0.406
Median	0.345
SD	0.197
Std. Error of Mean	0.0492
Coefficient of Variation	0.484
Skewness	0.586

Log-transformed Statistics

Minimum of Log Data	-2.419
Maximum of Log Data	-0.236
Mean of log Data	-1.027
SD of log Data	0.554

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.943
Shapiro Wilk Critical Value	0.887

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.937
Shapiro Wilk Critical Value	0.887

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	0.492
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95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995)	0.495
95% Modified-t UCL (Johnson-1978)	0.494

Assuming Lognormal Distribution

95% H-UCL	0.564
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95% Chebyshev (MVUE) UCL	0.672
97.5% Chebyshev (MVUE) UCL	0.784
99% Chebyshev (MVUE) UCL	1.004

Gamma Distribution Test

k star (bias corrected)	3.386
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Theta Star	0.12
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MLE of Mean	0.406
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MLE of Standard Deviation	0.221
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nu star	108.4
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Approximate Chi Square Value (.05)	85.33
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Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

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Second Supplemental Remedial Investigation
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Adjusted Level of Significance	0.0335	95% CLT UCL	0.487
Adjusted Chi Square Value	83.01	95% Jackknife UCL	0.492
		95% Standard Bootstrap UCL	0.485
Anderson-Darling Test Statistic	0.264	95% Bootstrap-t UCL	0.505
Anderson-Darling 5% Critical Value	0.742	95% Hall's Bootstrap UCL	0.502
Kolmogorov-Smirnov Test Statistic	0.126	95% Percentile Bootstrap UCL	0.487
Kolmogorov-Smirnov 5% Critical Value	0.216	95% BCA Bootstrap UCL	0.489
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.621
Assuming Gamma Distribution		97.5% Chebyshev(Mean, Sd) UCL	0.713
95% Approximate Gamma UCL	0.516	99% Chebyshev(Mean, Sd) UCL	0.896
95% Adjusted Gamma UCL	0.53		
Potential UCL to Use			Use 95% Student's-t UCL 0.492

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). For additional insight, the user may want to consult a statistician.

Benzo(a)pyrene

General Statistics	
Number of Valid Observations	16
Number of Distinct Observations	15
Raw Statistics	
Minimum	0.14
Maximum	0.87
Mean	0.434
Median	0.375
SD	0.201
Std. Error of Mean	0.0503
Coefficient of Variation	0.463
Skewness	1.004
Log-transformed Statistics	
Minimum of Log Data	-1.966
Maximum of Log Data	-0.139
Mean of log Data	-0.932
SD of log Data	0.466
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic	0.908
Shapiro Wilk Critical Value	0.887
Data appear Normal at 5% Significance Level	
Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.967
Shapiro Wilk Critical Value	0.887
Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution	
Assuming Lognormal Distribution	

Table F-1
ProUCL Output - Area 1 Surface Soil
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Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

95% Student's-t UCL 0.522	95% H-UCL 0.559
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 0.531	95% Chebyshev (MVUE) UCL 0.663
95% Modified-t UCL (Johnson-1978) 0.525	97.5% Chebyshev (MVUE) UCL 0.761
	99% Chebyshev (MVUE) UCL 0.954
Gamma Distribution Test	Data Distribution
k star (bias corrected) 4.3	Data appear Normal at 5% Significance Level
Theta Star 0.101	
MLE of Mean 0.434	
MLE of Standard Deviation 0.209	
nu star 137.6	
Approximate Chi Square Value (.05) 111.5	Nonparametric Statistics
Adjusted Level of Significance 0.0335	95% CLT UCL 0.517
Adjusted Chi Square Value 108.8	95% Jackknife UCL 0.522
Anderson-Darling Test Statistic 0.309	95% Standard Bootstrap UCL 0.515
Anderson-Darling 5% Critical Value 0.741	95% Bootstrap-t UCL 0.547
Kolmogorov-Smirnov Test Statistic 0.163	95% Hall's Bootstrap UCL 0.567
Kolmogorov-Smirnov 5% Critical Value 0.216	95% Percentile Bootstrap UCL 0.523
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 0.527
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 0.653
95% Approximate Gamma UCL 0.536	97.5% Chebyshev(Mean, Sd) UCL 0.748
95% Adjusted Gamma UCL 0.549	99% Chebyshev(Mean, Sd) UCL 0.935
Potential UCL to Use	Use 95% Student's-t UCL 0.522

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). For additional insight, the user may want to consult a statistician.

Benzo(b)fluoranthene

General Statistics	
Number of Valid Observations 16	Number of Distinct Observations 15
Raw Statistics	Log-transformed Statistics
Minimum 0.073	Minimum of Log Data -2.617
Maximum 1.1	Maximum of Log Data 0.0953
Mean 0.566	Mean of log Data -0.713
Median 0.49	SD of log Data 0.634

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SD 0.272

Std. Error of Mean 0.0681

Coefficient of Variation 0.481

Skewness 0.439

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.952

Shapiro Wilk Critical Value 0.887

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.844

Shapiro Wilk Critical Value 0.887

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 0.686

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 0.686

95% Modified-t UCL (Johnson-1978) 0.687

Assuming Lognormal Distribution

95% H-UCL 0.859

95% Chebyshev (MVUE) UCL 1.018

97.5% Chebyshev (MVUE) UCL 1.203

99% Chebyshev (MVUE) UCL 1.567

Gamma Distribution Test

k star (bias corrected) 2.979

Theta Star 0.19

MLE of Mean 0.566

MLE of Standard Deviation 0.328

nu star 95.33

Approximate Chi Square Value (.05) 73.81

Adjusted Level of Significance 0.0335

Adjusted Chi Square Value 71.65

Anderson-Darling Test Statistic 0.421

Anderson-Darling 5% Critical Value 0.743

Kolmogorov-Smirnov Test Statistic 0.147

Kolmogorov-Smirnov 5% Critical Value 0.216

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 0.678

95% Jackknife UCL 0.686

95% Standard Bootstrap UCL 0.674

95% Bootstrap-t UCL 0.695

95% Hall's Bootstrap UCL 0.691

95% Percentile Bootstrap UCL 0.681

95% BCA Bootstrap UCL 0.676

95% Chebyshev(Mean, Sd) UCL 0.863

97.5% Chebyshev(Mean, Sd) UCL 0.991

99% Chebyshev(Mean, Sd) UCL 1.244

Assuming Gamma Distribution

95% Approximate Gamma UCL 0.732

95% Adjusted Gamma UCL 0.754

Potential UCL to Use

Use 95% Student's-t UCL 0.686

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). For additional insight, the user may want to consult a statistician.

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Carbazole

General Statistics			
Number of Valid Data	11	Number of Detected Data	7
Number of Distinct Detected Data	7	Number of Non-Detect Data	4
		Percent Non-Detects	36.36%
Raw Statistics			
Minimum Detected	0.038	Minimum Detected	-3.27
Maximum Detected	0.14	Maximum Detected	-1.966
Mean of Detected	0.0789	Mean of Detected	-2.66
SD of Detected	0.0409	SD of Detected	0.532
Minimum Non-Detect	0.033	Minimum Non-Detect	-3.411
Maximum Non-Detect	0.43	Maximum Non-Detect	-0.844
Note: Data have multiple DLs - Use of KM Method is recommended			
For all methods (except KM, DL/2, and ROS Methods),			
Observations < Largest ND are treated as NDs			
Number treated as Non-Detect			
Number treated as Detected			
Single DL Non-Detect Percentage			

Warning: There are only 7 Detected Values in this data

**Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions**

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.891	Shapiro Wilk Test Statistic	0.902
5% Shapiro Wilk Critical Value	0.803	5% Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.107	Mean	-2.503
SD	0.0719	SD	0.829
95% DL/2 (t) UCL	0.146	95% H-Stat (DL/2) UCL	0.233
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	
		-2.82	

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SD in Log Scale	0.586
Mean in Original Scale	0.0689
SD in Original Scale	0.0377
95% t UCL	0.0895
95% Percentile Bootstrap UCL	0.0877
95% BCA Bootstrap UCL	0.0893
95% H-UCL	0.108

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	2.579
Theta Star	0.0306
nu star	36.11

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

A-D Test Statistic	0.394
5% A-D Critical Value	0.71
K-S Test Statistic	0.71
5% K-S Critical Value	0.313

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	0.0738
SD	0.0379

Data appear Gamma Distributed at 5% Significance Level

SE of Mean	0.0145
95% KM (t) UCL	0.1
95% KM (z) UCL	0.0975
95% KM (jackknife) UCL	0.1
95% KM (bootstrap t) UCL	0.109
95% KM (BCA) UCL	0.0983
95% KM (Percentile Bootstrap) UCL	0.0978
95% KM (Chebyshev) UCL	0.137
97.5% KM (Chebyshev) UCL	0.164
99% KM (Chebyshev) UCL	0.218

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000001
Maximum	0.14
Mean	0.0694
Median	0.068
SD	0.0413
k star	0.501
Theta star	0.139
Nu star	11.01
AppChi2	4.585
95% Gamma Approximate UCL	0.167
95% Adjusted Gamma UCL	0.195

Potential UCLs to Use

95% KM (t) UCL	0.1
95% KM (Percentile Bootstrap) UCL	0.0978

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Dibenz(a,h)anthracene

General Statistics

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Number of Valid Data	14	Number of Detected Data	7
Number of Distinct Detected Data	5	Number of Non-Detect Data	7
		Percent Non-Detects	50.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.055	Minimum Detected	-2.9
Maximum Detected	0.18	Maximum Detected	-1.715
Mean of Detected	0.119	Mean of Detected	-2.187
SD of Detected	0.0429	SD of Detected	0.391
Minimum Non-Detect	0.0184	Minimum Non-Detect	-3.995
Maximum Non-Detect	0.66	Maximum Non-Detect	-0.416

Note: Data have multiple DLs - Use of KM Method is recommended

For all methods (except KM, DL/2, and ROS Methods),

Observations < Largest ND are treated as NDs

Number treated as Non-Detect	14
Number treated as Detected	0
Single DL Non-Detect Percentage	100.00%

Warning: There are only 7 Detected Values in this data

**Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions**

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics	
Normal Distribution Test with Detected Values Only	Lognormal Distribution Test with Detected Values Only
Shapiro Wilk Test Statistic	0.892
5% Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level	
Lognormal Distribution Test with Detected Values Only	Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.157	Mean	-2.077
SD	0.081	SD	0.876
95% DL/2 (t) UCL	0.195	95% H-Stat (DL/2) UCL	0.345

Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method
MLE method failed to converge properly		Mean in Log Scale
		SD in Log Scale
		Mean in Original Scale
		SD in Original Scale
		95% t UCL
		95% Percentile Bootstrap UCL

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		95% BCA Bootstrap UCL	0.123
		95% H-UCL	0.131
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
			Data appear Normal at 5% Significance Level
k star (bias corrected)	4.862		
Theta Star	0.0245		
nu star	68.07		
A-D Test Statistic	0.503	Nonparametric Statistics	
5% A-D Critical Value	0.709	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.709	Mean	0.111
5% K-S Critical Value	0.312	SD	0.0428
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0163
		95% KM (t) UCL	0.14
		95% KM (z) UCL	0.138
Assuming Gamma Distribution		95% KM (jackknife) UCL	0.141
Gamma ROS Statistics using Extrapolated Data		95% KM (bootstrap t) UCL	0.15
Minimum	0.000001	95% KM (BCA) UCL	0.146
Maximum	0.18	95% KM (Percentile Bootstrap) UCL	0.141
Mean	0.108	95% KM (Chebyshev) UCL	0.182
Median	0.112	97.5% KM (Chebyshev) UCL	0.213
SD	0.0442	99% KM (Chebyshev) UCL	0.274
k star	0.639		
Theta star	0.169	Potential UCLs to Use	
Nu star	17.89	95% KM (t) UCL	0.14
AppChi2	9.314	95% KM (Percentile Bootstrap) UCL	0.141
95% Gamma Approximate UCL	0.207		
95% Adjusted Gamma UCL	0.227		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Indeno(1,2,3-cd)pyrene

General Statistics	
Number of Valid Observations	16
Number of Distinct Observations	16
Raw Statistics	
Minimum	0.086
Maximum	0.7
Log-transformed Statistics	
Minimum of Log Data	-2.453
Maximum of Log Data	-0.357

Table F-1
ProUCL Output - Area 1 Surface Soil
Second Supplemental Remedial Investigation
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Mean 0.316	Mean of log Data -1.266
Median 0.285	SD of log Data 0.507
SD 0.157	
Std. Error of Mean 0.0392	
Coefficient of Variation 0.497	
Skewness 1.152	

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.911	Shapiro Wilk Critical Value 0.887
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Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.969	Shapiro Wilk Critical Value 0.887
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Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 0.385	95% H-UCL 0.42
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95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 0.393	97.5% Chebyshev (MVUE) UCL 0.578
95% Modified-t UCL (Johnson-1978) 0.387	99% Chebyshev (MVUE) UCL 0.732

Assuming Lognormal Distribution

95% Chebyshev (MVUE) UCL 0.499	95% Bootstrap-t UCL 0.409
97.5% Chebyshev (MVUE) UCL 0.578	95% Hall's Bootstrap UCL 0.448
99% Chebyshev (MVUE) UCL 0.732	95% Percentile Bootstrap UCL 0.38

Gamma Distribution Test

k star (bias corrected) 3.728	MLE of Mean 0.316
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Theta Star 0.0848	MLE of Standard Deviation 0.164
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MLE of Mean 0.316	nu star 119.3
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Approximate Chi Square Value (.05) 95.06	Adjusted Level of Significance 0.0335
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Adjusted Chi Square Value 92.6	Anderson-Darling Test Statistic 0.254
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Anderson-Darling 5% Critical Value 0.742	Anderson-Darling 5% Critical Value 0.742
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Kolmogorov-Smirnov Test Statistic 0.141	Kolmogorov-Smirnov Test Statistic 0.141
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Kolmogorov-Smirnov 5% Critical Value 0.216	Kolmogorov-Smirnov 5% Critical Value 0.216
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Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 0.381	95% Jackknife UCL 0.385
95% Standard Bootstrap UCL 0.379	95% Bootstrap-t UCL 0.409
95% Hall's Bootstrap UCL 0.448	95% Percentile Bootstrap UCL 0.38
95% BCA Bootstrap UCL 0.395	95% Chebyshev(Mean, Sd) UCL 0.487
95% Chebyshev(Mean, Sd) UCL 0.561	97.5% Chebyshev(Mean, Sd) UCL 0.561
99% Chebyshev(Mean, Sd) UCL 0.706	99% Chebyshev(Mean, Sd) UCL 0.706

Assuming Gamma Distribution

95% Approximate Gamma UCL 0.397	95% Adjusted Gamma UCL 0.407
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Potential UCL to Use

Use 95% Student's-t UCL 0.385

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

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These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Antimony

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 14
Raw Statistics	
Minimum 0.35	Minimum of Log Data -1.05
Maximum 6.3	Maximum of Log Data 1.841
Mean 1.725	Mean of log Data 0.253
Median 1	SD of log Data 0.769
SD 1.551	
Std. Error of Mean 0.4	
Coefficient of Variation 0.899	
Skewness 2.119	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.764	Lognormal Distribution Test
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Test Statistic 0.977
Data not Normal at 5% Significance Level	Shapiro Wilk Critical Value 0.881
	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	
95% Student's-t UCL 2.43	95% H-UCL 2.837
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 2.617	95% Chebyshev (MVUE) UCL 3.246
95% Modified-t UCL (Johnson-1978) 2.466	97.5% Chebyshev (MVUE) UCL 3.919
	99% Chebyshev (MVUE) UCL 5.241
Gamma Distribution Test	
k star (bias corrected) 1.534	Data Distribution
Theta Star 1.124	Data appear Gamma Distributed at 5% Significance Level
MLE of Mean 1.725	
MLE of Standard Deviation 1.393	
nu star 46.01	
Approximate Chi Square Value (.05) 31.45	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 2.383
Adjusted Chi Square Value 29.97	95% Jackknife UCL 2.43
Anderson-Darling Test Statistic 0.434	95% Standard Bootstrap UCL 2.357
	95% Bootstrap-t UCL 2.957

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Anderson-Darling 5% Critical Value 0.749	95% Hall's Bootstrap UCL 5.431
Kolmogorov-Smirnov Test Statistic 0.198	95% Percentile Bootstrap UCL 2.437
Kolmogorov-Smirnov 5% Critical Value 0.225	95% BCA Bootstrap UCL 2.698
Data appear Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
95% Approximate Gamma UCL 2.523	95% Chebyshev(Mean, Sd) UCL 3.47
95% Adjusted Gamma UCL 2.648	97.5% Chebyshev(Mean, Sd) UCL 4.225
Potential UCL to Use	
Use 95% Approximate Gamma UCL 2.523	

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). For additional insight, the user may want to consult a statistician.

Arsenic

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 13
Raw Statistics	
Minimum 2.8	Minimum of Log Data 1.03
Maximum 9.5	Maximum of Log Data 2.251
Mean 6.2	Mean of log Data 1.786
Median 6.5	SD of log Data 0.3
SD 1.641	
Std. Error of Mean 0.424	
Coefficient of Variation 0.265	
Skewness -0.239	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.972	Shapiro Wilk Test Statistic 0.913
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data appear Normal at 5% Significance Level	
Log-transformed Statistics	
Std. Error of Mean 0.424	
Coefficient of Variation 0.265	
Skewness -0.239	
Lognormal Distribution Test	
Shapiro Wilk Test Statistic 0.972	Shapiro Wilk Test Statistic 0.913
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution	
95% Student's-t UCL 6.946	95% H-UCL 7.262
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 6.869	95% Chebyshev (MVUE) UCL 8.352
95% Modified-t UCL (Johnson-1978) 6.942	97.5% Chebyshev (MVUE) UCL 9.274
Assuming Lognormal Distribution	
95% Student's-t UCL 6.946	99% Chebyshev (MVUE) UCL 11.08

Table F-1
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Gamma Distribution Test		Data Distribution
k star (bias corrected) 10.65		Data appear Normal at 5% Significance Level
Theta Star 0.582		
MLE of Mean 6.2		
MLE of Standard Deviation 1.9		
nu star 319.5		
Approximate Chi Square Value (.05) 279.1		Nonparametric Statistics
Adjusted Level of Significance 0.0324		95% CLT UCL 6.897
Adjusted Chi Square Value 274.5		95% Jackknife UCL 6.946
Anderson-Darling Test Statistic 0.453		95% Standard Bootstrap UCL 6.852
Anderson-Darling 5% Critical Value 0.737		95% Bootstrap-t UCL 6.898
Kolmogorov-Smirnov Test Statistic 0.169		95% Hall's Bootstrap UCL 6.913
Kolmogorov-Smirnov 5% Critical Value 0.221		95% Percentile Bootstrap UCL 6.887
Data appear Gamma Distributed at 5% Significance Level		95% BCA Bootstrap UCL 6.84
Assuming Gamma Distribution		95% Chebyshev(Mean, Sd) UCL 8.046
95% Approximate Gamma UCL 7.098		97.5% Chebyshev(Mean, Sd) UCL 8.845
95% Adjusted Gamma UCL 7.218		99% Chebyshev(Mean, Sd) UCL 10.41
Potential UCL to Use		Use 95% Student's-t UCL 6.946

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). For additional insight, the user may want to consult a statistician.

Note: For highly negative-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positively skewed data sets.

Cobalt

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 15
Raw Statistics	Log-transformed Statistics
Minimum 3.7	Minimum of Log Data 1.308
Maximum 8.2	Maximum of Log Data 2.104
Mean 5.953	Mean of log Data 1.762

Table F-1
ProUCL Output - Area 1 Surface Soil
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Median 5.7	SD of log Data 0.222
SD 1.274	
Std. Error of Mean 0.329	
Coefficient of Variation 0.214	
Skewness 0.0297	

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.981
 Shapiro Wilk Critical Value 0.881

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.972
 Shapiro Wilk Critical Value 0.881

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 6.533

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 6.497
 95% Modified-t UCL (Johnson-1978) 6.533

Assuming Lognormal Distribution

95% H-UCL 6.65
 95% Chebyshev (MVUE) UCL 7.456
 97.5% Chebyshev (MVUE) UCL 8.105
 99% Chebyshev (MVUE) UCL 9.38

Gamma Distribution Test

k star (bias corrected) 18.05
 Theta Star 0.33
 MLE of Mean 5.953
 MLE of Standard Deviation 1.401
 nu star 541.5
 Approximate Chi Square Value (.05) 488.5
 Adjusted Level of Significance 0.0324
 Adjusted Chi Square Value 482.3

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 6.494
 95% Jackknife UCL 6.533
 95% Standard Bootstrap UCL 6.473
 95% Bootstrap-t UCL 6.559
 95% Hall's Bootstrap UCL 6.513
 95% Percentile Bootstrap UCL 6.46
 95% BCA Bootstrap UCL 6.473
 95% Chebyshev(Mean, Sd) UCL 7.387
 97.5% Chebyshev(Mean, Sd) UCL 8.007
 99% Chebyshev(Mean, Sd) UCL 9.226

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 6.599
 95% Adjusted Gamma UCL 6.684

Potential UCL to Use

Use 95% Student's-t UCL 6.533

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)

Table F-1
ProUCL Output - Area 1 Surface Soil
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and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Thallium

General Statistics			
Number of Valid Data	14	Number of Detected Data	6
Number of Distinct Detected Data	5	Number of Non-Detect Data	8
		Percent Non-Detects	57.14%
Raw Statistics			
Minimum Detected	0.11	Minimum Detected	-2.207
Maximum Detected	0.18	Maximum Detected	-1.715
Mean of Detected	0.143	Mean of Detected	-1.954
SD of Detected	0.0234	SD of Detected	0.165
Minimum Non-Detect	0.17	Minimum Non-Detect	-1.772
Maximum Non-Detect	0.2	Maximum Non-Detect	-1.609
Note: Data have multiple DLs - Use of KM Method is recommended			
For all methods (except KM, DL/2, and ROS Methods),			
Observations < Largest ND are treated as NDs			
		Number treated as Non-Detect	14
		Number treated as Detected	0
		Single DL Non-Detect Percentage	100.00%

Warning: There are only 6 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.97	Shapiro Wilk Test Statistic	0.973
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.114	Mean	-2.198
SD	0.0301	SD	0.245
95% DL/2 (t) UCL	0.129	95% H-Stat (DL/2) UCL	0.13
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	

Table F-1
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MLE method failed to converge properly	Mean in Log Scale	-1.975
	SD in Log Scale	0.12
	Mean in Original Scale	0.14
	SD in Original Scale	0.017
	95% t UCL	0.148
	95% Percentile Bootstrap UCL	0.147
	95% BCA Bootstrap UCL	0.148
	95% H-UCL	0.148

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	22.53
Theta Star	0.00636
nu star	270.4

A-D Test Statistic	0.231
5% A-D Critical Value	0.697
K-S Test Statistic	0.697
5% K-S Critical Value	0.332

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution	Nonparametric Statistics		
Gamma ROS Statistics using Extrapolated Data	Kaplan-Meier (KM) Method	Mean	0.14
Minimum	95% KM (t) UCL	SD	0.0194
Maximum	95% KM (z) UCL	SE of Mean	0.00803
Mean	95% KM (jackknife) UCL		
Median	95% KM (bootstrap t) UCL		
SD	95% KM (BCA) UCL		
k star	95% KM (Percentile Bootstrap) UCL		
Theta star	95% KM (Chebyshev) UCL		
Nu star	97.5% KM (Chebyshev) UCL		
AppChi2	99% KM (Chebyshev) UCL		
95% Gamma Approximate UCL	95% KM (t) UCL	0.155	
95% Adjusted Gamma UCL	95% KM (Percentile Bootstrap) UCL	0.153	

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Benzo(k)fluoranthene

Table F-1
ProUCL Output - Area 1 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

General Statistics

Number of Valid Observations 16	Number of Distinct Observations 13
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Raw Statistics

Minimum 0.068
Maximum 0.43
Mean 0.219
Median 0.19
SD 0.101
Std. Error of Mean 0.0254
Coefficient of Variation 0.464
Skewness 0.657

Log-transformed Statistics

Minimum of Log Data -2.688
Maximum of Log Data -0.844
Mean of log Data -1.628
SD of log Data 0.498

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.954
Shapiro Wilk Critical Value 0.887

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.973
Shapiro Wilk Critical Value 0.887

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 0.263

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 0.265
95% Modified-t UCL (Johnson-1978) 0.264

Assuming Lognormal Distribution

95% H-UCL 0.289

95% Chebyshev (MVUE) UCL 0.344
97.5% Chebyshev (MVUE) UCL 0.397
99% Chebyshev (MVUE) UCL 0.502

Gamma Distribution Test

k star (bias corrected) 3.929
Theta Star 0.0557
MLE of Mean 0.219
MLE of Standard Deviation 0.11
nu star 125.7
Approximate Chi Square Value (.05) 100.8
Adjusted Level of Significance 0.0335
Adjusted Chi Square Value 98.3

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 0.26

95% Jackknife UCL 0.263

95% Standard Bootstrap UCL 0.259

95% Bootstrap-t UCL 0.27

95% Hall's Bootstrap UCL 0.266

95% Percentile Bootstrap UCL 0.262

95% BCA Bootstrap UCL 0.261

95% Chebyshev(Mean, Sd) UCL 0.329

97.5% Chebyshev(Mean, Sd) UCL 0.377

99% Chebyshev(Mean, Sd) UCL 0.471

Assuming Gamma Distribution

Table F-1
ProUCL Output - Area 1 Surface Soil
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95% Approximate Gamma UCL 0.273

95% Adjusted Gamma UCL 0.28

Potential UCL to Use Use 95% Student's-t UCL 0.263

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). For additional insight, the user may want to consult a statistician.

Chrysene

General Statistics

Number of Valid Observations 16	Number of Distinct Observations 15
---------------------------------	------------------------------------

Raw Statistics

Minimum 0.12	Maximum of Log Data -2.12
Maximum 0.88	Maximum of Log Data -0.128
Mean 0.466	Mean of log Data -0.864
Median 0.415	SD of log Data 0.492
SD 0.204	
Std. Error of Mean 0.051	
Coefficient of Variation 0.437	
Skewness 0.526	

Log-transformed Statistics

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.957	Lognormal Distribution Test
Shapiro Wilk Critical Value 0.887	Shapiro Wilk Test Statistic 0.94

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Critical Value 0.887	
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Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 0.556

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 0.557	Assuming Lognormal Distribution
95% Modified-t UCL (Johnson-1978) 0.557	95% H-UCL 0.616

Assuming Lognormal Distribution

95% Chebyshev (MVUE) UCL 0.732

97.5% Chebyshev (MVUE) UCL 0.845	
99% Chebyshev (MVUE) UCL 1.066	

Gamma Distribution Test

k star (bias corrected) 4.187

Theta Star 0.111

MLE of Mean 0.466

MLE of Standard Deviation 0.228

Data Distribution

Data appear Normal at 5% Significance Level

Table F-1
ProUCL Output - Area 1 Surface Soil
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nu star 134	
Approximate Chi Square Value (.05) 108.2	Nonparametric Statistics
Adjusted Level of Significance 0.0335	95% CLT UCL 0.55
Adjusted Chi Square Value 105.6	95% Jackknife UCL 0.556
	95% Standard Bootstrap UCL 0.547
Anderson-Darling Test Statistic 0.257	95% Bootstrap-t UCL 0.57
Anderson-Darling 5% Critical Value 0.741	95% Hall's Bootstrap UCL 0.571
Kolmogorov-Smirnov Test Statistic 0.116	95% Percentile Bootstrap UCL 0.552
Kolmogorov-Smirnov 5% Critical Value 0.216	95% BCA Bootstrap UCL 0.552
Data appear Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 0.688
Assuming Gamma Distribution	97.5% Chebyshev(Mean, Sd) UCL 0.784
95% Approximate Gamma UCL 0.577	99% Chebyshev(Mean, Sd) UCL 0.973
95% Adjusted Gamma UCL 0.592	
Potential UCL to Use	Use 95% Student's-t UCL 0.556

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). For additional insight, the user may want to consult a statistician.

Aluminum

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 15
Raw Statistics	Log-transformed Statistics
Minimum 4400	Minimum of Log Data 8.389
Maximum 12700	Maximum of Log Data 9.449
Mean 6269	Mean of log Data 8.696
Median 5410	SD of log Data 0.303
SD 2248	
Std. Error of Mean 580.5	
Coefficient of Variation 0.359	
Skewness 1.896	
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.779	Shapiro Wilk Test Statistic 0.867
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data not Normal at 5% Significance Level	Data not Lognormal at 5% Significance Level

Table F-1
ProUCL Output - Area 1 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 7292	95% H-UCL 7292
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 8393
95% Adjusted-CLT UCL (Chen-1995) 7528	97.5% Chebyshev (MVUE) UCL 9325
95% Modified-t UCL (Johnson-1978) 7339	99% Chebyshev (MVUE) UCL 11156
Gamma Distribution Test	Data Distribution
k star (bias corrected) 8.563	Data do not follow a Discernable Distribution (0.05)
Theta Star 732.2	
MLE of Mean 6269	
MLE of Standard Deviation 2142	
nu star 256.9	
Approximate Chi Square Value (.05) 220.8	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 7224
Adjusted Chi Square Value 216.6	95% Jackknife UCL 7292
Anderson-Darling Test Statistic 0.88	95% Standard Bootstrap UCL 7193
Anderson-Darling 5% Critical Value 0.737	95% Bootstrap-t UCL 7938
Kolmogorov-Smirnov Test Statistic 0.238	95% Hall's Bootstrap UCL 8062
Kolmogorov-Smirnov 5% Critical Value 0.221	95% Percentile Bootstrap UCL 7215
Data not Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 7555
 	95% Chebyshev(Mean, Sd) UCL 8800
Assuming Gamma Distribution	97.5% Chebyshev(Mean, Sd) UCL 9895
95% Approximate Gamma UCL 7295	99% Chebyshev(Mean, Sd) UCL 12045
95% Adjusted Gamma UCL 7434	
Potential UCL to Use	Use 95% Student's-t UCL 7292 or 95% Modified-t UCL 7339

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). For additional insight, the user may want to consult a statistician.

Barium

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 15
Raw Statistics	
Minimum 69.4	Minimum of Log Data 4.24

Table F-1
ProUCL Output - Area 1 Surface Soil
Second Supplemental Remedial Investigation
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Queens, New York

Maximum 449	Maximum of Log Data 6.107
Mean 205.8	Mean of log Data 5.202
Median 192	SD of log Data 0.539
SD 102.2	
Std. Error of Mean 26.39	
Coefficient of Variation 0.496	
Skewness 0.724	

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.943
 Shapiro Wilk Critical Value 0.881

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.953
 Shapiro Wilk Critical Value 0.881

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 252.3

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 254.5
 95% Modified-t UCL (Johnson-1978) 253.1

Assuming Lognormal Distribution

95% H-UCL 284.5

95% Chebyshev (MVUE) UCL 337.9
 97.5% Chebyshev (MVUE) UCL 394.3
 99% Chebyshev (MVUE) UCL 505

Gamma Distribution Test

k star (bias corrected) 3.362
 Theta Star 61.23
 MLE of Mean 205.8
 MLE of Standard Deviation 112.3
 nu star 100.9

Approximate Chi Square Value (.05) 78.69
 Adjusted Level of Significance 0.0324
 Adjusted Chi Square Value 76.28

Anderson-Darling Test Statistic 0.284
 Anderson-Darling 5% Critical Value 0.74
 Kolmogorov-Smirnov Test Statistic 0.148
 Kolmogorov-Smirnov 5% Critical Value 0.222

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 249.2
 95% Jackknife UCL 252.3
 95% Standard Bootstrap UCL 248.2
 95% Bootstrap-t UCL 257.4
 95% Hall's Bootstrap UCL 265.4
 95% Percentile Bootstrap UCL 246.8
 95% BCA Bootstrap UCL 250.1
 95% Chebyshev(Mean, Sd) UCL 320.9
 97.5% Chebyshev(Mean, Sd) UCL 370.6
 99% Chebyshev(Mean, Sd) UCL 468.4

Assuming Gamma Distribution

95% Approximate Gamma UCL 263.8
 95% Adjusted Gamma UCL 272.2

Potential UCL to Use

Use 95% Student's-t UCL 252.3

Table F-1
ProUCL Output - Area 1 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
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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). For additional insight, the user may want to consult a statistician.

Cadmium

General Statistics																	
Number of Valid Observations 14	Number of Distinct Observations 13																
Raw Statistics	Log-transformed Statistics																
<table border="0"> <tr> <td style="width: 50%;">Minimum 0.16</td><td style="width: 50%;">Minimum of Log Data -1.833</td></tr> <tr> <td>Maximum 2.4</td><td>Maximum of Log Data 0.875</td></tr> <tr> <td>Mean 1.086</td><td>Mean of log Data -0.0676</td></tr> <tr> <td>Median 1</td><td>SD of log Data 0.641</td></tr> <tr> <td>SD 0.545</td><td></td></tr> <tr> <td>Std. Error of Mean 0.146</td><td></td></tr> <tr> <td>Coefficient of Variation 0.502</td><td></td></tr> <tr> <td>Skewness 0.781</td><td></td></tr> </table>		Minimum 0.16	Minimum of Log Data -1.833	Maximum 2.4	Maximum of Log Data 0.875	Mean 1.086	Mean of log Data -0.0676	Median 1	SD of log Data 0.641	SD 0.545		Std. Error of Mean 0.146		Coefficient of Variation 0.502		Skewness 0.781	
Minimum 0.16	Minimum of Log Data -1.833																
Maximum 2.4	Maximum of Log Data 0.875																
Mean 1.086	Mean of log Data -0.0676																
Median 1	SD of log Data 0.641																
SD 0.545																	
Std. Error of Mean 0.146																	
Coefficient of Variation 0.502																	
Skewness 0.781																	
Relevant UCL Statistics																	
Normal Distribution Test	Lognormal Distribution Test																
Shapiro Wilk Test Statistic 0.956	Shapiro Wilk Test Statistic 0.88																
Shapiro Wilk Critical Value 0.874	Shapiro Wilk Critical Value 0.874																
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level																
Assuming Normal Distribution	Assuming Lognormal Distribution																
95% Student's-t UCL 1.344	95% H-UCL 1.718																
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 2.008																
95% Adjusted-CLT UCL (Chen-1995) 1.358	97.5% Chebyshev (MVUE) UCL 2.388																
95% Modified-t UCL (Johnson-1978) 1.349	99% Chebyshev (MVUE) UCL 3.135																
Gamma Distribution Test	Data Distribution																
k star (bias corrected) 2.793	95% CLT UCL 1.326																
Theta Star 0.389	95% Jackknife UCL 1.344																
MLE of Mean 1.086	95% Standard Bootstrap UCL 1.313																
MLE of Standard Deviation 0.65																	
nu star 78.19																	
Approximate Chi Square Value (.05) 58.82	Nonparametric Statistics																
Adjusted Level of Significance 0.0312																	
Adjusted Chi Square Value 56.6																	

Table F-1
ProUCL Output - Area 1 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
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Anderson-Darling Test Statistic 0.33	95% Bootstrap-t UCL 1.387
Anderson-Darling 5% Critical Value 0.741	95% Hall's Bootstrap UCL 1.47
Kolmogorov-Smirnov Test Statistic 0.167	95% Percentile Bootstrap UCL 1.324
Kolmogorov-Smirnov 5% Critical Value 0.23	95% BCA Bootstrap UCL 1.344
Data appear Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 1.721
	97.5% Chebyshev(Mean, Sd) UCL 1.996
	99% Chebyshev(Mean, Sd) UCL 2.536
Assuming Gamma Distribution	
95% Approximate Gamma UCL 1.443	
95% Adjusted Gamma UCL 1.5	
 Potential UCL to Use	 Use 95% Student's-t UCL 1.344

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). For additional insight, the user may want to consult a statistician.

Chromium

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 15
Raw Statistics	
Minimum 11.7	Minimum of Log Data 2.46
Maximum 30	Maximum of Log Data 3.401
Mean 21.05	Mean of log Data 3.017
Median 20.8	SD of log Data 0.255
SD 5.12	
Std. Error of Mean 1.322	
Coefficient of Variation 0.243	
Skewness 0.0724	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.98	Shapiro Wilk Test Statistic 0.969
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	
95% Student's-t UCL 23.38	95% H-UCL 23.95
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 23.25	95% Chebyshev (MVUE) UCL 27.17
	97.5% Chebyshev (MVUE) UCL 29.82

Table F-1
ProUCL Output - Area 1 Surface Soil
Second Supplemental Remedial Investigation
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95% Modified-t UCL (Johnson-1978) 23.38	99% Chebyshev (MVUE) UCL 35.01
Gamma Distribution Test	Data Distribution
k star (bias corrected) 13.84	Data appear Normal at 5% Significance Level
Theta Star 1.52	
MLE of Mean 21.05	
MLE of Standard Deviation 5.657	
nu star 415.3	
Approximate Chi Square Value (.05) 369.1	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 23.22
Adjusted Chi Square Value 363.7	95% Jackknife UCL 23.38
Anderson-Darling Test Statistic 0.177	95% Standard Bootstrap UCL 23.15
Anderson-Darling 5% Critical Value 0.735	95% Bootstrap-t UCL 23.39
Kolmogorov-Smirnov Test Statistic 0.109	95% Hall's Bootstrap UCL 23.26
Kolmogorov-Smirnov 5% Critical Value 0.221	95% Percentile Bootstrap UCL 23.27
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 23.19
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 26.81
95% Approximate Gamma UCL 23.68	97.5% Chebyshev(Mean, Sd) UCL 29.3
95% Adjusted Gamma UCL 24.03	99% Chebyshev(Mean, Sd) UCL 34.2
Potential UCL to Use	Use 95% Student's-t UCL 23.38

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). For additional insight, the user may want to consult a statistician.

Copper

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 15
Raw Statistics	Log-transformed Statistics
Minimum 30.1	Minimum of Log Data 3.405
Maximum 346	Maximum of Log Data 5.846
Mean 110.3	Mean of log Data 4.463
Median 103	SD of log Data 0.724
SD 82.91	
Std. Error of Mean 21.41	
Coefficient of Variation 0.752	

Table F-1
ProUCL Output - Area 1 Surface Soil
Second Supplemental Remedial Investigation
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Skewness 1.728

Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.835	Shapiro Wilk Test Statistic 0.95
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 148	95% H-UCL 177.2
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 205.4
95% Adjusted-CLT UCL (Chen-1995) 155.7	97.5% Chebyshev (MVUE) UCL 246.6
95% Modified-t UCL (Johnson-1978) 149.6	99% Chebyshev (MVUE) UCL 327.4
Gamma Distribution Test	Data Distribution
k star (bias corrected) 1.832	Data appear Gamma Distributed at 5% Significance Level
Theta Star 60.2	
MLE of Mean 110.3	
MLE of Standard Deviation 81.48	
nu star 54.96	
Approximate Chi Square Value (.05) 38.92	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 145.5
Adjusted Chi Square Value 37.26	95% Jackknife UCL 148
Anderson-Darling Test Statistic 0.32	95% Standard Bootstrap UCL 144.5
Anderson-Darling 5% Critical Value 0.746	95% Bootstrap-t UCL 164.8
Kolmogorov-Smirnov Test Statistic 0.132	95% Hall's Bootstrap UCL 208.6
Kolmogorov-Smirnov 5% Critical Value 0.224	95% Percentile Bootstrap UCL 146.5
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 155.3
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 203.6
95% Approximate Gamma UCL 155.7	97.5% Chebyshev(Mean, Sd) UCL 244
95% Adjusted Gamma UCL 162.6	99% Chebyshev(Mean, Sd) UCL 323.3
Potential UCL to Use	Use 95% Approximate Gamma UCL 155.7

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). For additional insight, the user may want to consult a statistician.

Table F-1
ProUCL Output - Area 1 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 15
Raw Statistics	
Minimum 168	Minimum of Log Data 5.124
Maximum 1540	Maximum of Log Data 7.34
Mean 577.6	Mean of log Data 6.183
Median 550	SD of log Data 0.619
SD 369.1	
Std. Error of Mean 95.31	
Coefficient of Variation 0.639	
Skewness 1.463	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.864	Shapiro Wilk Test Statistic 0.968
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data not Normal at 5% Significance Level	
Lognormal Distribution Test	
Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution	
95% Student's-t UCL 745.5	95% H-UCL 844.8
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 772.8	95% Chebyshev (MVUE) UCL 998.5
95% Modified-t UCL (Johnson-1978) 751.5	97.5% Chebyshev (MVUE) UCL 1180
99% Chebyshev (MVUE) UCL 1538	
Gamma Distribution Test	
Data Distribution	
Data appear Gamma Distributed at 5% Significance Level	
Nonparametric Statistics	
Approximate Chi Square Value (.05) 54.45	95% CLT UCL 734.4
Adjusted Level of Significance 0.0324	95% Jackknife UCL 745.5
Adjusted Chi Square Value 52.46	95% Standard Bootstrap UCL 728.5
Anderson-Darling Test Statistic 0.286	95% Bootstrap-t UCL 824.4
Anderson-Darling 5% Critical Value 0.745	95% Hall's Bootstrap UCL 1525
Kolmogorov-Smirnov Test Statistic 0.126	95% Percentile Bootstrap UCL 742.5
Kolmogorov-Smirnov 5% Critical Value 0.223	95% BCA Bootstrap UCL 770.5
Data appear Gamma Distributed at 5% Significance Level	
95% Chebyshev(Mean, Sd) UCL 993	
97.5% Chebyshev(Mean, Sd) UCL 1173	

Table F-1
ProUCL Output - Area 1 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Assuming Gamma Distribution	99% Chebyshev(Mean, Sd) UCL 1526
95% Approximate Gamma UCL 775.9	
95% Adjusted Gamma UCL 805.2	

Potential UCL to Use	Use 95% Approximate Gamma UCL 775.9
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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). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 15
Raw Statistics	Log-transformed Statistics
<hr/>	
Minimum 212	Minimum of Log Data 5.357
Maximum 536	Maximum of Log Data 6.284
Mean 292.1	Mean of log Data 5.638
Median 259	SD of log Data 0.275
SD 93.83	
Std. Error of Mean 24.23	
Coefficient of Variation 0.321	
Skewness 1.744	
<hr/>	
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.776	Shapiro Wilk Test Statistic 0.853
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data not Normal at 5% Significance Level	Data not Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 334.7	95% H-UCL 334.5
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 381.9
95% Adjusted-CLT UCL (Chen-1995) 343.6	97.5% Chebyshev (MVUE) UCL 421.2
95% Modified-t UCL (Johnson-1978) 336.6	99% Chebyshev (MVUE) UCL 498.5
Gamma Distribution Test	Data Distribution
k star (bias corrected) 10.42	Data do not follow a Discernable Distribution (0.05)
Theta Star 28.03	
MLE of Mean 292.1	

Table F-1
ProUCL Output - Area 1 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

MLE of Standard Deviation 90.47	Nonparametric Statistics
nu star 312.6	
Approximate Chi Square Value (.05) 272.7	95% CLT UCL 331.9
Adjusted Level of Significance 0.0324	95% Jackknife UCL 334.7
Adjusted Chi Square Value 268.1	95% Standard Bootstrap UCL 332
Anderson-Darling Test Statistic 1.03	95% Bootstrap-t UCL 371.9
Anderson-Darling 5% Critical Value 0.737	95% Hall's Bootstrap UCL 367.1
Kolmogorov-Smirnov Test Statistic 0.225	95% Percentile Bootstrap UCL 334.9
Kolmogorov-Smirnov 5% Critical Value 0.221	95% BCA Bootstrap UCL 339.5
Data not Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 397.7
Assuming Gamma Distribution	97.5% Chebyshev(Mean, Sd) UCL 443.4
95% Approximate Gamma UCL 334.9	99% Chebyshev(Mean, Sd) UCL 533.1
95% Adjusted Gamma UCL 340.6	
Potential UCL to Use	Use 95% Student's-t UCL 334.7 or 95% Modified-t UCL 336.6

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). For additional insight, the user may want to consult a statistician.

Mercury

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 15
Raw Statistics	
Minimum 0.25	Minimum of Log Data -1.386
Maximum 2.4	Maximum of Log Data 0.875
Mean 0.94	Mean of log Data -0.185
Median 0.82	SD of log Data 0.518
SD 0.511	
Std. Error of Mean 0.132	
Coefficient of Variation 0.544	
Skewness 1.743	
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.858	Shapiro Wilk Test Statistic 0.968

Table F-1
ProUCL Output - Area 1 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Shapiro Wilk Critical Value 0.881 Data not Normal at 5% Significance Level	Shapiro Wilk Critical Value 0.881 Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 1.172	95% H-UCL 1.27
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 1.22	95% Chebyshev (MVUE) UCL 1.508
95% Modified-t UCL (Johnson-1978) 1.182	97.5% Chebyshev (MVUE) UCL 1.754
	99% Chebyshev (MVUE) UCL 2.235
Gamma Distribution Test	Data Distribution
k star (bias corrected) 3.43	Data appear Gamma Distributed at 5% Significance Level
Theta Star 0.274	
MLE of Mean 0.94	
MLE of Standard Deviation 0.508	
nu star 102.9	
Approximate Chi Square Value (.05) 80.5	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 1.157
Adjusted Chi Square Value 78.06	95% Jackknife UCL 1.172
Anderson-Darling Test Statistic 0.296	95% Standard Bootstrap UCL 1.146
Anderson-Darling 5% Critical Value 0.74	95% Bootstrap-t UCL 1.276
Kolmogorov-Smirnov Test Statistic 0.127	95% Hall's Bootstrap UCL 2.248
Kolmogorov-Smirnov 5% Critical Value 0.222	95% Percentile Bootstrap UCL 1.175
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 1.233
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 1.515
95% Approximate Gamma UCL 1.202	97.5% Chebyshev(Mean, Sd) UCL 1.764
95% Adjusted Gamma UCL 1.239	99% Chebyshev(Mean, Sd) UCL 2.253
Potential UCL to Use	Use 95% Approximate Gamma UCL 1.202

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). For additional insight, the user may want to consult a statistician.

Mercury, Inorganic Salts

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 15

Raw Statistics	Log-transformed Statistics
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Table F-1
ProUCL Output - Area 1 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Minimum 0.25	Minimum of Log Data -1.386
Maximum 2.4	Maximum of Log Data 0.875
Mean 0.94	Mean of log Data -0.185
Median 0.82	SD of log Data 0.518
SD 0.511	
Std. Error of Mean 0.132	
Coefficient of Variation 0.544	
Skewness 1.743	

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.858
 Shapiro Wilk Critical Value 0.881

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.968
 Shapiro Wilk Critical Value 0.881

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 1.172

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 1.22
 95% Modified-t UCL (Johnson-1978) 1.182

Assuming Lognormal Distribution

95% H-UCL 1.27

95% Chebyshev (MVUE) UCL 1.508
 97.5% Chebyshev (MVUE) UCL 1.754
 99% Chebyshev (MVUE) UCL 2.235

Gamma Distribution Test

k star (bias corrected) 3.43
 Theta Star 0.274
 MLE of Mean 0.94
 MLE of Standard Deviation 0.508
 nu star 102.9
 Approximate Chi Square Value (.05) 80.5
 Adjusted Level of Significance 0.0324
 Adjusted Chi Square Value 78.06

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Anderson-Darling Test Statistic 0.296
 Anderson-Darling 5% Critical Value 0.74
 Kolmogorov-Smirnov Test Statistic 0.127
 Kolmogorov-Smirnov 5% Critical Value 0.222

Nonparametric Statistics

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 1.202
 95% Adjusted Gamma UCL 1.239

95% CLT UCL 1.157
 95% Jackknife UCL 1.172
 95% Standard Bootstrap UCL 1.147
 95% Bootstrap-t UCL 1.284
 95% Hall's Bootstrap UCL 2.235
 95% Percentile Bootstrap UCL 1.157
 95% BCA Bootstrap UCL 1.239
 95% Chebyshev(Mean, Sd) UCL 1.515
 97.5% Chebyshev(Mean, Sd) UCL 1.764
 99% Chebyshev(Mean, Sd) UCL 2.253

Potential UCL to Use

Use 95% Approximate Gamma UCL 1.202

Table F-1
ProUCL Output - Area 1 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

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). For additional insight, the user may want to consult a statistician.

Vanadium

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 14
Raw Statistics	
Minimum 18.4	Minimum of Log Data 2.912
Maximum 33	Maximum of Log Data 3.497
Mean 23.63	Mean of log Data 3.148
Median 23.7	SD of log Data 0.171
SD 4.204	
Std. Error of Mean 1.085	
Coefficient of Variation 0.178	
Skewness 0.871	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.928	Shapiro Wilk Test Statistic 0.955
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	
95% Student's-t UCL 25.54	95% H-UCL 25.66
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 25.67	95% Chebyshev (MVUE) UCL 28.18
95% Modified-t UCL (Johnson-1978) 25.58	97.5% Chebyshev (MVUE) UCL 30.15
	99% Chebyshev (MVUE) UCL 34.03
Assuming Lognormal Distribution	
Gamma Distribution Test	
k star (bias corrected) 28.79	95% CLT UCL 25.41
Theta Star 0.821	95% Jackknife UCL 25.54
MLE of Mean 23.63	
MLE of Standard Deviation 4.403	
nu star 863.7	
Approximate Chi Square Value (.05) 796.5	Nonparametric Statistics
Adjusted Level of Significance 0.0324	
Adjusted Chi Square Value 788.6	

Table F-1
ProUCL Output - Area 1 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Anderson-Darling Test Statistic 0.31	95% Standard Bootstrap UCL 25.32
Anderson-Darling 5% Critical Value 0.735	95% Bootstrap-t UCL 25.88
Kolmogorov-Smirnov Test Statistic 0.128	95% Hall's Bootstrap UCL 26.04
Kolmogorov-Smirnov 5% Critical Value 0.221	95% Percentile Bootstrap UCL 25.39
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 25.51
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 28.36
95% Approximate Gamma UCL 25.62	97.5% Chebyshev(Mean, Sd) UCL 30.41
95% Adjusted Gamma UCL 25.88	99% Chebyshev(Mean, Sd) UCL 34.43
Potential UCL to Use	Use 95% Student's-t UCL 25.54

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). For additional insight, the user may want to consult a statistician.

Table F-2
ProUCL Output - Area 2 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Area2 BLANKS REMOVED.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Number of Valid Observations	27	Number of Distinct Observations	20
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Raw Statistics

Minimum	0.031
Maximum	1.6
Mean	0.284
Median	0.16
SD	0.382
Std. Error of Mean	0.0735
Coefficient of Variation	1.343
Skewness	2.979

Log-transformed Statistics

Minimum of Log Data	-3.474
Maximum of Log Data	0.47
Mean of log Data	-1.739
SD of log Data	0.933

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.557
Shapiro Wilk Critical Value	0.923

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.941
Shapiro Wilk Critical Value	0.923

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	0.41
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95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995)	0.45
95% Modified-t UCL (Johnson-1978)	0.417

Assuming Lognormal Distribution

95% H-UCL	0.424
95% Chebyshev (MVUE) UCL	0.5
97.5% Chebyshev (MVUE) UCL	0.601
99% Chebyshev (MVUE) UCL	0.801

Gamma Distribution Test

k star (bias corrected)	1.073
Theta Star	0.265
MLE of Mean	0.284
MLE of Standard Deviation	0.274
nu star	57.93
Approximate Chi Square Value (.05)	41.43

Data Distribution

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

Table F-2
ProUCL Output - Area 2 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Adjusted Level of Significance	0.0401	95% CLT UCL	0.405
Adjusted Chi Square Value	40.54	95% Jackknife UCL	0.41
		95% Standard Bootstrap UCL	0.402
Anderson-Darling Test Statistic	1.409	95% Bootstrap-t UCL	0.666
Anderson-Darling 5% Critical Value	0.77	95% Hall's Bootstrap UCL	1.053
Kolmogorov-Smirnov Test Statistic	0.182	95% Percentile Bootstrap UCL	0.401
Kolmogorov-Smirnov 5% Critical Value	0.172	95% BCA Bootstrap UCL	0.462
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.604
		97.5% Chebyshev(Mean, Sd) UCL	0.743
		99% Chebyshev(Mean, Sd) UCL	1.015
Assuming Gamma Distribution			
95% Approximate Gamma UCL	0.397		
95% Adjusted Gamma UCL	0.406		
Potential UCL to Use			Use 95% H-UCL 0.424

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.

H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.

It is therefore recommended to avoid the use of H-statistic based 95% UCLs.

Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

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). For additional insight, the user may want to consult a statistician.

Benzo(a)pyrene

General Statistics	
Number of Valid Observations	27
Number of Distinct Observations	22
Raw Statistics	
Minimum	0.038
Maximum	1.6
Mean	0.313
Median	0.2
SD	0.382
Std. Error of Mean	0.0736
Coefficient of Variation	1.222
Skewness	2.764
Log-transformed Statistics	
Minimum of Log Data	-3.27
Maximum of Log Data	0.47
Mean of log Data	-1.603
SD of log Data	0.909
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test

Table F-2
ProUCL Output - Area 2 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Shapiro Wilk Test Statistic 0.609	Shapiro Wilk Test Statistic 0.956
Shapiro Wilk Critical Value 0.923	Shapiro Wilk Critical Value 0.923
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 0.438	95% H-UCL 0.467
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 0.553
95% Adjusted-CLT UCL (Chen-1995) 0.476	97.5% Chebyshev (MVUE) UCL 0.663
95% Modified-t UCL (Johnson-1978) 0.445	99% Chebyshev (MVUE) UCL 0.88
Gamma Distribution Test	Data Distribution
k star (bias corrected) 1.159	Data Follow Appr. Gamma Distribution at 5% Significance Level
Theta Star 0.27	
MLE of Mean 0.313	
MLE of Standard Deviation 0.291	
nu star 62.56	
Approximate Chi Square Value (.05) 45.37	Nonparametric Statistics
Adjusted Level of Significance 0.0401	95% CLT UCL 0.434
Adjusted Chi Square Value 44.43	95% Jackknife UCL 0.438
 	95% Standard Bootstrap UCL 0.431
Anderson-Darling Test Statistic 1.09	95% Bootstrap-t UCL 0.641
Anderson-Darling 5% Critical Value 0.768	95% Hall's Bootstrap UCL 1.05
Kolmogorov-Smirnov Test Statistic 0.162	95% Percentile Bootstrap UCL 0.439
Kolmogorov-Smirnov 5% Critical Value 0.172	95% BCA Bootstrap UCL 0.497
Data follow Appr. Gamma Distribution at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 0.634
 	97.5% Chebyshev(Mean, Sd) UCL 0.772
Assuming Gamma Distribution	99% Chebyshev(Mean, Sd) UCL 1.045
95% Approximate Gamma UCL 0.431	
95% Adjusted Gamma UCL 0.441	
Potential UCL to Use	Use 95% Approximate Gamma UCL 0.431

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). For additional insight, the user may want to consult a statistician.

Benzo(b)fluoranthene

General Statistics	
Number of Valid Observations 27	Number of Distinct Observations 22

Table F-2
ProUCL Output - Area 2 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Raw Statistics	Log-transformed Statistics
Minimum 0.035	Minimum of Log Data -3.352
Maximum 2.2	Maximum of Log Data 0.788
Mean 0.441	Mean of log Data -1.297
Median 0.24	SD of log Data 0.98
SD 0.547	
Std. Error of Mean 0.105	
Coefficient of Variation 1.239	
Skewness 2.715	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.61	Shapiro Wilk Test Statistic 0.953
Shapiro Wilk Critical Value 0.923	Shapiro Wilk Critical Value 0.923
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	
95% Student's-t UCL 0.62	95% H-UCL 0.714
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 0.673	95% Chebyshev (MVUE) UCL 0.834
95% Modified-t UCL (Johnson-1978) 0.63	97.5% Chebyshev (MVUE) UCL 1.008
	99% Chebyshev (MVUE) UCL 1.351
Gamma Distribution Test	
k star (bias corrected) 1.078	Data Distribution
Theta Star 0.409	Data Follow Appr. Gamma Distribution at 5% Significance Level
MLE of Mean 0.441	
MLE of Standard Deviation 0.425	
nu star 58.19	
Approximate Chi Square Value (.05) 41.65	Nonparametric Statistics
Adjusted Level of Significance 0.0401	95% CLT UCL 0.614
Adjusted Chi Square Value 40.76	95% Jackknife UCL 0.62
Anderson-Darling Test Statistic 1.059	95% Standard Bootstrap UCL 0.608
Anderson-Darling 5% Critical Value 0.769	95% Bootstrap-t UCL 0.874
Kolmogorov-Smirnov Test Statistic 0.159	95% Hall's Bootstrap UCL 1.455
Kolmogorov-Smirnov 5% Critical Value 0.172	95% Percentile Bootstrap UCL 0.623
Data follow Appr. Gamma Distribution at 5% Significance Level	95% BCA Bootstrap UCL 0.672
Assuming Gamma Distribution	
95% Approximate Gamma UCL 0.616	95% Chebyshev(Mean, Sd) UCL 0.9
95% Adjusted Gamma UCL 0.63	97.5% Chebyshev(Mean, Sd) UCL 1.098
	99% Chebyshev(Mean, Sd) UCL 1.488

Table F-2
ProUCL Output - Area 2 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Potential UCL to Use	Use 95% Approximate Gamma UCL 0.616
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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). For additional insight, the user may want to consult a statistician.

Carbazole

General Statistics			
Number of Valid Data	13	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	7
		Percent Non-Detects	53.85%
Raw Statistics			
Minimum Detected	0.034	Minimum Detected	-3.381
Maximum Detected	0.1	Maximum Detected	-2.303
Mean of Detected	0.0577	Mean of Detected	-2.909
SD of Detected	0.0225	SD of Detected	0.355
Minimum Non-Detect	0.033	Minimum Non-Detect	-3.411
Maximum Non-Detect	0.46	Maximum Non-Detect	-0.777
Note: Data have multiple DLs - Use of KM Method is recommended			
For all methods (except KM, DL/2, and ROS Methods),			
Observations < Largest ND are treated as NDs			
		Number treated as Non-Detect	13
		Number treated as Detected	0
		Single DL Non-Detect Percentage	100.00%

Warning: There are only 6 Detected Values in this data

**Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions**

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.848	Shapiro Wilk Test Statistic	0.937
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.122	Mean	-2.392

Table F-2
ProUCL Output - Area 2 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

SD	0.0816	SD	0.868
95% DL/2 (t) UCL	0.162	95% H-Stat (DL/2) UCL	0.257
Maximum Likelihood Estimate(MLE) Method MLE method failed to converge properly	N/A	Log ROS Method	
		Mean in Log Scale	-3.028
		SD in Log Scale	0.356
		Mean in Original Scale	0.0513
		SD in Original Scale	0.0187
		95% t UCL	0.0606
		95% Percentile Bootstrap UCL	0.0598
		95% BCA Bootstrap UCL	0.0621
		95% H-UCL	0.0631

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	4.703
Theta Star	0.0123
nu star	56.44

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

A-D Test Statistic	0.387
5% A-D Critical Value	0.698
K-S Test Statistic	0.698
5% K-S Critical Value	0.333

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	0.0543
SD	0.0207

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000001
Maximum	0.1
Mean	0.0509
Median	0.0537
SD	0.0232
k star	0.624
Theta star	0.0815
Nu star	16.23
AppChi2	8.127
95% Gamma Approximate UCL	0.102
95% Adjusted Gamma UCL	0.113

95% KM (t) UCL	0.0696
95% KM (z) UCL	0.0684
95% KM (jackknife) UCL	0.0696
95% KM (bootstrap t) UCL	0.0794
95% KM (BCA) UCL	0.0714
95% KM (Percentile Bootstrap) UCL	0.0694
95% KM (Chebyshev) UCL	0.0917
97.5% KM (Chebyshev) UCL	0.108
99% KM (Chebyshev) UCL	0.14

Potential UCLs to Use

95% KM (t) UCL	0.0696
95% KM (Percentile Bootstrap) UCL	0.0694

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Table F-2
ProUCL Output - Area 2 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Dibenz(a,h)anthracene

General Statistics			
Number of Valid Data	25	Number of Detected Data	14
Number of Distinct Detected Data	14	Number of Non-Detect Data	11
		Percent Non-Detects	44.00%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0078	Minimum Detected	-4.854
Maximum Detected	0.28	Maximum Detected	-1.273
Mean of Detected	0.0788	Mean of Detected	-2.927
SD of Detected	0.0717	SD of Detected	0.975
Minimum Non-Detect	0.058	Minimum Non-Detect	-2.847
Maximum Non-Detect	0.66	Maximum Non-Detect	-0.416
Note: Data have multiple DLs - Use of KM Method is recommended For all methods (except KM, DL/2, and ROS Methods), Observations < Largest ND are treated as NDs		Number treated as Non-Detect	25
		Number treated as Detected	0
		Single DL Non-Detect Percentage	100.00%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.826	Shapiro Wilk Test Statistic	0.976
5% Shapiro Wilk Critical Value	0.874	5% Shapiro Wilk Critical Value	0.874
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution			
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.124	Mean	-2.471
SD	0.0923	SD	1.02
95% DL/2 (t) UCL	0.156	95% H-Stat (DL/2) UCL	0.24
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-3.018
		SD in Log Scale	0.769
		Mean in Original Scale	0.0647
		SD in Original Scale	0.0566
		95% t UCL	0.0841
		95% Percentile Bootstrap UCL	0.0836
		95% BCA Bootstrap UCL	0.0892
		95% H-UCL	0.0932

Table F-2
ProUCL Output - Area 2 Surface Soil
Second Supplemental Remedial Investigation
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Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only		
k star (bias corrected)		Data appear Gamma Distributed at 5% Significance Level		
Theta Star		Data appear Gamma Distributed at 5% Significance Level		
nu star		Data appear Gamma Distributed at 5% Significance Level		
A-D Test Statistic		Nonparametric Statistics		
5% A-D Critical Value		Kaplan-Meier (KM) Method		
K-S Test Statistic		Mean		
5% K-S Critical Value		SD		
Data appear Gamma Distributed at 5% Significance Level		SE of Mean		
		95% KM (t) UCL		
Assuming Gamma Distribution		95% KM (z) UCL		
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL		
Minimum		95% KM (bootstrap t) UCL		
Maximum		95% KM (BCA) UCL		
Mean		95% KM (Percentile Bootstrap) UCL		
Median		95% KM (Chebyshev) UCL		
SD		97.5% KM (Chebyshev) UCL		
k star		99% KM (Chebyshev) UCL		
Theta star		Potential UCLs to Use		
Nu star		95% KM (t) UCL		
AppChi2		95% KM (t) UCL		
95% Gamma Approximate UCL		95% KM (t) UCL		
95% Adjusted Gamma UCL		95% KM (t) UCL		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Indeno(1,2,3-cd)pyrene

General Statistics			
Number of Valid Data	27	Number of Detected Data	26
Number of Distinct Detected Data	20	Number of Non-Detect Data	1
		Percent Non-Detects	3.70%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.034	Minimum Detected	-3.381
Maximum Detected	1.3	Maximum Detected	0.262

Table F-2
ProUCL Output - Area 2 Surface Soil
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Mean of Detected	0.26	Mean of Detected	-1.77
SD of Detected	0.313	SD of Detected	0.867
Minimum Non-Detect	0.033	Minimum Non-Detect	-3.411
Maximum Non-Detect	0.033	Maximum Non-Detect	-3.411
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.616	Shapiro Wilk Test Statistic	0.959
5% Shapiro Wilk Critical Value	0.92	5% Shapiro Wilk Critical Value	0.92
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution			
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.251	Mean	-1.857
SD	0.311	SD	0.961
95% DL/2 (t) UCL	0.353	95% H-Stat (DL/2) UCL	0.395
Assuming Lognormal Distribution			
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.244	Mean in Log Scale	-1.85
SD	0.313	SD in Log Scale	0.946
95% MLE (t) UCL	0.347	Mean in Original Scale	0.251
95% MLE (Tiku) UCL	0.339	SD in Original Scale	0.311
		95% t UCL	0.353
		95% Percentile Bootstrap UCL	0.359
		95% BCA Bootstrap UCL	0.377
		95% H UCL	0.387
Gamma Distribution Test with Detected Values Only			
Data Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.201	Data appear Lognormal at 5% Significance Level	
Theta Star	0.216		
nu star	62.44		
Assuming Gamma Distribution			
Gamma ROS Statistics using Extrapolated Data		Nonparametric Statistics	
A-D Test Statistic	1.16	Kaplan-Meier (KM) Method	
5% A-D Critical Value	0.766	Mean	0.251
K-S Test Statistic	0.766	SD	0.304
5% K-S Critical Value	0.175	SE of Mean	0.0597
Data not Gamma Distributed at 5% Significance Level		95% KM (t) UCL	0.353
		95% KM (z) UCL	0.349
		95% KM (jackknife) UCL	0.352
		95% KM (bootstrap t) UCL	0.503

Table F-2
ProUCL Output - Area 2 Surface Soil
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Queens, New York

Maximum	1.3	95% KM (BCA) UCL	0.357
Mean	0.25	95% KM (Percentile Bootstrap) UCL	0.355
Median	0.16	95% KM (Chebyshev) UCL	0.512
SD	0.311	97.5% KM (Chebyshev) UCL	0.624
k star	0.669	99% KM (Chebyshev) UCL	0.846
Theta star	0.374		
Nu star	36.12	Potential UCLs to Use	
AppChi2	23.37	95% KM (Chebyshev) UCL	0.512
95% Gamma Approximate UCL	0.386		
95% Adjusted Gamma UCL	0.398		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Antimony

General Statistics			
Number of Valid Data	26	Number of Detected Data	25
Number of Distinct Detected Data	20	Number of Non-Detect Data	1
Number of Missing Values	1	Percent Non-Detects	3.85%
Raw Statistics			
Minimum Detected	0.34	Minimum Detected	-1.079
Maximum Detected	5.7	Maximum Detected	1.74
Mean of Detected	0.992	Mean of Detected	-0.235
SD of Detected	1.046	SD of Detected	0.58
Minimum Non-Detect	0.47	Minimum Non-Detect	-0.755
Maximum Non-Detect	0.47	Maximum Non-Detect	-0.755
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.49	Shapiro Wilk Test Statistic	0.86
5% Shapiro Wilk Critical Value	0.918	5% Shapiro Wilk Critical Value	0.918
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.963	Mean	-0.282

Table F-2
ProUCL Output - Area 2 Surface Soil
Second Supplemental Remedial Investigation
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SD	1.035	SD	0.616
95% DL/2 (t) UCL	1.309	95% H-Stat (DL/2) UCL	1.178
Maximum Likelihood Estimate(MLE) Method			Log ROS Method
Mean	0.863	Mean in Log Scale	-0.268
SD	1.124	SD in Log Scale	0.594
95% MLE (t) UCL	1.239	Mean in Original Scale	0.966
95% MLE (Tiku) UCL	1.223	SD in Original Scale	1.033
		95% t UCL	1.312
		95% Percentile Bootstrap UCL	1.334
		95% BCA Bootstrap UCL	1.543
		95% H UCL	1.163
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	2.105	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.471		
nu star	105.2		
A-D Test Statistic		Nonparametric Statistics	
5% A-D Critical Value	0.755	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.755	Mean	0.968
5% K-S Critical Value	0.176	SD	1.011
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.202
		95% KM (t) UCL	1.314
Assuming Gamma Distribution		95% KM (z) UCL	1.301
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.314
Minimum	0.000001	95% KM (bootstrap t) UCL	1.913
Maximum	5.7	95% KM (BCA) UCL	1.349
Mean	0.953	95% KM (Percentile Bootstrap) UCL	1.326
Median	0.645	95% KM (Chebyshev) UCL	1.851
SD	1.043	97.5% KM (Chebyshev) UCL	2.233
k star	0.762	99% KM (Chebyshev) UCL	2.983
Theta star	1.252		
Nu star	39.61	Potential UCLs to Use	
AppChi2	26.19	95% KM (Chebyshev) UCL	1.851
95% Gamma Approximate UCL	1.442		
95% Adjusted Gamma UCL	1.483		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Table F-2
ProUCL Output - Area 2 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Arsenic

General Statistics	
Number of Valid Observations 27	Number of Distinct Observations 24
Raw Statistics	
Minimum 2.7	Minimum of Log Data 0.993
Maximum 11.7	Maximum of Log Data 2.46
Mean 5.041	Mean of log Data 1.568
Median 4.7	SD of log Data 0.312
SD 1.767	
Std. Error of Mean 0.34	
Coefficient of Variation 0.351	
Skewness 2.012	
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.841	Shapiro Wilk Test Statistic 0.964
Shapiro Wilk Critical Value 0.923	Shapiro Wilk Critical Value 0.923
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	
95% Student's-t UCL 5.621	95% H-UCL 5.633
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 5.741	95% Chebyshev (MVUE) UCL 6.365
95% Modified-t UCL (Johnson-1978) 5.643	97.5% Chebyshev (MVUE) UCL 6.944
	99% Chebyshev (MVUE) UCL 8.082
Gamma Distribution Test	
k star (bias corrected) 9.169	Data Distribution
Theta Star 0.55	Data appear Gamma Distributed at 5% Significance Level
MLE of Mean 5.041	
MLE of Standard Deviation 1.665	
nu star 495.1	
Approximate Chi Square Value (.05) 444.5	Nonparametric Statistics
Adjusted Level of Significance 0.0401	95% CLT UCL 5.6
Adjusted Chi Square Value 441.5	95% Jackknife UCL 5.621
Anderson-Darling Test Statistic 0.338	95% Standard Bootstrap UCL 5.593
Anderson-Darling 5% Critical Value 0.744	95% Bootstrap-t UCL 5.811
Kolmogorov-Smirnov Test Statistic 0.0961	95% Hall's Bootstrap UCL 6.32
	95% Percentile Bootstrap UCL 5.648

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Kolmogorov-Smirnov 5% Critical Value 0.168	95% BCA Bootstrap UCL 5.719
Data appear Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 6.523
	97.5% Chebyshev(Mean, Sd) UCL 7.165
	99% Chebyshev(Mean, Sd) UCL 8.425
Assuming Gamma Distribution	
95% Approximate Gamma UCL 5.615	
95% Adjusted Gamma UCL 5.653	
Potential UCL to Use	Use 95% Approximate Gamma UCL 5.615

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). For additional insight, the user may want to consult a statistician.

Cobalt

General Statistics	
Number of Valid Observations 27	Number of Distinct Observations 19
Raw Statistics	
Minimum 3.7	Minimum of Log Data 1.308
Maximum 9.5	Maximum of Log Data 2.251
Mean 5.719	Mean of log Data 1.724
Median 5.6	SD of log Data 0.203
SD 1.204	
Std. Error of Mean 0.232	
Coefficient of Variation 0.211	
Skewness 1.05	
Log-transformed Statistics	

Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.939	Shapiro Wilk Test Statistic 0.981
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 6.114	95% H-UCL 6.137
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 6.698
95% Adjusted-CLT UCL (Chen-1995) 6.15	97.5% Chebyshev (MVUE) UCL 7.122
95% Modified-t UCL (Johnson-1978) 6.122	99% Chebyshev (MVUE) UCL 7.956

Gamma Distribution Test	Data Distribution
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Table F-2
ProUCL Output - Area 2 Surface Soil
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k star (bias corrected) 22.21	Data appear Normal at 5% Significance Level
Theta Star 0.257	
MLE of Mean 5.719	
MLE of Standard Deviation 1.213	
nu star 1199	
Approximate Chi Square Value (.05) 1120	Nonparametric Statistics
Adjusted Level of Significance 0.0401	95% CLT UCL 6.1
Adjusted Chi Square Value 1115	95% Jackknife UCL 6.114
Anderson-Darling Test Statistic 0.233	95% Standard Bootstrap UCL 6.089
Anderson-Darling 5% Critical Value 0.744	95% Bootstrap-t UCL 6.159
Kolmogorov-Smirnov Test Statistic 0.0952	95% Hall's Bootstrap UCL 6.253
Kolmogorov-Smirnov 5% Critical Value 0.168	95% Percentile Bootstrap UCL 6.104
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 6.137
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 6.729
95% Approximate Gamma UCL 6.124	97.5% Chebyshev(Mean, Sd) UCL 7.166
95% Adjusted Gamma UCL 6.151	99% Chebyshev(Mean, Sd) UCL 8.025
Potential UCL to Use	Use 95% Student's-t UCL 6.114

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). For additional insight, the user may want to consult a statistician.

Thallium

General Statistics			
Number of Valid Data	25	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	24
		Percent Non-Detects	96.00%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
 It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Thallium was not processed!

Benzo(k)fluoranthene

Table F-2
ProUCL Output - Area 2 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

General Statistics			
Number of Valid Data	26	Number of Detected Data	20
Number of Distinct Detected Data	19	Number of Non-Detect Data	6
		Percent Non-Detects	23.08%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.019	Minimum Detected	-3.963
Maximum Detected	0.92	Maximum Detected	-0.0834
Mean of Detected	0.204	Mean of Detected	-1.994
SD of Detected	0.224	SD of Detected	0.896
Minimum Non-Detect	0.0018	Minimum Non-Detect	-6.32
Maximum Non-Detect	0.062	Maximum Non-Detect	-2.781
Note: Data have multiple DLs - Use of KM Method is recommended For all methods (except KM, DL/2, and ROS Methods), Observations < Largest ND are treated as NDs		Number treated as Non-Detect	8
		Number treated as Detected	18
		Single DL Non-Detect Percentage	30.77%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.686	Shapiro Wilk Test Statistic	0.966
5% Shapiro Wilk Critical Value	0.905	5% Shapiro Wilk Critical Value	0.905
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.159	Mean	-2.827
SD	0.212	SD	1.878
95% DL/2 (t) UCL	0.23	95% H-Stat (DL/2) UCL	1.444
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.116	Mean in Log Scale	-2.45
SD	0.258	SD in Log Scale	1.158
95% MLE (t) UCL	0.202	Mean in Original Scale	0.161
95% MLE (Tiku) UCL	0.206	SD in Original Scale	0.211
		95% t UCL	0.232
		95% Percentile Bootstrap UCL	0.232
		95% BCA Bootstrap UCL	0.252
		95% H UCL	0.317
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.209	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	0.169		

Table F-2
ProUCL Output - Area 2 Surface Soil
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nu star	48.35						
A-D Test Statistic	0.776	Nonparametric Statistics					
5% A-D Critical Value	0.76	Kaplan-Meier (KM) Method					
K-S Test Statistic	0.76	Mean					
5% K-S Critical Value	0.198	SD					
Data follow Appr. Gamma Distribution at 5% Significance Level							
Assuming Gamma Distribution							
Gamma ROS Statistics using Extrapolated Data							
Minimum	0.000001	95% KM (t) UCL					
Maximum	0.92	95% KM (z) UCL					
Mean	0.157	95% KM (jackknife) UCL					
Median	0.088	95% KM (bootstrap t) UCL					
SD	0.214	95% KM (BCA) UCL					
k star	0.245	97.5% KM (Chebyshev) UCL					
Theta star	0.64	99% KM (Percentile Bootstrap) UCL					
Nu star	12.74	99% KM (Chebyshev) UCL					
AppChi2	5.716	95% KM (Chebyshev) UCL					
95% Gamma Approximate UCL	0.349	95% KM (BCA) UCL					
95% Adjusted Gamma UCL	0.369	95% KM (Percentile Bootstrap) UCL					

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Chrysene

General Statistics			
Number of Valid Data	27	Number of Detected Data	26
Number of Distinct Detected Data	19	Number of Non-Detect Data	1
		Percent Non-Detects	3.70%
Raw Statistics			
Minimum Detected	0.036	Minimum Detected	-3.324
Maximum Detected	1.9	Maximum Detected	0.642
Mean of Detected	0.348	Mean of Detected	-1.483
SD of Detected	0.423	SD of Detected	0.904
Minimum Non-Detect	0.38	Minimum Non-Detect	-0.968
Maximum Non-Detect	0.38	Maximum Non-Detect	-0.968
Log-transformed Statistics			

Table F-2
ProUCL Output - Area 2 Surface Soil
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UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.598	Shapiro Wilk Test Statistic	0.945
5% Shapiro Wilk Critical Value	0.92	5% Shapiro Wilk Critical Value	0.92
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.342	Mean	-1.49
SD	0.416	SD	0.887
95% DL/2 (t) UCL	0.479	95% H-Stat (DL/2) UCL	0.506
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-1.495
		SD in Log Scale	0.889
		Mean in Original Scale	0.341
		SD in Original Scale	0.417
		95% t UCL	0.478
		95% Percentile Bootstrap UCL	0.479
		95% BCA Bootstrap UCL	0.525
		95% H-UCL	0.504
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.187	Data appear Lognormal at 5% Significance Level	
Theta Star	0.293		
nu star	61.7		
A-D Test Statistic	1.178	Nonparametric Statistics	
5% A-D Critical Value	0.766	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.766	Mean	0.341
5% K-S Critical Value	0.175	SD	0.409
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0803
		95% KM (t) UCL	0.479
Assuming Gamma Distribution		95% KM (z) UCL	0.474
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.478
Minimum	0.036	95% KM (bootstrap t) UCL	0.725
Maximum	1.9	95% KM (BCA) UCL	0.504
Mean	0.343	95% KM (Percentile Bootstrap) UCL	0.485
Median	0.22	95% KM (Chebyshev) UCL	0.692
SD	0.416	97.5% KM (Chebyshev) UCL	0.843

Table F-2
ProUCL Output - Area 2 Surface Soil
Second Supplemental Remedial Investigation
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k star	1.224	99% KM (Chebyshev) UCL	1.141
Theta star	0.28		
Nu star	66.11	Potential UCLs to Use	
AppChi2	48.4	95% KM (Chebyshev) UCL	0.692
95% Gamma Approximate UCL	0.469		
95% Adjusted Gamma UCL	0.478		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006). For additional insight, the user may want to consult a statistician.

Heptachlor epoxide

General Statistics	
Number of Valid Observations 3	Number of Distinct Observations 3

Warning: This data set only has 3 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Heptachlor epoxide was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!
If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Aluminum

General Statistics	
Number of Valid Observations 27	Number of Distinct Observations 26

Raw Statistics	Log-transformed Statistics
Minimum 48	Minimum of Log Data 3.871
Maximum 14400	Maximum of Log Data 9.575
Mean 6966	Mean of log Data 8.668
Median 6640	SD of log Data 0.991
SD 2449	
Std. Error of Mean 471.4	
Coefficient of Variation 0.352	
Skewness 0.328	

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Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.899	Shapiro Wilk Test Statistic 0.427
Shapiro Wilk Critical Value 0.923	Shapiro Wilk Critical Value 0.923
Data not Normal at 5% Significance Level	Data not Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 7770	95% H-UCL 15480
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 18040
95% Adjusted-CLT UCL (Chen-1995) 7773	97.5% Chebyshev (MVUE) UCL 21838
95% Modified-t UCL (Johnson-1978) 7775	99% Chebyshev (MVUE) UCL 29299
Gamma Distribution Test	Data Distribution
k star (bias corrected) 2.627	Data do not follow a Discernable Distribution (0.05)
Theta Star 2652	
MLE of Mean 6966	
MLE of Standard Deviation 4298	
nu star 141.9	
Approximate Chi Square Value (.05) 115.3	Nonparametric Statistics
Adjusted Level of Significance 0.0401	95% CLT UCL 7741
Adjusted Chi Square Value 113.8	95% Jackknife UCL 7770
Anderson-Darling Test Statistic 3.386	95% Standard Bootstrap UCL 7754
Anderson-Darling 5% Critical Value 0.752	95% Bootstrap-t UCL 7808
Kolmogorov-Smirnov Test Statistic 0.299	95% Hall's Bootstrap UCL 8004
Kolmogorov-Smirnov 5% Critical Value 0.169	95% Percentile Bootstrap UCL 7708
Data not Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 7750
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 9021
95% Approximate Gamma UCL 8568	97.5% Chebyshev(Mean, Sd) UCL 9910
95% Adjusted Gamma UCL 8683	99% Chebyshev(Mean, Sd) UCL 11656
Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL 9021

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). For additional insight, the user may want to consult a statistician.

Table F-2
ProUCL Output - Area 2 Surface Soil
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General Statistics

Number of Valid Observations 27	Number of Distinct Observations 25
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Raw Statistics

Minimum 64.9	Maximum 295
Mean 104.1	Median 92.9
SD 44.1	Std. Error of Mean 8.486
Coefficient of Variation 0.424	Skewness 3.306

Log-transformed Statistics

Minimum of Log Data 4.173	Maximum of Log Data 5.687
Mean of log Data 4.589	SD of log Data 0.313

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.662	Shapiro Wilk Critical Value 0.923
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Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.876	Shapiro Wilk Critical Value 0.923
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Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 118.5	95% H-UCL 115.6
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95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 123.8	95% Chebyshev (MVUE) UCL 130.7
95% Modified-t UCL (Johnson-1978) 119.4	97.5% Chebyshev (MVUE) UCL 142.6
	99% Chebyshev (MVUE) UCL 166

Assuming Lognormal Distribution

95% H-UCL 115.6	95% Chebyshev (MVUE) UCL 130.7
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Gamma Distribution Test

k star (bias corrected) 8.075	MLE of Mean 104.1
Theta Star 12.89	MLE of Standard Deviation 36.62
MLE of Standard Deviation 36.62	nu star 436.1
Approximate Chi Square Value (.05) 388.7	
Adjusted Level of Significance 0.0401	
Adjusted Chi Square Value 385.8	

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Anderson-Darling Test Statistic 1.103	95% CLT UCL 118.5
Anderson-Darling 5% Critical Value 0.744	95% Jackknife UCL 118.5
Kolmogorov-Smirnov Test Statistic 0.168	95% Standard Bootstrap UCL 117.4
Kolmogorov-Smirnov 5% Critical Value 0.168	95% Bootstrap-t UCL 130.1

Nonparametric Statistics

95% Hall's Bootstrap UCL 178.9	95% Percentile Bootstrap UCL 118.8
95% BCA Bootstrap UCL 127.3	95% Chebyshev(Mean, Sd) UCL 141
95% Chebyshev(Mean, Sd) UCL 157.1	97.5% Chebyshev(Mean, Sd) UCL 188.5

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

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95% Approximate Gamma UCL 116.7

95% Adjusted Gamma UCL 117.6

Potential UCL to Use	Use 95% Student's-t UCL 118.5 or 95% Modified-t UCL 119.4
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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). For additional insight, the user may want to consult a statistician.

Cadmium

General Statistics

Number of Valid Observations 26	Number of Distinct Observations 21
---------------------------------	------------------------------------

Raw Statistics

Minimum 0.23
Maximum 1.9
Mean 0.584
Median 0.535
SD 0.345
Std. Error of Mean 0.0677
Coefficient of Variation 0.591
Skewness 2.38

Log-transformed Statistics

Minimum of Log Data -1.47
Maximum of Log Data 0.642
Mean of log Data -0.665
SD of log Data 0.499

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.784
Shapiro Wilk Critical Value 0.92

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.964
Shapiro Wilk Critical Value 0.92

Data not Normal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 0.7
95% UCLs (Adjusted for Skewness)
95% Adjusted-CLT UCL (Chen-1995) 0.729
95% Modified-t UCL (Johnson-1978) 0.705

Assuming Lognormal Distribution

95% H-UCL 0.708
95% Chebyshev (MVUE) UCL 0.836
97.5% Chebyshev (MVUE) UCL 0.948
99% Chebyshev (MVUE) UCL 1.166

Gamma Distribution Test

k star (bias corrected) 3.632
Theta Star 0.161
MLE of Mean 0.584

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Table F-2
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MLE of Standard Deviation 0.307	Nonparametric Statistics
nu star 188.9	
Approximate Chi Square Value (.05) 158.1	95% CLT UCL 0.696
Adjusted Level of Significance 0.0398	95% Jackknife UCL 0.7
Adjusted Chi Square Value 156.2	95% Standard Bootstrap UCL 0.688
Anderson-Darling Test Statistic 0.429	95% Bootstrap-t UCL 0.765
Anderson-Darling 5% Critical Value 0.748	95% Hall's Bootstrap UCL 1.23
Kolmogorov-Smirnov Test Statistic 0.13	95% Percentile Bootstrap UCL 0.71
Kolmogorov-Smirnov 5% Critical Value 0.172	95% BCA Bootstrap UCL 0.73
Data appear Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 0.879
Assuming Gamma Distribution	97.5% Chebyshev(Mean, Sd) UCL 1.007
95% Approximate Gamma UCL 0.698	99% Chebyshev(Mean, Sd) UCL 1.258
95% Adjusted Gamma UCL 0.706	
Potential UCL to Use	Use 95% Approximate Gamma UCL 0.698

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). For additional insight, the user may want to consult a statistician.

Chromium

General Statistics	
Number of Valid Observations 27	Number of Distinct Observations 24
Raw Statistics	Log-transformed Statistics
Minimum 9.8	Minimum of Log Data 2.282
Maximum 29.4	Maximum of Log Data 3.381
Mean 17.57	Mean of log Data 2.834
Median 17.3	SD of log Data 0.262
SD 4.6	
Std. Error of Mean 0.885	
Coefficient of Variation 0.262	
Skewness 0.592	
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.97	Shapiro Wilk Test Statistic 0.986
Shapiro Wilk Critical Value 0.923	Shapiro Wilk Critical Value 0.923

Table F-2
ProUCL Output - Area 2 Surface Soil
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Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 19.08	95% H-UCL 19.31
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 21.5
95% Adjusted-CLT UCL (Chen-1995) 19.14	97.5% Chebyshev (MVUE) UCL 23.19
95% Modified-t UCL (Johnson-1978) 19.1	99% Chebyshev (MVUE) UCL 26.52
Gamma Distribution Test	Data Distribution
k star (bias corrected) 13.72	Data appear Normal at 5% Significance Level
Theta Star 1.281	
MLE of Mean 17.57	
MLE of Standard Deviation 4.745	
nu star 740.7	
Approximate Chi Square Value (.05) 678.5	Nonparametric Statistics
Adjusted Level of Significance 0.0401	95% CLT UCL 19.03
Adjusted Chi Square Value 674.7	95% Jackknife UCL 19.08
Anderson-Darling Test Statistic 0.159	95% Standard Bootstrap UCL 19
Anderson-Darling 5% Critical Value 0.744	95% Bootstrap-t UCL 19.17
Kolmogorov-Smirnov Test Statistic 0.0897	95% Hall's Bootstrap UCL 19.27
Kolmogorov-Smirnov 5% Critical Value 0.168	95% Percentile Bootstrap UCL 18.99
appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 19.04
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 21.43
95% Approximate Gamma UCL 19.18	97.5% Chebyshev(Mean, Sd) UCL 23.1
95% Adjusted Gamma UCL 19.29	99% Chebyshev(Mean, Sd) UCL 26.38
Potential UCL to Use	Use 95% Student's-t UCL 19.08

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). For additional insight, the user may want to consult a statistician.

Copper

General Statistics	
Number of Valid Observations	27
Number of Distinct Observations	26
Raw Statistics	
Minimum	19
Log-transformed Statistics	
Minimum of Log Data	2.944

Table F-2
ProUCL Output - Area 2 Surface Soil
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Maximum	11500	Maximum of Log Data	9.35
Mean	468.8	Mean of log Data	3.961
Median	46	SD of log Data	1.118
SD	2205		
Std. Error of Mean	424.3		
Coefficient of Variation	4.702		
Skewness	5.196		

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.202
 Shapiro Wilk Critical Value 0.923

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.436
 Shapiro Wilk Critical Value 0.923

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 1193

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 1620
 95% Modified-t UCL (Johnson-1978) 1263

Assuming Lognormal Distribution

95% H-UCL 176.5

95% Chebyshev (MVUE) UCL 198.4
 97.5% Chebyshev (MVUE) UCL 243.3
 99% Chebyshev (MVUE) UCL 331.4

Gamma Distribution Test

k star (bias corrected) 0.303
 Theta Star 1549
 MLE of Mean 468.8
 MLE of Standard Deviation 852.1
 nu star 16.35
 Approximate Chi Square Value (.05) 8.209
 Adjusted Level of Significance 0.0401
 Adjusted Chi Square Value 7.841
 Anderson-Darling Test Statistic 9.068
 Anderson-Darling 5% Critical Value 0.85
 Kolmogorov-Smirnov Test Statistic 0.522
 Kolmogorov-Smirnov 5% Critical Value 0.182

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL 1167
 95% Jackknife UCL 1193
 95% Standard Bootstrap UCL 1165
 95% Bootstrap-t UCL 93739
 95% Hall's Bootstrap UCL 31465
 95% Percentile Bootstrap UCL 1317
 95% BCA Bootstrap UCL 1744
 95% Chebyshev(Mean, Sd) UCL 2318
 97.5% Chebyshev(Mean, Sd) UCL 3118
 99% Chebyshev(Mean, Sd) UCL 4690

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 933.8
 95% Adjusted Gamma UCL 977.6

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL 2318

Table F-2
ProUCL Output - Area 2 Surface Soil
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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). For additional insight, the user may want to consult a statistician.

Lead

General Statistics		
Number of Valid Observations 27	Number of Distinct Observations 26	
Raw Statistics		
Minimum 73.2	Minimum of Log Data 4.293	
Maximum 494	Maximum of Log Data 6.203	
Mean 279.2	Mean of log Data 5.53	
Median 278	SD of log Data 0.489	
SD 118		
Std. Error of Mean 22.7		
Coefficient of Variation 0.423		
Skewness 0.155		
Relevant UCL Statistics		
Normal Distribution Test		
Shapiro Wilk Test Statistic 0.966	Lognormal Distribution Test	
Shapiro Wilk Critical Value 0.923	Shapiro Wilk Test Statistic 0.943	
Data appear Normal at 5% Significance Level	Shapiro Wilk Critical Value 0.923	
	Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		
95% Student's-t UCL 317.9	Assuming Lognormal Distribution	
95% UCLs (Adjusted for Skewness)		
95% Adjusted-CLT UCL (Chen-1995) 317.2	95% H-UCL 342.8	
95% Modified-t UCL (Johnson-1978) 318	95% Chebyshev (MVUE) UCL 403.2	
Gamma Distribution Test		
k star (bias corrected) 4.515	97.5% Chebyshev (MVUE) UCL 455.4	
Theta Star 61.83	99% Chebyshev (MVUE) UCL 558	
MLE of Mean 279.2		
MLE of Standard Deviation 131.4		
nu star 243.8		
Approximate Chi Square Value (.05) 208.6	Data Distribution	
Adjusted Level of Significance 0.0401	Data appear Normal at 5% Significance Level	
Adjusted Chi Square Value 206.6	Nonparametric Statistics	
	95% CLT UCL 316.5	
	95% Jackknife UCL 317.9	
	95% Standard Bootstrap UCL 314.9	

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Anderson-Darling Test Statistic 0.29	95% Bootstrap-t UCL 319.7
Anderson-Darling 5% Critical Value 0.747	95% Hall's Bootstrap UCL 317.1
Kolmogorov-Smirnov Test Statistic 0.109	95% Percentile Bootstrap UCL 317.7
Kolmogorov-Smirnov 5% Critical Value 0.169	95% BCA Bootstrap UCL 314.1
Data appear Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 378.1
	97.5% Chebyshev(Mean, Sd) UCL 420.9
	99% Chebyshev(Mean, Sd) UCL 505
Assuming Gamma Distribution	
95% Approximate Gamma UCL 326.2	
95% Adjusted Gamma UCL 329.5	
Potential UCL to Use	Use 95% Student's-t UCL 317.9

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). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics	
Number of Valid Observations 27	Number of Distinct Observations 25
Raw Statistics	
Minimum 84.8	Minimum of Log Data 4.44
Maximum 617	Maximum of Log Data 6.425
Mean 313.8	Mean of log Data 5.676
Median 305	SD of log Data 0.412
SD 114.8	
Std. Error of Mean 22.1	
Coefficient of Variation 0.366	
Skewness 0.496	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.977	Shapiro Wilk Test Statistic 0.943
Shapiro Wilk Critical Value 0.923	Shapiro Wilk Critical Value 0.923
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	
95% Student's-t UCL 351.5	95% H-UCL 370.4
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 352.5	95% Chebyshev (MVUE) UCL 429.3
	97.5% Chebyshev (MVUE) UCL 478

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95% Modified-t UCL (Johnson-1978) 351.9	99% Chebyshev (MVUE) UCL 573.8
Gamma Distribution Test	
k star (bias corrected) 6.256	Data Distribution
Theta Star 50.17	Data appear Normal at 5% Significance Level
MLE of Mean 313.8	
MLE of Standard Deviation 125.5	
nu star 337.8	
Approximate Chi Square Value (.05) 296.2	Nonparametric Statistics
Adjusted Level of Significance 0.0401	95% CLT UCL 350.2
Adjusted Chi Square Value 293.8	95% Jackknife UCL 351.5
Anderson-Darling Test Statistic 0.297	95% Standard Bootstrap UCL 349.7
Anderson-Darling 5% Critical Value 0.746	95% Bootstrap-t UCL 353.6
Kolmogorov-Smirnov Test Statistic 0.116	95% Hall's Bootstrap UCL 356.9
Kolmogorov-Smirnov 5% Critical Value 0.168	95% Percentile Bootstrap UCL 348.8
Data appear Gamma Distributed at 5% Significance Level	
95% Approximate Gamma UCL 357.9	95% BCA Bootstrap UCL 350.7
95% Adjusted Gamma UCL 360.9	95% Chebyshev(Mean, Sd) UCL 410.2
Potential UCL to Use	
	97.5% Chebyshev(Mean, Sd) UCL 451.9
	99% Chebyshev(Mean, Sd) UCL 533.8
	Use 95% Student's-t UCL 351.5

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). For additional insight, the user may want to consult a statistician.

Mercury

General Statistics	
Number of Valid Observations 25	Number of Distinct Observations 24
Raw Statistics	
Minimum 0.14	Minimum of Log Data -1.966
Maximum 2.7	Maximum of Log Data 0.993
Mean 0.848	Mean of log Data -0.453
Median 0.5	SD of log Data 0.761
SD 0.704	
Std. Error of Mean 0.141	
Coefficient of Variation 0.831	
Log-transformed Statistics	

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Skewness 1.424

Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.799	Shapiro Wilk Test Statistic 0.942
Shapiro Wilk Critical Value 0.918	Shapiro Wilk Critical Value 0.918
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 1.089	95% H-UCL 1.197
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 1.441
95% Adjusted-CLT UCL (Chen-1995) 1.122	97.5% Chebyshev (MVUE) UCL 1.703
95% Modified-t UCL (Johnson-1978) 1.095	99% Chebyshev (MVUE) UCL 2.216
Gamma Distribution Test	Data Distribution
k star (bias corrected) 1.686	Data appear Lognormal at 5% Significance Level
Theta Star 0.503	
MLE of Mean 0.848	
MLE of Standard Deviation 0.653	
nu star 84.3	
Approximate Chi Square Value (.05) 64.14	Nonparametric Statistics
Adjusted Level of Significance 0.0395	95% CLT UCL 1.079
Adjusted Chi Square Value 62.94	95% Jackknife UCL 1.089
Anderson-Darling Test Statistic 0.973	95% Standard Bootstrap UCL 1.073
Anderson-Darling 5% Critical Value 0.758	95% Bootstrap-t UCL 1.164
Kolmogorov-Smirnov Test Statistic 0.18	95% Hall's Bootstrap UCL 1.112
Kolmogorov-Smirnov 5% Critical Value 0.177	95% Percentile Bootstrap UCL 1.1
Data not Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 1.128
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 1.461
95% Approximate Gamma UCL 1.114	97.5% Chebyshev(Mean, Sd) UCL 1.727
95% Adjusted Gamma UCL 1.135	99% Chebyshev(Mean, Sd) UCL 2.249
Potential UCL to Use	Use 95% H-UCL 1.197

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.

H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.

It is therefore recommended to avoid the use of H-statistic based 95% UCLs.

Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

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These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Mercury, Inorganic Salts

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 14
Raw Statistics	
Minimum 0.14	Minimum of Log Data -1.966
Maximum 2.7	Maximum of Log Data 0.993
Mean 0.922	Mean of log Data -0.366
Median 0.77	SD of log Data 0.79
SD 0.754	
Std. Error of Mean 0.195	
Coefficient of Variation 0.818	
Skewness 1.472	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.809	Lognormal Distribution Test
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Test Statistic 0.964
Data not Normal at 5% Significance Level	Shapiro Wilk Critical Value 0.881
	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	
95% Student's-t UCL 1.265	95% H-UCL 1.584
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 1.321	95% Chebyshev (MVUE) UCL 1.799
95% Modified-t UCL (Johnson-1978) 1.277	97.5% Chebyshev (MVUE) UCL 2.178
	99% Chebyshev (MVUE) UCL 2.922
Gamma Distribution Test	
k star (bias corrected) 1.57	Data Distribution
Theta Star 0.587	Data appear Gamma Distributed at 5% Significance Level
MLE of Mean 0.922	
MLE of Standard Deviation 0.736	
nu star 47.11	
Approximate Chi Square Value (.05) 32.36	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 1.242
Adjusted Chi Square Value 30.86	95% Jackknife UCL 1.265
Anderson-Darling Test Statistic 0.461	95% Standard Bootstrap UCL 1.224
	95% Bootstrap-t UCL 1.493

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Anderson-Darling 5% Critical Value 0.748	95% Hall's Bootstrap UCL 1.385
Kolmogorov-Smirnov Test Statistic 0.199	95% Percentile Bootstrap UCL 1.251
Kolmogorov-Smirnov 5% Critical Value 0.225	95% BCA Bootstrap UCL 1.313
Data appear Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
95% Approximate Gamma UCL 1.342	95% Chebyshev(Mean, Sd) UCL 1.771
95% Adjusted Gamma UCL 1.408	97.5% Chebyshev(Mean, Sd) UCL 2.138
Potential UCL to Use	
Use 95% Approximate Gamma UCL 1.342	

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). For additional insight, the user may want to consult a statistician.

Vanadium

General Statistics	
Number of Valid Observations	27
Number of Distinct Observations	27
Raw Statistics	
Minimum	17.7
Maximum	61.7
Mean	29.2
Median	28.7
SD	8.439
Std. Error of Mean	1.624
Coefficient of Variation	0.289
Skewness	2.159
Log-transformed Statistics	
Minimum of Log Data	2.874
Maximum of Log Data	4.122
Mean of log Data	3.341
SD of log Data	0.254
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic	0.826
Shapiro Wilk Critical Value	0.923
Data not Normal at 5% Significance Level	
Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.95
Shapiro Wilk Critical Value	0.923
Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution	
95% Student's-t UCL	31.97
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995)	32.59
95% Modified-t UCL (Johnson-1978)	32.08
Assuming Lognormal Distribution	
95% H-UCL	31.9
95% Chebyshev (MVUE) UCL	35.42
97.5% Chebyshev (MVUE) UCL	38.14
99% Chebyshev (MVUE) UCL	43.48

Table F-2
ProUCL Output - Area 2 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Gamma Distribution Test	Data Distribution
k star (bias corrected) 13.55	Data appear Gamma Distributed at 5% Significance Level
Theta Star 2.156	
MLE of Mean 29.2	
MLE of Standard Deviation 7.934	
nu star 731.5	
Approximate Chi Square Value (.05) 669.7	Nonparametric Statistics
Adjusted Level of Significance 0.0401	95% CLT UCL 31.87
Adjusted Chi Square Value 666	95% Jackknife UCL 31.97
Anderson-Darling Test Statistic 0.447	95% Standard Bootstrap UCL 31.83
Anderson-Darling 5% Critical Value 0.744	95% Bootstrap-t UCL 33.26
Kolmogorov-Smirnov Test Statistic 0.105	95% Hall's Bootstrap UCL 37.68
Kolmogorov-Smirnov 5% Critical Value 0.168	95% Percentile Bootstrap UCL 31.96
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 32.81
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 36.28
95% Approximate Gamma UCL 31.89	97.5% Chebyshev(Mean, Sd) UCL 39.34
95% Adjusted Gamma UCL 32.07	99% Chebyshev(Mean, Sd) UCL 45.36
Potential UCL to Use	Use 95% Approximate Gamma UCL 31.89

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). For additional insight, the user may want to consult a statistician.

Table F-3
ProUCL Output - Area 3 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Area3.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Number of Valid Observations	30	Number of Distinct Observations	26
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Raw Statistics

Minimum	0.064
Maximum	1.5
Mean	0.36
Median	0.26
SD	0.296
Std. Error of Mean	0.054
Coefficient of Variation	0.823
Skewness	2.238

Log-transformed Statistics

Minimum of Log Data	-2.749
Maximum of Log Data	0.405
Mean of log Data	-1.289
SD of log Data	0.742

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.793
Shapiro Wilk Critical Value	0.927

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.984
Shapiro Wilk Critical Value	0.927

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	0.452
---------------------	-------

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995)	0.472
95% Modified-t UCL (Johnson-1978)	0.455

Assuming Lognormal Distribution

95% H-UCL	0.49
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95% Chebyshev (MVUE) UCL	0.59
97.5% Chebyshev (MVUE) UCL	0.69
99% Chebyshev (MVUE) UCL	0.887

Gamma Distribution Test

k star (bias corrected)	1.846
Theta Star	0.195
MLE of Mean	0.36
MLE of Standard Deviation	0.265
nu star	110.8
Approximate Chi Square Value (.05)	87.47

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

Table F-3
ProUCL Output - Area 3 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Adjusted Level of Significance	0.041	95% CLT UCL	0.449
Adjusted Chi Square Value	86.28	95% Jackknife UCL	0.452
		95% Standard Bootstrap UCL	0.448
Anderson-Darling Test Statistic	0.337	95% Bootstrap-t UCL	0.488
Anderson-Darling 5% Critical Value	0.758	95% Hall's Bootstrap UCL	0.548
Kolmogorov-Smirnov Test Statistic	0.111	95% Percentile Bootstrap UCL	0.449
Kolmogorov-Smirnov 5% Critical Value	0.162	95% BCA Bootstrap UCL	0.475
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.595
		97.5% Chebyshev(Mean, Sd) UCL	0.697
		99% Chebyshev(Mean, Sd) UCL	0.897
Assuming Gamma Distribution			
95% Approximate Gamma UCL	0.456		
95% Adjusted Gamma UCL	0.462		
Potential UCL to Use		Use 95% Approximate Gamma UCL	0.456

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). For additional insight, the user may want to consult a statistician.

Benzo(a)pyrene

General Statistics	
Number of Valid Observations	30
Number of Distinct Observations	23
Raw Statistics	
Minimum	0.075
Maximum	1.8
Mean	0.386
Median	0.3
SD	0.336
Std. Error of Mean	0.0613
Coefficient of Variation	0.871
Skewness	2.815
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic	0.729
Shapiro Wilk Critical Value	0.927
Data not Normal at 5% Significance Level	
Log-transformed Statistics	
Minimum of Log Data	-2.59
Maximum of Log Data	0.588
Mean of log Data	-1.216
SD of log Data	0.723
Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.977
Shapiro Wilk Critical Value	0.927
Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution	
Assuming Lognormal Distribution	

Table F-3
ProUCL Output - Area 3 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

95% Student's-t UCL 0.49	95% H-UCL 0.514
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 0.52	95% Chebyshev (MVUE) UCL 0.619
95% Modified-t UCL (Johnson-1978) 0.495	97.5% Chebyshev (MVUE) UCL 0.721
	99% Chebyshev (MVUE) UCL 0.924
 Gamma Distribution Test	
k star (bias corrected) 1.869	Data appear Gamma Distributed at 5% Significance Level
Theta Star 0.206	
MLE of Mean 0.386	
MLE of Standard Deviation 0.282	
nu star 112.1	
Approximate Chi Square Value (.05) 88.69	Nonparametric Statistics
Adjusted Level of Significance 0.041	95% CLT UCL 0.486
Adjusted Chi Square Value 87.48	95% Jackknife UCL 0.49
Anderson-Darling Test Statistic 0.454	95% Standard Bootstrap UCL 0.486
Anderson-Darling 5% Critical Value 0.758	95% Bootstrap-t UCL 0.558
Kolmogorov-Smirnov Test Statistic 0.0889	95% Hall's Bootstrap UCL 0.964
Kolmogorov-Smirnov 5% Critical Value 0.162	95% Percentile Bootstrap UCL 0.49
Data appear Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
95% Approximate Gamma UCL 0.487	95% BCA Bootstrap UCL 0.525
95% Adjusted Gamma UCL 0.494	95% Chebyshev(Mean, Sd) UCL 0.653
 Potential UCL to Use	97.5% Chebyshev(Mean, Sd) UCL 0.769
	99% Chebyshev(Mean, Sd) UCL 0.996
	Use 95% Approximate Gamma UCL 0.487

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). For additional insight, the user may want to consult a statistician.

Benzo(b)fluoranthene

General Statistics	
Number of Valid Observations 30	Number of Distinct Observations 26
 Raw Statistics	
Minimum 0.099	Minimum of Log Data -2.313
Maximum 2.9	Maximum of Log Data 1.065
Mean 0.597	Mean of log Data -0.821
Median 0.455	SD of log Data 0.789
 Log-transformed Statistics	

Table F-3
ProUCL Output - Area 3 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

SD 0.551

Std. Error of Mean 0.101

Coefficient of Variation 0.923

Skewness 2.761

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.734

Shapiro Wilk Critical Value 0.927

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.986

Shapiro Wilk Critical Value 0.927

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 0.768

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 0.817

95% Modified-t UCL (Johnson-1978) 0.776

Assuming Lognormal Distribution

95% H-UCL 0.833

95% Chebyshev (MVUE) UCL 1.003

97.5% Chebyshev (MVUE) UCL 1.18

99% Chebyshev (MVUE) UCL 1.528

Gamma Distribution Test

k star (bias corrected) 1.633

Theta Star 0.366

MLE of Mean 0.597

MLE of Standard Deviation 0.467

nu star 97.97

Approximate Chi Square Value (.05) 76.14

Adjusted Level of Significance 0.041

Adjusted Chi Square Value 75.03

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 0.762

95% Jackknife UCL 0.768

95% Standard Bootstrap UCL 0.757

95% Bootstrap-t UCL 0.862

95% Hall's Bootstrap UCL 1.516

95% Percentile Bootstrap UCL 0.759

95% BCA Bootstrap UCL 0.808

95% Chebyshev(Mean, Sd) UCL 1.036

97.5% Chebyshev(Mean, Sd) UCL 1.225

99% Chebyshev(Mean, Sd) UCL 1.598

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 0.768

95% Adjusted Gamma UCL 0.78

Potential UCL to Use

Use 95% Approximate Gamma UCL 0.768

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). For additional insight, the user may want to consult a statistician.

Table F-3
ProUCL Output - Area 3 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Carbazole

General Statistics			
Number of Valid Data	16	Number of Detected Data	9
Number of Distinct Detected Data	7	Number of Non-Detect Data	7
Number of Missing Values	14	Percent Non-Detects	43.75%
Raw Statistics			
Minimum Detected	0.011	Minimum Detected	-4.51
Maximum Detected	0.17	Maximum Detected	-1.772
Mean of Detected	0.0731	Mean of Detected	-2.967
SD of Detected	0.053	SD of Detected	1.008
Minimum Non-Detect	0.35	Minimum Non-Detect	-1.05
Maximum Non-Detect	0.39	Maximum Non-Detect	-0.942

Note: Data have multiple DLs - Use of KM Method is recommended

Number treated as Non-Detect 16

For all methods (except KM, DL/2, and ROS Methods),

Number treated as Detected 0

Observations < Largest ND are treated as NDs

Single DL Non-Detect Percentage 100.00%

Warning: There are only 9 Detected Values in this data

**Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions**

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.939
5% Shapiro Wilk Critical Value	0.829

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.88
5% Shapiro Wilk Critical Value	0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.122
SD	0.0693
95% DL/2 (t) UCL	0.152

Maximum Likelihood Estimate(MLE) Method

MLE method failed to converge properly

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean	-2.407
SD	0.986
95% H-Stat (DL/2) UCL	0.29

Log ROS Method

Mean in Log Scale -2.967

Table F-3
ProUCL Output - Area 3 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

		SD in Log Scale	0.79	
		Mean in Original Scale	0.0657	
		SD in Original Scale	0.0432	
		95% t UCL	0.0847	
		95% Percentile Bootstrap UCL	0.0824	
		95% BCA Bootstrap UCL	0.085	
		95% H-UCL	0.115	
Gamma Distribution Test with Detected Values Only				
k star (bias corrected)	1.121	Data Distribution Test with Detected Values Only		
Theta Star	0.0652	Data appear Normal at 5% Significance Level		
nu star	20.18			
A-D Test Statistic	0.37	Nonparametric Statistics		
5% A-D Critical Value	0.734	Kaplan-Meier (KM) Method		
K-S Test Statistic	0.734	Mean	0.0731	
5% K-S Critical Value	0.284	SD	0.05	
Data appear Gamma Distributed at 5% Significance Level				
Assuming Gamma Distribution				
Gamma ROS Statistics using Extrapolated Data		SE of Mean	0.0177	
Minimum	0.011	95% KM (t) UCL	0.104	
Maximum	0.17	95% KM (z) UCL	0.102	
Mean	0.0734	95% KM (jackknife) UCL	0.105	
Median	0.0741	95% KM (bootstrap t) UCL	0.11	
SD	0.0423	95% KM (BCA) UCL	0.1	
k star	1.93	95% KM (Percentile Bootstrap) UCL	0.103	
Theta star	0.038	95% KM (Chebyshev) UCL	0.15	
Nu star	61.77	97.5% KM (Chebyshev) UCL	0.184	
AppChi2	44.69	99% KM (Chebyshev) UCL	0.249	
95% Gamma Approximate UCL	0.101	Potential UCLs to Use		
95% Adjusted Gamma UCL	0.105	95% KM (t) UCL	0.104	
		95% KM (Percentile Bootstrap) UCL	0.103	

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Dibenz(a,h)anthracene

General Statistics

Table F-3
ProUCL Output - Area 3 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Number of Valid Data	28	Number of Detected Data	20
Number of Distinct Detected Data	18	Number of Non-Detect Data	8
Number of Missing Values	2	Percent Non-Detects	28.57%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.017	Minimum Detected	-4.075
Maximum Detected	0.18	Maximum Detected	-1.715
Mean of Detected	0.0781	Mean of Detected	-2.782
SD of Detected	0.0519	SD of Detected	0.727
Minimum Non-Detect	0.25	Minimum Non-Detect	-1.386
Maximum Non-Detect	0.39	Maximum Non-Detect	-0.942

Note: Data have multiple DLs - Use of KM Method is recommended

For all methods (except KM, DL/2, and ROS Methods),

Observations < Largest ND are treated as NDs

Number treated as Non-Detect	28
Number treated as Detected	0
Single DL Non-Detect Percentage	100.00%

UCL Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.897
5% Shapiro Wilk Critical Value	0.905

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.946
5% Shapiro Wilk Critical Value	0.905

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.107
SD	0.0641
95% DL/2 (t) UCL	0.127

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean	-2.483
SD	0.78
95% H-Stat (DL/2) UCL	0.157

Maximum Likelihood Estimate(MLE) Method

MLE method failed to converge properly

N/A

Log ROS Method

Mean in Log Scale	-2.782
SD in Log Scale	0.627
Mean in Original Scale	0.0741
SD in Original Scale	0.0451
95% t UCL	0.0886
95% Percentile Bootstrap UCL	0.0882
95% BCA Bootstrap UCL	0.0893
95% H-UCL	0.0966

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.996
Theta Star	0.0391
nu star	79.82

Data Distribution Test with Detected Values Only

Data appear Gamma Distributed at 5% Significance Level

Table F-3
ProUCL Output - Area 3 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

A-D Test Statistic	0.412	Nonparametric Statistics		
5% A-D Critical Value	0.751	Kaplan-Meier (KM) Method		
K-S Test Statistic	0.751	Mean		
5% K-S Critical Value	0.196	SD		
Data appear Gamma Distributed at 5% Significance Level		SE of Mean		
		95% KM (t) UCL		
Assuming Gamma Distribution		95% KM (z) UCL		
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL		
Minimum	0.017	95% KM (bootstrap t) UCL		
Maximum	0.18	95% KM (BCA) UCL		
Mean	0.0796	95% KM (Percentile Bootstrap) UCL		
Median	0.0845	95% KM (Chebyshev) UCL		
SD	0.0449	97.5% KM (Chebyshev) UCL		
k star	2.697	99% KM (Chebyshev) UCL		
Theta star	0.0295			
Nu star	151	Potential UCLs to Use		
AppChi2	123.6	95% KM (Percentile Bootstrap) UCL		
95% Gamma Approximate UCL	0.0972			
95% Adjusted Gamma UCL	0.0985			

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Indeno(1,2,3-cd)pyrene

General Statistics		
Number of Valid Observations	30	Number of Distinct Observations
Raw Statistics		Log-transformed Statistics
Minimum	0.07	Minimum of Log Data
Maximum	1.2	0.182
Mean	0.288	Mean of log Data
Median	0.24	-1.478
SD	0.228	SD of log Data
Std. Error of Mean	0.0417	0.685
Coefficient of Variation	0.793	
Skewness	2.485	

Table F-3
ProUCL Output - Area 3 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.764	Shapiro Wilk Test Statistic 0.969
Shapiro Wilk Critical Value 0.927	Shapiro Wilk Critical Value 0.927
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 0.359	95% H-UCL 0.377
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 0.453
95% Adjusted-CLT UCL (Chen-1995) 0.377	97.5% Chebyshev (MVUE) UCL 0.526
95% Modified-t UCL (Johnson-1978) 0.362	99% Chebyshev (MVUE) UCL 0.669
Gamma Distribution Test	Data Distribution
k star (bias corrected) 2.093	Data appear Gamma Distributed at 5% Significance Level
Theta Star 0.137	
MLE of Mean 0.288	
MLE of Standard Deviation 0.199	
nu star 125.6	
Approximate Chi Square Value (.05) 100.7	
Adjusted Level of Significance 0.041	Nonparametric Statistics
Adjusted Chi Square Value 99.43	95% CLT UCL 0.356
Anderson-Darling Test Statistic 0.452	95% Jackknife UCL 0.359
Anderson-Darling 5% Critical Value 0.757	95% Standard Bootstrap UCL 0.354
Kolmogorov-Smirnov Test Statistic 0.103	95% Bootstrap-t UCL 0.395
Kolmogorov-Smirnov 5% Critical Value 0.162	95% Hall's Bootstrap UCL 0.509
Data appear Gamma Distributed at 5% Significance Level	95% Percentile Bootstrap UCL 0.358
Assuming Gamma Distribution	95% BCA Bootstrap UCL 0.383
95% Approximate Gamma UCL 0.359	95% Chebyshev(Mean, Sd) UCL 0.469
95% Adjusted Gamma UCL 0.364	97.5% Chebyshev(Mean, Sd) UCL 0.548
Potential UCL to Use	99% Chebyshev(Mean, Sd) UCL 0.703
	Use 95% Approximate Gamma UCL 0.359

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). For additional insight, the user may want to consult a statistician.

Antimony

General Statistics

Table F-3
ProUCL Output - Area 3 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Number of Valid Data	30	Number of Detected Data	27
Number of Distinct Detected Data	22	Number of Non-Detect Data	3
		Percent Non-Detects	10.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.22	Minimum Detected	-1.514
Maximum Detected	2.1	Maximum Detected	0.742
Mean of Detected	0.537	Mean of Detected	-0.74
SD of Detected	0.351	SD of Detected	0.454
Minimum Non-Detect	0.44	Minimum Non-Detect	-0.821
Maximum Non-Detect	0.47	Maximum Non-Detect	-0.755

Note: Data have multiple DLs - Use of KM Method is recommended

For all methods (except KM, DL/2, and ROS Methods),

Observations < Largest ND are treated as NDs

Number treated as Non-Detect	16
Number treated as Detected	14
Single DL Non-Detect Percentage	53.33%

UCL Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.622
5% Shapiro Wilk Critical Value	0.923

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.924
5% Shapiro Wilk Critical Value	0.923

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.506
SD	0.346
95% DL/2 (t) UCL	0.614

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean	-0.814
SD	0.486
95% H-Stat (DL/2) UCL	0.594

Maximum Likelihood Estimate(MLE) Method

Mean	0.342
SD	0.5
95% MLE (t) UCL	0.497
95% MLE (Tiku) UCL	0.544

Log ROS Method

Mean in Log Scale	-0.778
SD in Log Scale	0.446
Mean in Original Scale	0.516
SD in Original Scale	0.339
95% t UCL	0.621
95% Percentile Bootstrap UCL	0.633
95% BCA Bootstrap UCL	0.675
95% H UCL	0.594

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	3.905
Theta Star	0.138
nu star	210.9

Data Distribution Test with Detected Values Only

Data Follow Appr. Gamma Distribution at 5% Significance Level

Table F-3
ProUCL Output - Area 3 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

A-D Test Statistic	0.984	Nonparametric Statistics			
5% A-D Critical Value	0.748	Kaplan-Meier (KM) Method			
K-S Test Statistic	0.748	Mean 0.517			
5% K-S Critical Value	0.169	SD 0.333			
Data follow Appr. Gamma Distribution at 5% Significance Level					
Assuming Gamma Distribution					
Gamma ROS Statistics using Extrapolated Data					
Minimum	0.22	95% KM (t) UCL 0.623			
Maximum	2.1	95% KM (z) UCL 0.619			
Mean	0.518	95% KM (jackknife) UCL 0.622			
Median	0.455	95% KM (bootstrap t) UCL 0.725			
SD	0.338	95% KM (BCA) UCL 0.634			
k star	4.072	95% KM (Percentile Bootstrap) UCL 0.629			
Theta star	0.127	95% KM (Chebyshev) UCL 0.788			
Nu star	244.3	97.5% KM (Chebyshev) UCL 0.905			
AppChi2	209.1	99% KM (Chebyshev) UCL 1.136			
95% Gamma Approximate UCL	0.605	Potential UCLs to Use			
95% Adjusted Gamma UCL	0.611	95% KM (BCA) UCL	0.634		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Arsenic

General Statistics		
Number of Valid Observations	30	Number of Distinct Observations
Raw Statistics		
Minimum	3.6	Minimum of Log Data
Maximum	132	4.883
Mean	13.16	Mean of log Data 2.091
Median	6.3	SD of log Data 0.753
SD	24.25	
Std. Error of Mean	4.428	
Coefficient of Variation	1.843	
Skewness	4.497	

Table F-3
ProUCL Output - Area 3 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
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Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.373	Shapiro Wilk Test Statistic 0.741
Shapiro Wilk Critical Value 0.927	Shapiro Wilk Critical Value 0.927
Data not Normal at 5% Significance Level	Data not Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 20.69	95% H-UCL 14.6
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 17.58
95% Adjusted-CLT UCL (Chen-1995) 24.33	97.5% Chebyshev (MVUE) UCL 20.59
95% Modified-t UCL (Johnson-1978) 21.29	99% Chebyshev (MVUE) UCL 26.5
Gamma Distribution Test	Data Distribution
k star (bias corrected) 1.072	Data do not follow a Discernable Distribution (0.05)
Theta Star 12.28	
MLE of Mean 13.16	
MLE of Standard Deviation 12.71	
nu star 64.33	
Approximate Chi Square Value (.05) 46.88	Nonparametric Statistics
Adjusted Level of Significance 0.041	95% CLT UCL 20.45
Adjusted Chi Square Value 46.02	95% Jackknife UCL 20.69
Anderson-Darling Test Statistic 4.574	95% Standard Bootstrap UCL 20.33
Anderson-Darling 5% Critical Value 0.771	95% Bootstrap-t UCL 54.51
Kolmogorov-Smirnov Test Statistic 0.305	95% Hall's Bootstrap UCL 48.01
Kolmogorov-Smirnov 5% Critical Value 0.164	95% Percentile Bootstrap UCL 21.36
Data not Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 25.64
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 32.46
95% Approximate Gamma UCL 18.06	97.5% Chebyshev(Mean, Sd) UCL 40.82
95% Adjusted Gamma UCL 18.4	99% Chebyshev(Mean, Sd) UCL 57.22
Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL 32.46

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). For additional insight, the user may want to consult a statistician.

Table F-3
ProUCL Output - Area 3 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Number of Valid Observations 30	Number of Distinct Observations 22
Raw Statistics	Log-transformed Statistics
Minimum 2.9	Minimum of Log Data 1.065
Maximum 23.7	Maximum of Log Data 3.165
Mean 5.777	Mean of log Data 1.666
Median 5.35	SD of log Data 0.366
SD 3.574	
Std. Error of Mean 0.653	
Coefficient of Variation 0.619	
Skewness 4.602	
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.48	Shapiro Wilk Test Statistic 0.804
Shapiro Wilk Critical Value 0.927	Shapiro Wilk Critical Value 0.927
Data not Normal at 5% Significance Level	Data not Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 6.885	95% H-UCL 6.418
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 7.331
95% Adjusted-CLT UCL (Chen-1995) 7.436	97.5% Chebyshev (MVUE) UCL 8.06
95% Modified-t UCL (Johnson-1978) 6.977	99% Chebyshev (MVUE) UCL 9.492
Gamma Distribution Test	Data Distribution
k star (bias corrected) 5.315	Data do not follow a Discernable Distribution (0.05)
Theta Star 1.087	
MLE of Mean 5.777	
MLE of Standard Deviation 2.506	
nu star 318.9	
Approximate Chi Square Value (.05) 278.5	
Adjusted Level of Significance 0.041	Nonparametric Statistics
Adjusted Chi Square Value 276.4	95% CLT UCL 6.85
Anderson-Darling Test Statistic 2.319	95% Jackknife UCL 6.885
Anderson-Darling 5% Critical Value 0.746	95% Standard Bootstrap UCL 6.823
Kolmogorov-Smirnov Test Statistic 0.24	95% Bootstrap-t UCL 8.555
Kolmogorov-Smirnov 5% Critical Value 0.16	95% Hall's Bootstrap UCL 11.34
Data not Gamma Distributed at 5% Significance Level	95% Percentile Bootstrap UCL 6.963
Assuming Gamma Distribution	95% BCA Bootstrap UCL 7.643
95% Approximate Gamma UCL 6.614	95% Chebyshev(Mean, Sd) UCL 8.621
	97.5% Chebyshev(Mean, Sd) UCL 9.852
	99% Chebyshev(Mean, Sd) UCL 12.27

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95% Adjusted Gamma UCL 6.666

Potential UCL to Use	Use 95% Student's-t UCL 6.885 or 95% Modified-t UCL 6.977
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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). For additional insight, the user may want to consult a statistician.

Thallium

General Statistics			
Number of Valid Data	30	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	24
		Percent Non-Detects	80.00%
Raw Statistics			
Minimum Detected	0.12	Minimum Detected	-2.12
Maximum Detected	0.2	Maximum Detected	-1.609
Mean of Detected	0.15	Mean of Detected	-1.911
SD of Detected	0.0283	SD of Detected	0.179
Minimum Non-Detect	0.16	Minimum Non-Detect	-1.833
Maximum Non-Detect	5.9	Maximum Non-Detect	1.775
Note: Data have multiple DLs - Use of KM Method is recommended			
For all methods (except KM, DL/2, and ROS Methods),			
Observations < Largest ND are treated as NDs			
			Number treated as Non-Detect
			30
			Number treated as Detected
			0
			Single DL Non-Detect Percentage
			100.00%

Warning: There are only 6 Detected Values in this data

**Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions**

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.922	Shapiro Wilk Test Statistic	0.96
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Table F-3
ProUCL Output - Area 3 Surface Soil
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Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.381	Mean	-1.535
SD	0.544	SD	1.024
95% DL/2 (t) UCL	0.549	95% H-Stat (DL/2) UCL	0.587
Maximum Likelihood Estimate(MLE) Method MLE method failed to converge properly		Log ROS Method Mean in Log Scale SD in Log Scale Mean in Original Scale SD in Original Scale 95% t UCL 95% Percentile Bootstrap UCL 95% BCA Bootstrap UCL 95% H-UCL	
		0.118	0.14
		0.0174	0.0145
		0.145	0.145
		0.146	0.146
		0.145	0.145
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)		Data appear Normal at 5% Significance Level	
Theta Star			
nu star			
A-D Test Statistic		Nonparametric Statistics	
5% A-D Critical Value		Kaplan-Meier (KM) Method	
K-S Test Statistic		Mean	
5% K-S Critical Value		SD	
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	
Assuming Gamma Distribution		95% KM (t) UCL	
Gamma ROS Statistics using Extrapolated Data		95% KM (z) UCL	
Minimum		95% KM (jackknife) UCL	
Maximum		95% KM (bootstrap t) UCL	
Mean		95% KM (BCA) UCL	
Median		95% KM (Percentile Bootstrap) UCL	
SD		95% KM (Chebyshev) UCL	
k star		97.5% KM (Chebyshev) UCL	
Theta star		99% KM (Chebyshev) UCL	
Nu star		Potential UCLs to Use	
AppChi2		95% KM (t) UCL	
95% Gamma Approximate UCL		95% KM (Percentile Bootstrap) UCL	
95% Adjusted Gamma UCL		0.152	0.153

Note: DL/2 is not a recommended method.

Table F-3
ProUCL Output - Area 3 Surface Soil
Second Supplemental Remedial Investigation
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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, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Benzo(k)fluoranthene

General Statistics					
Number of Valid Data	30	Number of Detected Data	18		
Number of Distinct Detected Data	13	Number of Non-Detect Data	12		
		Percent Non-Detects	40.00%		
Raw Statistics					
Minimum Detected	0.057	Minimum Detected	-2.865		
Maximum Detected	0.54	Maximum Detected	-0.616		
Mean of Detected	0.21	Mean of Detected	-1.731		
SD of Detected	0.125	SD of Detected	0.625		
Minimum Non-Detect	0.0019	Minimum Non-Detect	-6.266		
Maximum Non-Detect	0.21	Maximum Non-Detect	-1.561		
Note: Data have multiple DLs - Use of KM Method is recommended					
For all methods (except KM, DL/2, and ROS Methods),					
Observations < Largest ND are treated as NDs					
Log-transformed Statistics					
UCL Statistics					
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only			
Shapiro Wilk Test Statistic	0.896	Shapiro Wilk Test Statistic	0.943		
5% Shapiro Wilk Critical Value	0.897	5% Shapiro Wilk Critical Value	0.897		
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level			
Assuming Normal Distribution					
DL/2 Substitution Method					
Mean	0.131	DL/2 Substitution Method			
SD	0.139	Mean	-3.406		
95% DL/2 (t) UCL	0.174	SD	2.316		
95% H-Stat (DL/2) UCL					
Assuming Lognormal Distribution					
Log ROS Method					
Mean	0.357	Mean in Log Scale	-2.29		
SD	0.101	SD in Log Scale	0.868		
95% MLE (t) UCL	0.388	Mean in Original Scale	0.144		
95% MLE (Tiku) UCL	0.42	SD in Original Scale	0.126		
		95% t UCL	0.184		

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ProUCL Output - Area 3 Surface Soil
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		95% Percentile Bootstrap UCL	0.183
		95% BCA Bootstrap UCL	0.188
		95% H UCL	0.214
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
			Data appear Gamma Distributed at 5% Significance Level
k star (bias corrected)	2.609		
Theta Star	0.0805		
nu star	93.94		
		Nonparametric Statistics	
A-D Test Statistic	0.366		
5% A-D Critical Value	0.745		
K-S Test Statistic	0.745		
5% K-S Critical Value	0.205		
Data appear Gamma Distributed at 5% Significance Level		Mean	0.15
		SD	0.12
		SE of Mean	0.0226
		95% KM (t) UCL	0.189
		95% KM (z) UCL	0.187
Assuming Gamma Distribution		95% KM (jackknife) UCL	0.187
Gamma ROS Statistics using Extrapolated Data		95% KM (bootstrap t) UCL	0.195
Minimum	0.000001	95% KM (BCA) UCL	0.191
Maximum	0.54	95% KM (Percentile Bootstrap) UCL	0.192
Mean	0.126	95% KM (Chebyshev) UCL	0.249
Median	0.092	97.5% KM (Chebyshev) UCL	0.291
SD	0.142	99% KM (Chebyshev) UCL	0.375
k star	0.174		
Theta star	0.726		
Nu star	10.41	Potential UCLs to Use	
AppChi2	4.202	95% KM (t) UCL	0.189
95% Gamma Approximate UCL	0.312		
95% Adjusted Gamma UCL	0.33		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Chrysene

General Statistics		
Number of Valid Observations	30	Number of Distinct Observations
Raw Statistics		
Minimum	0.072	Minimum of Log Data
Log-transformed Statistics		
-2.631		

Table F-3
ProUCL Output - Area 3 Surface Soil
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Maximum 2	Maximum of Log Data 0.693
Mean 0.437	Mean of log Data -1.115
Median 0.355	SD of log Data 0.773
SD 0.384	
Std. Error of Mean 0.0701	
Coefficient of Variation 0.877	
Skewness 2.588	

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.754
 Shapiro Wilk Critical Value 0.927

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.979
 Shapiro Wilk Critical Value 0.927

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 0.556

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 0.588
 95% Modified-t UCL (Johnson-1978) 0.562

Assuming Lognormal Distribution

95% H-UCL 0.607

95% Chebyshev (MVUE) UCL 0.731
 97.5% Chebyshev (MVUE) UCL 0.859
 99% Chebyshev (MVUE) UCL 1.109

Gamma Distribution Test

k star (bias corrected) 1.72
 Theta Star 0.254
 MLE of Mean 0.437
 MLE of Standard Deviation 0.333
 nu star 103.2
 Approximate Chi Square Value (.05) 80.77
 Adjusted Level of Significance 0.041
 Adjusted Chi Square Value 79.62

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Anderson-Darling Test Statistic 0.389
 Anderson-Darling 5% Critical Value 0.76
 Kolmogorov-Smirnov Test Statistic 0.13
 Kolmogorov-Smirnov 5% Critical Value 0.162

Nonparametric Statistics

Data appear Gamma Distributed at 5% Significance Level

95% CLT UCL 0.553
 95% Jackknife UCL 0.556
 95% Standard Bootstrap UCL 0.551
 95% Bootstrap-t UCL 0.629
 95% Hall's Bootstrap UCL 1.066
 95% Percentile Bootstrap UCL 0.556
 95% BCA Bootstrap UCL 0.589
 95% Chebyshev(Mean, Sd) UCL 0.743
 97.5% Chebyshev(Mean, Sd) UCL 0.875
 99% Chebyshev(Mean, Sd) UCL 1.134

Assuming Gamma Distribution

95% Approximate Gamma UCL 0.559
 95% Adjusted Gamma UCL 0.567

Potential UCL to Use

Use 95% Approximate Gamma UCL 0.559

Table F-3
ProUCL Output - Area 3 Surface Soil
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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). For additional insight, the user may want to consult a statistician.

Aluminum

General Statistics	
Number of Valid Observations 30	Number of Distinct Observations 29
Raw Statistics	
Minimum 6070	Minimum of Log Data 8.711
Maximum 38200	Maximum of Log Data 10.55
Mean 10362	Mean of log Data 9.171
Median 9545	SD of log Data 0.343
SD 5697	
Std. Error of Mean 1040	
Coefficient of Variation 0.55	
Skewness 4.285	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.522	Shapiro Wilk Test Statistic 0.804
Shapiro Wilk Critical Value 0.927	Shapiro Wilk Critical Value 0.927
Data not Normal at 5% Significance Level	Data not Lognormal at 5% Significance Level
Assuming Normal Distribution	
95% Student's-t UCL 12129	95% H-UCL 11459
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 12943	95% Chebyshev (MVUE) UCL 13011
95% Modified-t UCL (Johnson-1978) 12265	97.5% Chebyshev (MVUE) UCL 14238
	99% Chebyshev (MVUE) UCL 16649
Gamma Distribution Test	
k star (bias corrected) 6.164	Data Distribution
Theta Star 1681	Data do not follow a Discernable Distribution (0.05)
MLE of Mean 10362	
MLE of Standard Deviation 4174	
nu star 369.8	
Approximate Chi Square Value (.05) 326.3	Nonparametric Statistics
Adjusted Level of Significance 0.041	95% CLT UCL 12073
Adjusted Chi Square Value 323.9	95% Jackknife UCL 12129
	95% Standard Bootstrap UCL 12004

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Anderson-Darling Test Statistic 2.237	95% Bootstrap-t UCL 14661
Anderson-Darling 5% Critical Value 0.746	95% Hall's Bootstrap UCL 19018
Kolmogorov-Smirnov Test Statistic 0.245	95% Percentile Bootstrap UCL 12235
Kolmogorov-Smirnov 5% Critical Value 0.16	95% BCA Bootstrap UCL 13246
Data not Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 14896
	97.5% Chebyshev(Mean, Sd) UCL 16858
	99% Chebyshev(Mean, Sd) UCL 20712
Assuming Gamma Distribution	
95% Approximate Gamma UCL 11746	
95% Adjusted Gamma UCL 11831	
Potential UCL to Use	Use 95% Student's-t UCL 12129 or 95% Modified-t UCL 12265

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). For additional insight, the user may want to consult a statistician.

Barium

General Statistics	
Number of Valid Observations 30	Number of Distinct Observations 30
Raw Statistics	
Minimum 33.4	Minimum of Log Data 3.509
Maximum 390	Maximum of Log Data 5.966
Mean 59.56	Mean of log Data 3.934
Median 48.05	SD of log Data 0.412
SD 62.83	
Std. Error of Mean 11.47	
Coefficient of Variation 1.055	
Skewness 5.362	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.28	Shapiro Wilk Test Statistic 0.522
Shapiro Wilk Critical Value 0.927	Shapiro Wilk Critical Value 0.927
Data not Normal at 5% Significance Level	Data not Lognormal at 5% Significance Level
Assuming Normal Distribution	
95% Student's-t UCL 79.05	95% H-UCL 64.25
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 74.2

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ProUCL Output - Area 3 Surface Soil
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95% Adjusted-CLT UCL (Chen-1995) 90.43	97.5% Chebyshev (MVUE) UCL 82.31
95% Modified-t UCL (Johnson-1978) 80.92	99% Chebyshev (MVUE) UCL 98.24
Gamma Distribution Test	Data Distribution
k star (bias corrected) 3.097	Data do not follow a Discernable Distribution (0.05)
Theta Star 19.23	
MLE of Mean 59.56	
MLE of Standard Deviation 33.85	
nu star 185.8	
Approximate Chi Square Value (.05) 155.3	Nonparametric Statistics
Adjusted Level of Significance 0.041	95% CLT UCL 78.43
Adjusted Chi Square Value 153.7	95% Jackknife UCL 79.05
Anderson-Darling Test Statistic 6.123	95% Standard Bootstrap UCL 78.4
Anderson-Darling 5% Critical Value 0.751	95% Bootstrap-t UCL 190.3
Kolmogorov-Smirnov Test Statistic 0.395	95% Hall's Bootstrap UCL 183
Kolmogorov-Smirnov 5% Critical Value 0.161	95% Percentile Bootstrap UCL 82.13
Data not Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 94.96
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 109.6
95% Approximate Gamma UCL 71.28	97.5% Chebyshev(Mean, Sd) UCL 131.2
95% Adjusted Gamma UCL 72.02	99% Chebyshev(Mean, Sd) UCL 173.7
Potential UCL to Use	Use 95% Student's-t UCL 79.05 or 95% Modified-t UCL 80.92

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). For additional insight, the user may want to consult a statistician.

Cadmium

General Statistics	
Number of Valid Observations 27	Number of Distinct Observations 24
Number of Missing Values 3	
Raw Statistics	Log-transformed Statistics
Minimum 0.02	Minimum of Log Data -3.912
Maximum 8.6	Maximum of Log Data 2.152
Mean 0.561	Mean of log Data -1.58
Median 0.19	SD of log Data 1.145

Table F-3
ProUCL Output - Area 3 Surface Soil
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SD 1.622

Std. Error of Mean 0.312

Coefficient of Variation 2.891

Skewness 5.047

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.296

Shapiro Wilk Critical Value 0.923

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.928

Shapiro Wilk Critical Value 0.923

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 1.093

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 1.398

95% Modified-t UCL (Johnson-1978) 1.144

Assuming Lognormal Distribution

95% H-UCL 0.731

95% Chebyshev (MVUE) UCL 0.813

97.5% Chebyshev (MVUE) UCL 1

99% Chebyshev (MVUE) UCL 1.366

Gamma Distribution Test

k star (bias corrected) 0.571

Theta Star 0.983

MLE of Mean 0.561

MLE of Standard Deviation 0.742

nu star 30.83

Approximate Chi Square Value (.05) 19.15

Adjusted Level of Significance 0.0401

Adjusted Chi Square Value 18.56

Data Distribution

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 1.074

95% Jackknife UCL 1.093

95% Standard Bootstrap UCL 1.063

95% Bootstrap-t UCL 4.386

95% Hall's Bootstrap UCL 2.924

95% Percentile Bootstrap UCL 1.178

95% BCA Bootstrap UCL 1.507

95% Chebyshev(Mean, Sd) UCL 1.921

97.5% Chebyshev(Mean, Sd) UCL 2.51

99% Chebyshev(Mean, Sd) UCL 3.666

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 0.903

95% Adjusted Gamma UCL 0.932

Potential UCL to Use

Use 95% H-UCL 0.731

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.

H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.

It is therefore recommended to avoid the use of H-statistic based 95% UCLs.

Table F-3
ProUCL Output - Area 3 Surface Soil
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Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

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). For additional insight, the user may want to consult a statistician.

Chromium

General Statistics																	
Number of Valid Observations 30	Number of Distinct Observations 25																
Raw Statistics	Log-transformed Statistics																
<table border="0"> <tr> <td style="width: 50%;">Minimum 15</td><td style="width: 50%;">Minimum of Log Data 2.708</td></tr> <tr> <td>Maximum 136</td><td>Maximum of Log Data 4.913</td></tr> <tr> <td>Mean 24.68</td><td>Mean of log Data 3.067</td></tr> <tr> <td>Median 19.8</td><td>SD of log Data 0.416</td></tr> <tr> <td>SD 22.19</td><td></td></tr> <tr> <td>Std. Error of Mean 4.052</td><td></td></tr> <tr> <td>Coefficient of Variation 0.899</td><td></td></tr> <tr> <td>Skewness 4.75</td><td></td></tr> </table>		Minimum 15	Minimum of Log Data 2.708	Maximum 136	Maximum of Log Data 4.913	Mean 24.68	Mean of log Data 3.067	Median 19.8	SD of log Data 0.416	SD 22.19		Std. Error of Mean 4.052		Coefficient of Variation 0.899		Skewness 4.75	
Minimum 15	Minimum of Log Data 2.708																
Maximum 136	Maximum of Log Data 4.913																
Mean 24.68	Mean of log Data 3.067																
Median 19.8	SD of log Data 0.416																
SD 22.19																	
Std. Error of Mean 4.052																	
Coefficient of Variation 0.899																	
Skewness 4.75																	
Relevant UCL Statistics																	
Normal Distribution Test	Lognormal Distribution Test																
Shapiro Wilk Test Statistic 0.349	Shapiro Wilk Test Statistic 0.552																
Shapiro Wilk Critical Value 0.927	Shapiro Wilk Critical Value 0.927																
Data not Normal at 5% Significance Level																	
<table border="0"> <tr> <td style="width: 50%;">Assuming Normal Distribution</td><td style="width: 50%;">Assuming Lognormal Distribution</td></tr> <tr> <td>95% Student's-t UCL 31.56</td><td>95% H-UCL 27.1</td></tr> <tr> <td colspan="2">95% UCLs (Adjusted for Skewness)</td></tr> <tr> <td>95% Adjusted-CLT UCL (Chen-1995) 35.1</td><td>95% Chebyshev (MVUE) UCL 31.32</td></tr> <tr> <td>95% Modified-t UCL (Johnson-1978) 32.15</td><td>97.5% Chebyshev (MVUE) UCL 34.77</td></tr> <tr> <td></td><td>99% Chebyshev (MVUE) UCL 41.54</td></tr> </table>		Assuming Normal Distribution	Assuming Lognormal Distribution	95% Student's-t UCL 31.56	95% H-UCL 27.1	95% UCLs (Adjusted for Skewness)		95% Adjusted-CLT UCL (Chen-1995) 35.1	95% Chebyshev (MVUE) UCL 31.32	95% Modified-t UCL (Johnson-1978) 32.15	97.5% Chebyshev (MVUE) UCL 34.77		99% Chebyshev (MVUE) UCL 41.54				
Assuming Normal Distribution	Assuming Lognormal Distribution																
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95% UCLs (Adjusted for Skewness)																	
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	99% Chebyshev (MVUE) UCL 41.54																
<table border="0"> <tr> <td style="width: 50%;">Gamma Distribution Test</td><td style="width: 50%;">Data Distribution</td></tr> <tr> <td>k star (bias corrected) 3.41</td><td></td></tr> <tr> <td>Theta Star 7.237</td><td>Data do not follow a Discernable Distribution (0.05)</td></tr> <tr> <td>MLE of Mean 24.68</td><td></td></tr> <tr> <td>MLE of Standard Deviation 13.36</td><td></td></tr> <tr> <td>nu star 204.6</td><td></td></tr> <tr> <td>Approximate Chi Square Value (.05) 172.5</td><td></td></tr> <tr> <td>Adjusted Level of Significance 0.041</td><td></td></tr> </table>		Gamma Distribution Test	Data Distribution	k star (bias corrected) 3.41		Theta Star 7.237	Data do not follow a Discernable Distribution (0.05)	MLE of Mean 24.68		MLE of Standard Deviation 13.36		nu star 204.6		Approximate Chi Square Value (.05) 172.5		Adjusted Level of Significance 0.041	
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Nonparametric Statistics																	
95% CLT UCL 31.34																	

Table F-3
ProUCL Output - Area 3 Surface Soil
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Adjusted Chi Square Value 170.8	95% Jackknife UCL 31.56
	95% Standard Bootstrap UCL 31.16
Anderson-Darling Test Statistic 5.864	95% Bootstrap-t UCL 75.43
Anderson-Darling 5% Critical Value 0.75	95% Hall's Bootstrap UCL 66.16
Kolmogorov-Smirnov Test Statistic 0.373	95% Percentile Bootstrap UCL 31.95
Kolmogorov-Smirnov 5% Critical Value 0.161	95% BCA Bootstrap UCL 38.35
Data not Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 42.34
	97.5% Chebyshev(Mean, Sd) UCL 49.98
Assuming Gamma Distribution	99% Chebyshev(Mean, Sd) UCL 65
95% Approximate Gamma UCL 29.27	
95% Adjusted Gamma UCL 29.56	
Potential UCL to Use	Use 95% Student's-t UCL 31.56 or 95% Modified-t UCL 32.15

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). For additional insight, the user may want to consult a statistician.

Copper

General Statistics	
Number of Valid Observations 30	Number of Distinct Observations 29
Raw Statistics	
Minimum 19.5	Minimum of Log Data 2.97
Maximum 268	Maximum of Log Data 5.591
Mean 44.36	Mean of log Data 3.597
Median 33.1	SD of log Data 0.522
SD 45.21	
Std. Error of Mean 8.254	
Coefficient of Variation 1.019	
Skewness 4.489	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.453	Shapiro Wilk Test Statistic 0.802
Shapiro Wilk Critical Value 0.927	Shapiro Wilk Critical Value 0.927
Data not Normal at 5% Significance Level	Data not Lognormal at 5% Significance Level
Assuming Normal Distribution	
Assuming Lognormal Distribution	

Table F-3
ProUCL Output - Area 3 Surface Soil
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95% Student's-t UCL 58.38	95% H-UCL 50.59
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 65.16	95% Chebyshev (MVUE) UCL 59.68
95% Modified-t UCL (Johnson-1978) 59.51	97.5% Chebyshev (MVUE) UCL 67.5
	99% Chebyshev (MVUE) UCL 82.88
 Gamma Distribution Test	
k star (bias corrected) 2.465	Data Distribution
Theta Star 17.99	Data do not follow a Discernable Distribution (0.05)
MLE of Mean 44.36	
MLE of Standard Deviation 28.25	
nu star 147.9	
Approximate Chi Square Value (.05) 120.8	Nonparametric Statistics
Adjusted Level of Significance 0.041	95% CLT UCL 57.93
Adjusted Chi Square Value 119.4	95% Jackknife UCL 58.38
Anderson-Darling Test Statistic 2.941	95% Standard Bootstrap UCL 57.84
Anderson-Darling 5% Critical Value 0.754	95% Bootstrap-t UCL 85.15
Kolmogorov-Smirnov Test Statistic 0.284	95% Hall's Bootstrap UCL 104.6
Kolmogorov-Smirnov 5% Critical Value 0.161	95% Percentile Bootstrap UCL 59.29
Data not Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 68.7
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 80.33
95% Approximate Gamma UCL 54.31	97.5% Chebyshev(Mean, Sd) UCL 95.9
95% Adjusted Gamma UCL 54.95	99% Chebyshev(Mean, Sd) UCL 126.5
Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL 80.33

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). For additional insight, the user may want to consult a statistician.

Lead

General Statistics	
Number of Valid Observations 30	Number of Distinct Observations 28
Raw Statistics	
Minimum 45	Minimum of Log Data 3.807
Maximum 2140	Maximum of Log Data 7.669
Mean 213.3	Mean of log Data 4.935
Median 122	SD of log Data 0.735
Log-transformed Statistics	

Table F-3
ProUCL Output - Area 3 Surface Soil
Second Supplemental Remedial Investigation
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SD 375.3

Std. Error of Mean 68.53

Coefficient of Variation 1.76

Skewness 4.988

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.366

Shapiro Wilk Critical Value 0.927

Data not Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 329.7

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 392.7

95% Modified-t UCL (Johnson-1978) 340.1

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.858

Shapiro Wilk Critical Value 0.927

Data not Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL 245

95% Chebyshev (MVUE) UCL 294.9

97.5% Chebyshev (MVUE) UCL 344.5

99% Chebyshev (MVUE) UCL 442

Gamma Distribution Test

k star (bias corrected) 1.203

Theta Star 177.3

MLE of Mean 213.3

MLE of Standard Deviation 194.4

nu star 72.19

Approximate Chi Square Value (.05) 53.62

Adjusted Level of Significance 0.041

Adjusted Chi Square Value 52.7

Anderson-Darling Test Statistic 3.026

Anderson-Darling 5% Critical Value 0.768

Kolmogorov-Smirnov Test Statistic 0.271

Kolmogorov-Smirnov 5% Critical Value 0.164

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL 326

95% Jackknife UCL 329.7

95% Standard Bootstrap UCL 325.5

95% Bootstrap-t UCL 685.9

95% Hall's Bootstrap UCL 710.3

95% Percentile Bootstrap UCL 342.1

95% BCA Bootstrap UCL 440.5

95% Chebyshev(Mean, Sd) UCL 512

97.5% Chebyshev(Mean, Sd) UCL 641.2

99% Chebyshev(Mean, Sd) UCL 895.1

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 287.1

95% Adjusted Gamma UCL 292.1

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL 512

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). For additional insight, the user may want to consult a statistician.

Table F-3
ProUCL Output - Area 3 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
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Manganese

General Statistics	
Number of Valid Observations 30	Number of Distinct Observations 27
Raw Statistics	
Minimum 151	Minimum of Log Data 5.017
Maximum 1140	Maximum of Log Data 7.039
Mean 274.5	Mean of log Data 5.528
Median 249	SD of log Data 0.362
SD 171.5	
Std. Error of Mean 31.31	
Coefficient of Variation 0.625	
Skewness 4.69	
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.465	Shapiro Wilk Test Statistic 0.79
Shapiro Wilk Critical Value 0.927	Shapiro Wilk Critical Value 0.927
Data not Normal at 5% Significance Level	Data not Lognormal at 5% Significance Level
Assuming Normal Distribution	
95% Student's-t UCL 327.7	95% H-UCL 304.2
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 354.6	95% Chebyshev (MVUE) UCL 347.1
95% Modified-t UCL (Johnson-1978) 332.1	97.5% Chebyshev (MVUE) UCL 381.3
	99% Chebyshev (MVUE) UCL 448.4
Gamma Distribution Test	
k star (bias corrected) 5.345	
Theta Star 51.35	
MLE of Mean 274.5	
MLE of Standard Deviation 118.7	
nu star 320.7	
Approximate Chi Square Value (.05) 280.2	
Adjusted Level of Significance 0.041	
Adjusted Chi Square Value 278	
Anderson-Darling Test Statistic 2.303	
Anderson-Darling 5% Critical Value 0.746	
Kolmogorov-Smirnov Test Statistic 0.216	
Data Distribution	
Data do not follow a Discernable Distribution (0.05)	
Nonparametric Statistics	
	95% CLT UCL 326
	95% Jackknife UCL 327.7
	95% Standard Bootstrap UCL 326.9
	95% Bootstrap-t UCL 413.7
	95% Hall's Bootstrap UCL 536.9
	95% Percentile Bootstrap UCL 332.4

Table F-3
ProUCL Output - Area 3 Surface Soil
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Kolmogorov-Smirnov 5% Critical Value 0.16	95% BCA Bootstrap UCL 366.6
Data not Gamma Distributed at 5% Significance Level	
95% Approximate Gamma UCL 314.1	95% Chebyshev(Mean, Sd) UCL 411
95% Adjusted Gamma UCL 316.6	97.5% Chebyshev(Mean, Sd) UCL 470
	99% Chebyshev(Mean, Sd) UCL 586
Assuming Gamma Distribution	
95% Potential UCL to Use	Use 95% Student's-t UCL 327.7 or 95% Modified-t UCL 332.1

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). For additional insight, the user may want to consult a statistician.

Mercury

General Statistics	
Number of Valid Observations 22	Number of Distinct Observations 20
Number of Missing Values 8	
Raw Statistics	
Minimum 0.12	Minimum of Log Data -2.12
Maximum 5	Maximum of Log Data 1.609
Mean 1	Mean of log Data -0.467
Median 0.54	SD of log Data 0.949
SD 1.154	
Std. Error of Mean 0.246	
Coefficient of Variation 1.154	
Skewness 2.33	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.699	Shapiro Wilk Test Statistic 0.958
Shapiro Wilk Critical Value 0.911	Shapiro Wilk Critical Value 0.911
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	
95% Student's-t UCL 1.423	95% H-UCL 1.654
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 1.535	95% Chebyshev (MVUE) UCL 1.897
95% Modified-t UCL (Johnson-1978) 1.444	97.5% Chebyshev (MVUE) UCL 2.305
	99% Chebyshev (MVUE) UCL 3.105

Table F-3
ProUCL Output - Area 3 Surface Soil
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Gamma Distribution Test	Data Distribution
k star (bias corrected) 1.076	Data appear Lognormal at 5% Significance Level
Theta Star 0.929	
MLE of Mean 1	
MLE of Standard Deviation 0.964	
nu star 47.34	
Approximate Chi Square Value (.05) 32.55	
Adjusted Level of Significance 0.0386	
Adjusted Chi Square Value 31.63	
Anderson-Darling Test Statistic 0.948	
Anderson-Darling 5% Critical Value 0.766	95% CLT UCL 1.405
Kolmogorov-Smirnov Test Statistic 0.195	95% Jackknife UCL 1.423
Kolmogorov-Smirnov 5% Critical Value 0.19	95% Standard Bootstrap UCL 1.4
Data not Gamma Distributed at 5% Significance Level	95% Bootstrap-t UCL 1.678
Assuming Gamma Distribution	95% Hall's Bootstrap UCL 1.741
95% Approximate Gamma UCL 1.454	95% Percentile Bootstrap UCL 1.432
95% Adjusted Gamma UCL 1.496	95% BCA Bootstrap UCL 1.58
Potential UCL to Use	95% Chebyshev(Mean, Sd) UCL 2.072
	97.5% Chebyshev(Mean, Sd) UCL 2.536
	99% Chebyshev(Mean, Sd) UCL 3.448
	Use 95% H-UCL 1.654

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.

H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.

It is therefore recommended to avoid the use of H-statistic based 95% UCLs.

Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

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). For additional insight, the user may want to consult a statistician.

Vanadium

General Statistics	
Number of Valid Observations 30	Number of Distinct Observations 27
Raw Statistics	
Minimum 18.5	Minimum of Log Data 2.918
Maximum 154	Maximum of Log Data 5.037
Mean 35.55	Mean of log Data 3.475
Log-transformed Statistics	

Table F-3
ProUCL Output - Area 3 Surface Soil
Second Supplemental Remedial Investigation
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Median 31.55	SD of log Data 0.378
SD 23.62	
Std. Error of Mean 4.312	
Coefficient of Variation 0.664	
Skewness 4.617	
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.472	Shapiro Wilk Test Statistic 0.796
Shapiro Wilk Critical Value 0.927	Shapiro Wilk Critical Value 0.927
Data not Normal at 5% Significance Level	Data not Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 42.88	95% H-UCL 39.51
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 45.27
95% Adjusted-CLT UCL (Chen-1995) 46.53	97.5% Chebyshev (MVUE) UCL 49.89
95% Modified-t UCL (Johnson-1978) 43.48	99% Chebyshev (MVUE) UCL 58.96
Gamma Distribution Test	Data Distribution
k star (bias corrected) 4.839	Data do not follow a Discernable Distribution (0.05)
Theta Star 7.347	
MLE of Mean 35.55	
MLE of Standard Deviation 16.16	
nu star 290.3	
Approximate Chi Square Value (.05) 251.9	Nonparametric Statistics
Adjusted Level of Significance 0.041	95% CLT UCL 42.64
Adjusted Chi Square Value 249.8	95% Jackknife UCL 42.88
Anderson-Darling Test Statistic 2.304	95% Standard Bootstrap UCL 42.44
Anderson-Darling 5% Critical Value 0.746	95% Bootstrap-t UCL 54.91
Kolmogorov-Smirnov Test Statistic 0.209	95% Hall's Bootstrap UCL 70.57
Kolmogorov-Smirnov 5% Critical Value 0.16	95% Percentile Bootstrap UCL 43.54
Data not Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 48.91
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 54.35
95% Approximate Gamma UCL 40.98	97.5% Chebyshev(Mean, Sd) UCL 62.48
95% Adjusted Gamma UCL 41.32	99% Chebyshev(Mean, Sd) UCL 78.46
Potential UCL to Use	Use 95% Student's-t UCL 42.88 or 95% Modified-t UCL 43.48

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Table F-3
ProUCL Output - Area 3 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Table F-4
ProUCL Output - Area 4 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Area4.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Number of Valid Observations	31	Number of Distinct Observations	24
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Raw Statistics

Minimum	0.096
Maximum	7.3
Mean	1.02
Median	0.3
SD	1.762
Std. Error of Mean	0.316
Coefficient of Variation	1.728
Skewness	2.641

Log-transformed Statistics

Minimum of Log Data	-2.343
Maximum of Log Data	1.988
Mean of log Data	-0.848
SD of log Data	1.2

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.554
Shapiro Wilk Critical Value	0.929

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.896
Shapiro Wilk Critical Value	0.929

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1.557
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95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995)	1.7
95% Modified-t UCL (Johnson-1978)	1.582

Assuming Lognormal Distribution

95% H-UCL	1.579
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95% Chebyshev (MVUE) UCL	1.801
97.5% Chebyshev (MVUE) UCL	2.214
99% Chebyshev (MVUE) UCL	3.025

Gamma Distribution Test

k star (bias corrected)	0.651
Theta Star	1.566
MLE of Mean	1.02
MLE of Standard Deviation	1.263
nu star	40.37
Approximate Chi Square Value (.05)	26.81

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Table F-4
ProUCL Output - Area 4 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
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Adjusted Level of Significance	0.0413	95% CLT UCL	1.54
Adjusted Chi Square Value	26.19	95% Jackknife UCL	1.557
		95% Standard Bootstrap UCL	1.521
Anderson-Darling Test Statistic	2.57	95% Bootstrap-t UCL	2.067
Anderson-Darling 5% Critical Value	0.792	95% Hall's Bootstrap UCL	1.655
Kolmogorov-Smirnov Test Statistic	0.237	95% Percentile Bootstrap UCL	1.535
Kolmogorov-Smirnov 5% Critical Value	0.165	95% BCA Bootstrap UCL	1.721
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	2.399
		97.5% Chebyshev(Mean, Sd) UCL	2.995
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	4.168
95% Approximate Gamma UCL	1.535		
95% Adjusted Gamma UCL	1.571		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	2.399

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). For additional insight, the user may want to consult a statistician.

Benzo(a)pyrene

General Statistics	
Number of Valid Observations	31
Number of Distinct Observations	24
Raw Statistics	
Minimum	0.13
Maximum	9.8
Mean	1.311
Median	0.45
SD	2.2
Std. Error of Mean	0.395
Coefficient of Variation	1.678
Skewness	2.717
Log-transformed Statistics	
Minimum of Log Data	-2.04
Maximum of Log Data	2.282
Mean of log Data	-0.582
SD of log Data	1.214
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic	0.578
Shapiro Wilk Critical Value	0.929
Data not Normal at 5% Significance Level	
Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.908
Shapiro Wilk Critical Value	0.929
Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution	
Assuming Lognormal Distribution	

Table F-4
ProUCL Output - Area 4 Surface Soil
Second Supplemental Remedial Investigation
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95% Student's-t UCL 1.981	95% H-UCL 2.117
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 2.166	95% Chebyshev (MVUE) UCL 2.404
95% Modified-t UCL (Johnson-1978) 2.013	97.5% Chebyshev (MVUE) UCL 2.959
	99% Chebyshev (MVUE) UCL 4.049
Gamma Distribution Test	Data Distribution
k star (bias corrected) 0.661	Data do not follow a Discernable Distribution (0.05)
Theta Star 1.984	
MLE of Mean 1.311	
MLE of Standard Deviation 1.613	
nu star 40.96	
Approximate Chi Square Value (.05) 27.29	Nonparametric Statistics
Adjusted Level of Significance 0.0413	95% CLT UCL 1.961
Adjusted Chi Square Value 26.67	95% Jackknife UCL 1.981
Anderson-Darling Test Statistic 2.194	95% Standard Bootstrap UCL 1.967
Anderson-Darling 5% Critical Value 0.792	95% Bootstrap-t UCL 2.591
Kolmogorov-Smirnov Test Statistic 0.237	95% Hall's Bootstrap UCL 2.183
Kolmogorov-Smirnov 5% Critical Value 0.164	95% Percentile Bootstrap UCL 1.991
Data not Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 2.205
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 3.033
95% Approximate Gamma UCL 1.967	97.5% Chebyshev(Mean, Sd) UCL 3.778
95% Adjusted Gamma UCL 2.013	99% Chebyshev(Mean, Sd) UCL 5.242
Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL 3.033

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). For additional insight, the user may want to consult a statistician.

Benzo(b)fluoranthene

General Statistics	
Number of Valid Observations 32	Number of Distinct Observations 27
Raw Statistics	Log-transformed Statistics
Minimum 0.093	Minimum of Log Data -2.375
Maximum 15	Maximum of Log Data 2.708
Mean 1.679	Mean of log Data -0.34
Median 0.635	SD of log Data 1.222

Table F-4
ProUCL Output - Area 4 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

SD 3.056

Std. Error of Mean 0.54

Coefficient of Variation 1.82

Skewness 3.361

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.528

Shapiro Wilk Critical Value 0.93

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.957

Shapiro Wilk Critical Value 0.93

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 2.594

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 2.91

95% Modified-t UCL (Johnson-1978) 2.648

Assuming Lognormal Distribution

95% H-UCL 2.721

95% Chebyshev (MVUE) UCL 3.086

97.5% Chebyshev (MVUE) UCL 3.797

99% Chebyshev (MVUE) UCL 5.192

Gamma Distribution Test

k star (bias corrected) 0.659

Theta Star 2.549

MLE of Mean 1.679

MLE of Standard Deviation 2.068

nu star 42.15

Approximate Chi Square Value (.05) 28.27

Adjusted Level of Significance 0.0416

Adjusted Chi Square Value 27.66

Data Distribution

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 2.567

95% Jackknife UCL 2.594

95% Standard Bootstrap UCL 2.555

95% Bootstrap-t UCL 3.781

95% Hall's Bootstrap UCL 3.938

95% Percentile Bootstrap UCL 2.637

95% BCA Bootstrap UCL 2.976

95% Chebyshev(Mean, Sd) UCL 4.033

97.5% Chebyshev(Mean, Sd) UCL 5.052

99% Chebyshev(Mean, Sd) UCL 7.053

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 2.503

95% Adjusted Gamma UCL 2.558

Potential UCL to Use

Use 95% H-UCL 2.721

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.

H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.

It is therefore recommended to avoid the use of H-statistic based 95% UCLs.

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Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

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). For additional insight, the user may want to consult a statistician.

Carbazole

General Statistics			
Number of Valid Data	15	Number of Detected Data	9
Number of Distinct Detected Data	9	Number of Non-Detect Data	6
		Percent Non-Detects	40.00%
Raw Statistics			
Minimum Detected	0.01	Minimum Detected	-4.605
Maximum Detected	160	Maximum Detected	5.075
Mean of Detected	37.25	Mean of Detected	-0.621
SD of Detected	60.66	SD of Detected	4.012
Minimum Non-Detect	0.37	Minimum Non-Detect	-0.994
Maximum Non-Detect	0.39	Maximum Non-Detect	-0.942
Note: Data have multiple DLs - Use of KM Method is recommended			
For all methods (except KM, DL/2, and ROS Methods),			
Observations < Largest ND are treated as NDs			
Number treated as Non-Detect			
Number treated as Detected			
Single DL Non-Detect Percentage			

Warning: There are only 9 Detected Values in this data

**Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions**

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.692	Shapiro Wilk Test Statistic	0.763
5% Shapiro Wilk Critical Value	0.829	5% Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	22.43	Mean	-1.037

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SD	49.55	SD	3.078
95% DL/2 (t) UCL	44.96	95% H-Stat (DL/2) UCL	10242
Maximum Likelihood Estimate(MLE) Method MLE yields a negative mean	N/A	Log ROS Method	
		Mean in Log Scale	-1.406
		SD in Log Scale	3.313
		Mean in Original Scale	22.42
		SD in Original Scale	49.56
		95% t UCL	44.95
		95% Percentile Bootstrap UCL	44.37
		95% BCA Bootstrap UCL	51.05
		95% H-UCL	34695
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.192	Data do not follow a Discernable Distribution (0.05)	
Theta Star	194		
nu star	3.456		
A-D Test Statistic	1.251	Nonparametric Statistics	
5% A-D Critical Value	0.853	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.853	Mean	22.37
5% K-S Critical Value	0.309	SD	47.9
Data not Gamma Distributed at 5% Significance Level		SE of Mean	13.12
		95% KM (t) UCL	45.48
Assuming Gamma Distribution		95% KM (z) UCL	43.95
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	44.92
Minimum	0.000001	95% KM (bootstrap t) UCL	75.56
Maximum	160	95% KM (BCA) UCL	46.7
Mean	22.36	95% KM (Percentile Bootstrap) UCL	43.7
Median	0.0277	95% KM (Chebyshev) UCL	79.55
SD	49.59	97.5% KM (Chebyshev) UCL	104.3
k star	0.136	99% KM (Chebyshev) UCL	152.9
Theta star	164.2		
Nu star	4.085	Potential UCLs to Use	
AppChi2	0.755	99% KM (Chebyshev) UCL	152.9
95% Gamma Approximate UCL	120.9		
95% Adjusted Gamma UCL	151.9		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

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Dibenz(a,h)anthracene

General Statistics			
Number of Valid Data	29	Number of Detected Data	24
Number of Distinct Detected Data	24	Number of Non-Detect Data	5
		Percent Non-Detects	17.24%
Raw Statistics			
Minimum Detected	0.022	Minimum Detected	-3.817
Maximum Detected	2	Maximum Detected	0.693
Mean of Detected	0.305	Mean of Detected	-2.1
SD of Detected	0.499	SD of Detected	1.285
Minimum Non-Detect	0.37	Minimum Non-Detect	-0.994
Maximum Non-Detect	0.66	Maximum Non-Detect	-0.416
Note: Data have multiple DLs - Use of KM Method is recommended			
For all methods (except KM, DL/2, and ROS Methods),			
Observations < Largest ND are treated as NDs			
Log-transformed Statistics			
Number treated as Non-Detect	25		
Number treated as Detected	4		
Single DL Non-Detect Percentage	86.21%		
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.606	Shapiro Wilk Test Statistic	0.914
5% Shapiro Wilk Critical Value	0.916	5% Shapiro Wilk Critical Value	0.916
Data not Normal at 5% Significance Level			
Assuming Normal Distribution			
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.29	Mean	-2.007
SD	0.454	SD	1.187
95% DL/2 (t) UCL	0.433	95% H-Stat (DL/2) UCL	0.499
Maximum Likelihood Estimate(MLE) Method			
MLE yields a negative mean			
Assuming Lognormal Distribution			
N/A		Log ROS Method	
		Mean in Log Scale	-2.166
		SD in Log Scale	1.188
		Mean in Original Scale	0.269
		SD in Original Scale	0.46
		95% t UCL	0.414
		95% Percentile Bootstrap UCL	0.416
		95% BCA Bootstrap UCL	0.459
		95% H-UCL	0.426

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Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)		Data do not follow a Discernable Distribution (0.05)	
Theta Star			
nu star			
A-D Test Statistic	1.831	Nonparametric Statistics	
5% A-D Critical Value	0.791	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.791	Mean	0.269
5% K-S Critical Value	0.186	SD	0.452
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0861
		95% KM (t) UCL	0.415
Assuming Gamma Distribution		95% KM (z) UCL	0.41
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.415
Minimum	0.000001	95% KM (bootstrap t) UCL	0.516
Maximum	2	95% KM (BCA) UCL	0.433
Mean	0.276	95% KM (Percentile Bootstrap) UCL	0.421
Median	0.098	95% KM (Chebyshev) UCL	0.644
SD	0.46	97.5% KM (Chebyshev) UCL	0.806
k star	0.397	99% KM (Chebyshev) UCL	1.125
Theta star	0.695		
Nu star	23.05	Potential UCLs to Use	
AppChi2	13.13	97.5% KM (Chebyshev) UCL	0.806
95% Gamma Approximate UCL	0.485		
95% Adjusted Gamma UCL	0.502		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Indeno(1,2,3-cd)pyrene

General Statistics			
Number of Valid Observations	31	Number of Distinct Observations	29
Raw Statistics		Log-transformed Statistics	
Minimum 0.085		Minimum of Log Data -2.465	
Maximum 7.4		Maximum of Log Data 2.001	
Mean 0.944		Mean of log Data -0.913	
Median 0.33		SD of log Data 1.208	

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SD 1.623

Std. Error of Mean 0.292

Coefficient of Variation 1.719

Skewness 2.875

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.565

Shapiro Wilk Critical Value 0.929

Data not Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 1.439

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 1.585

95% Modified-t UCL (Johnson-1978) 1.464

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.915

Shapiro Wilk Critical Value 0.929

Data not Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL 1.505

95% Chebyshev (MVUE) UCL 1.713

97.5% Chebyshev (MVUE) UCL 2.107

99% Chebyshev (MVUE) UCL 2.881

Gamma Distribution Test

k star (bias corrected) 0.659

Theta Star 1.433

MLE of Mean 0.944

MLE of Standard Deviation 1.163

nu star 40.85

Approximate Chi Square Value (.05) 27.2

Adjusted Level of Significance 0.0413

Adjusted Chi Square Value 26.58

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL 1.424

95% Jackknife UCL 1.439

95% Standard Bootstrap UCL 1.413

95% Bootstrap-t UCL 1.891

95% Hall's Bootstrap UCL 1.599

95% Percentile Bootstrap UCL 1.445

95% BCA Bootstrap UCL 1.608

95% Chebyshev(Mean, Sd) UCL 2.215

97.5% Chebyshev(Mean, Sd) UCL 2.765

99% Chebyshev(Mean, Sd) UCL 3.845

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 1.418

95% Adjusted Gamma UCL 1.451

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL 2.215

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). For additional insight, the user may want to consult a statistician.

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Antimony

General Statistics			
Number of Valid Data	25	Number of Detected Data	24
Number of Distinct Detected Data	18	Number of Non-Detect Data	1
		Percent Non-Detects	4.00%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.22	Minimum Detected	-1.514
Maximum Detected	1.1	Maximum Detected	0.0953
Mean of Detected	0.503	Mean of Detected	-0.802
SD of Detected	0.262	SD of Detected	0.48
Minimum Non-Detect	0.12	Minimum Non-Detect	-2.12
Maximum Non-Detect	0.12	Maximum Non-Detect	-2.12
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.853	Shapiro Wilk Test Statistic	0.938
5% Shapiro Wilk Critical Value	0.916	5% Shapiro Wilk Critical Value	0.916
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.486	Mean	-0.882
SD	0.271	SD	0.619
95% DL/2 (t) UCL	0.578	95% H-Stat (DL/2) UCL	0.651
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.483	Mean in Log Scale	-0.849
SD	0.271	SD in Log Scale	0.527
95% MLE (t) UCL	0.576	Mean in Original Scale	0.489
95% MLE (Tiku) UCL	0.574	SD in Original Scale	0.266
		95% t UCL	0.58
		95% Percentile Bootstrap UCL	0.583
		95% BCA Bootstrap UCL	0.589
		95% H UCL	0.608
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	3.967	Data appear Lognormal at 5% Significance Level	

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Theta Star	0.127			
nu star	190.4			
A-D Test Statistic	0.749	Nonparametric Statistics		
5% A-D Critical Value	0.747	Kaplan-Meier (KM) Method		
K-S Test Statistic	0.747	Mean		
5% K-S Critical Value	0.179	SD		
Data not Gamma Distributed at 5% Significance Level			SE of Mean	0.0525
			95% KM (t) UCL	0.582
Assuming Gamma Distribution			95% KM (z) UCL	0.578
Gamma ROS Statistics using Extrapolated Data			95% KM (jackknife) UCL	0.581
Minimum	0.000001	95% KM (bootstrap t) UCL		
Maximum	1.1	95% KM (BCA) UCL		
Mean	0.483	95% KM (Percentile Bootstrap) UCL		
Median	0.39	95% KM (Chebyshev) UCL		
SD	0.275	97.5% KM (Chebyshev) UCL		
k star	0.883	99% KM (Chebyshev) UCL		
Theta star	0.547			
Nu star	44.16	Potential UCLs to Use		
AppChi2	29.92	95% KM (Chebyshev) UCL		
95% Gamma Approximate UCL	0.713			
95% Adjusted Gamma UCL	0.733			

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Arsenic

General Statistics	
Number of Valid Observations	25
Number of Distinct Observations	19
Raw Statistics	
Minimum	2.9
Maximum	19.2
Mean	5.328
Median	4.3
SD	3.323
Std. Error of Mean	0.665
Coefficient of Variation	0.624
Log-transformed Statistics	
Minimum of Log Data	1.065
Maximum of Log Data	2.955
Mean of log Data	1.565
SD of log Data	0.424

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Skewness 3.324

Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.623	Shapiro Wilk Test Statistic 0.869
Shapiro Wilk Critical Value 0.918	Shapiro Wilk Critical Value 0.918
Data not Normal at 5% Significance Level	Data not Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 6.465	95% H-UCL 6.167
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 7.197
95% Adjusted-CLT UCL (Chen-1995) 6.894	97.5% Chebyshev (MVUE) UCL 8.056
95% Modified-t UCL (Johnson-1978) 6.539	99% Chebyshev (MVUE) UCL 9.742
Gamma Distribution Test	Data Distribution
k star (bias corrected) 4.241	Data do not follow a Discernable Distribution (0.05)
Theta Star 1.256	
MLE of Mean 5.328	
MLE of Standard Deviation 2.587	
nu star 212	
Approximate Chi Square Value (.05) 179.3	Nonparametric Statistics
Adjusted Level of Significance 0.0395	95% CLT UCL 6.421
Adjusted Chi Square Value 177.3	95% Jackknife UCL 6.465
Anderson-Darling Test Statistic 1.433	95% Standard Bootstrap UCL 6.414
Anderson-Darling 5% Critical Value 0.747	95% Bootstrap-t UCL 7.895
Kolmogorov-Smirnov Test Statistic 0.212	95% Hall's Bootstrap UCL 10.96
Kolmogorov-Smirnov 5% Critical Value 0.175	95% Percentile Bootstrap UCL 6.42
Data not Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 7.032
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 8.225
95% Approximate Gamma UCL 6.299	97.5% Chebyshev(Mean, Sd) UCL 9.479
95% Adjusted Gamma UCL 6.372	99% Chebyshev(Mean, Sd) UCL 11.94
Potential UCL to Use	Use 95% Student's-t UCL 6.465 or 95% Modified-t UCL 6.539

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). For additional insight, the user may want to consult a statistician.

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Cobalt

General Statistics	
Number of Valid Observations 25	Number of Distinct Observations 21
Raw Statistics	
Minimum 3.3	Minimum of Log Data 1.194
Maximum 8.2	Maximum of Log Data 2.104
Mean 5.82	Mean of log Data 1.73
Median 5.6	SD of log Data 0.258
SD 1.469	
Std. Error of Mean 0.294	
Coefficient of Variation 0.252	
Skewness 0.203	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.942	Shapiro Wilk Test Statistic 0.955
Shapiro Wilk Critical Value 0.918	Shapiro Wilk Critical Value 0.918
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	
95% Student's-t UCL 6.323	95% H-UCL 6.408
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 6.316	95% Chebyshev (MVUE) UCL 7.151
95% Modified-t UCL (Johnson-1978) 6.325	97.5% Chebyshev (MVUE) UCL 7.725
	99% Chebyshev (MVUE) UCL 8.853
Gamma Distribution Test	
k star (bias corrected) 14.16	Data Distribution
Theta Star 0.411	Data appear Normal at 5% Significance Level
MLE of Mean 5.82	
MLE of Standard Deviation 1.547	
nu star 708	
Approximate Chi Square Value (.05) 647.3	Nonparametric Statistics
Adjusted Level of Significance 0.0395	95% CLT UCL 6.303
Adjusted Chi Square Value 643.3	95% Jackknife UCL 6.323
	95% Standard Bootstrap UCL 6.302
Anderson-Darling Test Statistic 0.375	95% Bootstrap-t UCL 6.325
Anderson-Darling 5% Critical Value 0.744	95% Hall's Bootstrap UCL 6.338
Kolmogorov-Smirnov Test Statistic 0.125	95% Percentile Bootstrap UCL 6.296
Kolmogorov-Smirnov 5% Critical Value 0.174	95% BCA Bootstrap UCL 6.308
Data appear Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 7.101

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Assuming Gamma Distribution	97.5% Chebyshev(Mean, Sd) UCL 7.655 99% Chebyshev(Mean, Sd) UCL 8.744
Potential UCL to Use	95% Approximate Gamma UCL 6.366 95% Adjusted Gamma UCL 6.405

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). For additional insight, the user may want to consult a statistician.

Thallium

General Statistics			
Number of Valid Data	24	Number of Detected Data	6
Number of Distinct Detected Data	5	Number of Non-Detect Data	18
		Percent Non-Detects	75.00%
Raw Statistics			
Minimum Detected	0.12	Minimum Detected	-2.12
Maximum Detected	0.18	Maximum Detected	-1.715
Mean of Detected	0.16	Mean of Detected	-1.842
SD of Detected	0.0228	SD of Detected	0.154
Minimum Non-Detect	0.12	Minimum Non-Detect	-2.12
Maximum Non-Detect	1.2	Maximum Non-Detect	0.182
Log-transformed Statistics			

Note: Data have multiple DIs - Use of KM Method is recommended

Number treated as Non-Detect 34

For all methods (except KM, DI /2, and ROS Methods)

Number treated as Detected 0

Observations < Largest ND are treated as NDs

Single DI Non-Detect Percentage 100.00%

Warning: There are only 6 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.882	Shapiro Wilk Test Statistic	0.854
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788

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Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean		Mean	
0.112		-2.4	
SD		SD	
0.112		0.561	
95% DL/2 (t) UCL		95% H-Stat (DL/2) UCL	
0.152		0.135	
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	
		-2.198	
		SD in Log Scale	
		0.265	
		Mean in Original Scale	
		0.115	
		SD in Original Scale	
		0.0319	
		95% t UCL	
		0.126	
		95% Percentile Bootstrap UCL	
		0.125	
		95% BCA Bootstrap UCL	
		0.127	
		95% H-UCL	
		0.127	
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)		Data appear Normal at 5% Significance Level	
Theta Star			
nu star			
A-D Test Statistic		Nonparametric Statistics	
5% A-D Critical Value		Kaplan-Meier (KM) Method	
K-S Test Statistic		Mean	
5% K-S Critical Value		0.13	
Data appear Gamma Distributed at 5% Significance Level		SD	
		0.0205	
Assuming Gamma Distribution		SE of Mean	
Gamma ROS Statistics using Extrapolated Data		0.00469	
Minimum		95% KM (t) UCL	
Maximum		0.138	
Mean		95% KM (z) UCL	
Median		0.138	
SD		95% KM (jackknife) UCL	
k star		0.148	
Theta star		95% KM (bootstrap t) UCL	
Nu star		0.137	
AppChi2		95% KM (BCA) UCL	
95% Gamma Approximate UCL		0.171	
95% Adjusted Gamma UCL		95% KM (Percentile Bootstrap) UCL	
		0.164	
		95% KM (Chebyshev) UCL	
		0.151	
		97.5% KM (Chebyshev) UCL	
		0.16	
		99% KM (Chebyshev) UCL	
		0.177	
Potential UCLs to Use		Potential UCLs to Use	
		95% KM (t) UCL	
		0.138	
		95% KM (Percentile Bootstrap) UCL	
		0.164	

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Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Benzo(k)fluoranthene

General Statistics			
Number of Valid Data	30	Number of Detected Data	19
Number of Distinct Detected Data	19	Number of Non-Detect Data	11
		Percent Non-Detects	36.67%
Raw Statistics			
Minimum Detected	0.081	Minimum Detected	-2.513
Maximum Detected	2.7	Maximum Detected	0.993
Mean of Detected	0.688	Mean of Detected	-0.958
SD of Detected	0.767	SD of Detected	1.14
Minimum Non-Detect	0.0018	Minimum Non-Detect	-6.32
Maximum Non-Detect	0.076	Maximum Non-Detect	-2.577
Note: Data have multiple DLs - Use of KM Method is recommended			
For all methods (except KM, DL/2, and ROS Methods),			
Observations < Largest ND are treated as NDs			
Log-transformed Statistics			
Number treated as Non-Detect	11	Number treated as Non-Detect	11
Number treated as Detected	19	Number treated as Detected	19
Single DL Non-Detect Percentage	36.67%	Single DL Non-Detect Percentage	36.67%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.772	Shapiro Wilk Test Statistic	0.929
5% Shapiro Wilk Critical Value	0.901	5% Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution			
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.437	Mean	-2.932
SD	0.691	SD	2.858
95% DL/2 (t) UCL	0.652	95% H-Stat (DL/2) UCL	53.79
Maximum Likelihood Estimate(MLE) Method			
Mean	0.211	Log ROS Method	
SD	0.921	Mean in Log Scale	-1.978
95% MLE (t) UCL	0.497	SD in Log Scale	1.654
		Mean in Original Scale	0.445

Table F-4
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95% MLE (Tiku) UCL	0.524	SD in Original Scale	0.686
		95% t UCL	0.658
		95% Percentile Bootstrap UCL	0.661
		95% BCA Bootstrap UCL	0.675
		95% H UCL	1.542

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.869
Theta Star	0.792
nu star	33

Data Distribution Test with Detected Values Only

Data appear Gamma Distributed at 5% Significance Level

A-D Test Statistic	0.633
5% A-D Critical Value	0.77
K-S Test Statistic	0.77
5% K-S Critical Value	0.204

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	0.465
SD	0.662

Data appear Gamma Distributed at 5% Significance Level

SE of Mean	0.124
95% KM (t) UCL	0.676

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000001
Maximum	2.7
Mean	0.436
Median	0.135
SD	0.692
k star	0.164
Theta star	2.656
Nu star	9.844
AppChi2	3.844
95% Gamma Approximate UCL	1.116
95% Adjusted Gamma UCL	1.182

Potential UCLs to Use

95% KM (BCA) UCL	0.675
95% KM (bootstrap t) UCL	0.814
95% KM (BCA) UCL	0.675
95% KM (Percentile Bootstrap) UCL	0.681

95% KM (Chebyshev) UCL	1.007
97.5% KM (Chebyshev) UCL	1.241
99% KM (Chebyshev) UCL	1.701

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Chrysene

General Statistics

Number of Valid Observations 32

Number of Distinct Observations 25

Table F-4
ProUCL Output - Area 4 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Raw Statistics	Log-transformed Statistics
Minimum 0.11	Minimum of Log Data -2.207
Maximum 8.2	Maximum of Log Data 2.104
Mean 1.06	Mean of log Data -0.728
Median 0.355	SD of log Data 1.153
SD 1.767	
Std. Error of Mean 0.312	
Coefficient of Variation 1.666	
Skewness 2.872	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.565	Shapiro Wilk Test Statistic 0.916
Shapiro Wilk Critical Value 0.93	Shapiro Wilk Critical Value 0.93
Data not Normal at 5% Significance Level	Data not Lognormal at 5% Significance Level
Assuming Normal Distribution	
95% Student's-t UCL 1.59	95% H-UCL 1.616
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 1.743	95% Chebyshev (MVUE) UCL 1.87
95% Modified-t UCL (Johnson-1978) 1.616	97.5% Chebyshev (MVUE) UCL 2.286
	99% Chebyshev (MVUE) UCL 3.103
Gamma Distribution Test	
k star (bias corrected) 0.71	95% CLT UCL 1.574
Theta Star 1.494	95% Jackknife UCL 1.59
MLE of Mean 1.06	95% Standard Bootstrap UCL 1.57
MLE of Standard Deviation 1.259	95% Bootstrap-t UCL 1.957
nu star 45.42	95% Hall's Bootstrap UCL 1.696
Approximate Chi Square Value (.05) 30.96	95% Percentile Bootstrap UCL 1.598
Adjusted Level of Significance 0.0416	95% BCA Bootstrap UCL 1.753
Adjusted Chi Square Value 30.32	95% Chebyshev(Mean, Sd) UCL 2.422
	97.5% Chebyshev(Mean, Sd) UCL 3.011
Anderson-Darling Test Statistic 2.238	99% Chebyshev(Mean, Sd) UCL 4.168
Anderson-Darling 5% Critical Value 0.787	
Kolmogorov-Smirnov Test Statistic 0.209	
Kolmogorov-Smirnov 5% Critical Value 0.162	
Data not Gamma Distributed at 5% Significance Level	Data Distribution
Assuming Gamma Distribution	
95% Approximate Gamma UCL 1.556	
95% Adjusted Gamma UCL 1.588	
Nonparametric Statistics	

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Adjusted Chi Square Value 371.2	95% Jackknife UCL 9314
	95% Standard Bootstrap UCL 9256
Anderson-Darling Test Statistic 0.509	95% Bootstrap-t UCL 9436
Anderson-Darling 5% Critical Value 0.745	95% Hall's Bootstrap UCL 9429
Kolmogorov-Smirnov Test Statistic 0.111	95% Percentile Bootstrap UCL 9260
Kolmogorov-Smirnov 5% Critical Value 0.175	95% BCA Bootstrap UCL 9404
Data appear Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 10841
Assuming Gamma Distribution	97.5% Chebyshev(Mean, Sd) UCL 11929
95% Approximate Gamma UCL 9363	99% Chebyshev(Mean, Sd) UCL 14066
95% Adjusted Gamma UCL 9438	
Potential UCL to Use	Use 95% Approximate Gamma UCL 9363

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). For additional insight, the user may want to consult a statistician.

Barium

General Statistics																	
Number of Valid Observations 25	Number of Distinct Observations 25																
Raw Statistics	Log-transformed Statistics																
<table border="0"> <tr> <td>Minimum 42.9</td><td>Minimum of Log Data 3.759</td></tr> <tr> <td>Maximum 138</td><td>Maximum of Log Data 4.927</td></tr> <tr> <td>Mean 81.9</td><td>Mean of log Data 4.358</td></tr> <tr> <td>Median 80.9</td><td>SD of log Data 0.319</td></tr> <tr> <td>SD 25.42</td><td></td></tr> <tr> <td>Std. Error of Mean 5.085</td><td></td></tr> <tr> <td>Coefficient of Variation 0.31</td><td></td></tr> <tr> <td>Skewness 0.452</td><td></td></tr> </table>		Minimum 42.9	Minimum of Log Data 3.759	Maximum 138	Maximum of Log Data 4.927	Mean 81.9	Mean of log Data 4.358	Median 80.9	SD of log Data 0.319	SD 25.42		Std. Error of Mean 5.085		Coefficient of Variation 0.31		Skewness 0.452	
Minimum 42.9	Minimum of Log Data 3.759																
Maximum 138	Maximum of Log Data 4.927																
Mean 81.9	Mean of log Data 4.358																
Median 80.9	SD of log Data 0.319																
SD 25.42																	
Std. Error of Mean 5.085																	
Coefficient of Variation 0.31																	
Skewness 0.452																	
Relevant UCL Statistics																	
Normal Distribution Test	Lognormal Distribution Test																
Shapiro Wilk Test Statistic 0.967	Shapiro Wilk Test Statistic 0.971																
Shapiro Wilk Critical Value 0.918	Shapiro Wilk Critical Value 0.918																
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level																
Assuming Normal Distribution	Assuming Lognormal Distribution																
95% Student's-t UCL 90.6	95% H-UCL 92.55																

Table F-4
ProUCL Output - Area 4 Surface Soil
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95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL 105.2
95% Adjusted-CLT UCL (Chen-1995)	90.75	97.5% Chebyshev (MVUE) UCL 115.3
95% Modified-t UCL (Johnson-1978)	90.68	99% Chebyshev (MVUE) UCL 135
Gamma Distribution Test		Data Distribution
k star (bias corrected)		9.432
Theta Star		8.684
MLE of Mean		81.9
MLE of Standard Deviation		26.67
nu star		471.6
Approximate Chi Square Value (.05)		422.2
Adjusted Level of Significance		0.0395
Adjusted Chi Square Value		419.1
Anderson-Darling Test Statistic		0.15
Anderson-Darling 5% Critical Value		0.745
Kolmogorov-Smirnov Test Statistic		0.0723
Kolmogorov-Smirnov 5% Critical Value		0.174
Data appear Gamma Distributed at 5% Significance Level		Nonparametric Statistics
Assuming Gamma Distribution		95% CLT UCL 90.26
95% Approximate Gamma UCL		90.47
95% Adjusted Gamma UCL		92.17
Potential UCL to Use		Use 95% Student's-t UCL 90.6

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). For additional insight, the user may want to consult a statistician.

Cadmium

General Statistics	
Number of Valid Observations	23
Number of Distinct Observations	20
Raw Statistics	Log-transformed Statistics
Minimum 0.14	Minimum of Log Data -1.966
Maximum 0.85	Maximum of Log Data -0.163
Mean 0.356	Mean of log Data -1.184
Median 0.3	SD of log Data 0.561
SD 0.205	

Table F-4
ProUCL Output - Area 4 Surface Soil
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Std. Error of Mean 0.0427
 Coefficient of Variation 0.576
 Skewness 0.975

Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.893	Shapiro Wilk Test Statistic 0.952
Shapiro Wilk Critical Value 0.914	Shapiro Wilk Critical Value 0.914
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 0.429	95% H-UCL 0.456
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 0.545
95% Adjusted-CLT UCL (Chen-1995) 0.436	97.5% Chebyshev (MVUE) UCL 0.628
95% Modified-t UCL (Johnson-1978) 0.431	99% Chebyshev (MVUE) UCL 0.789
Gamma Distribution Test	Data Distribution
k star (bias corrected) 3.039	Data appear Gamma Distributed at 5% Significance Level
Theta Star 0.117	
MLE of Mean 0.356	
MLE of Standard Deviation 0.204	
nu star 139.8	
Approximate Chi Square Value (.05) 113.5	Nonparametric Statistics
Adjusted Level of Significance 0.0389	95% CLT UCL 0.426
Adjusted Chi Square Value 111.8	95% Jackknife UCL 0.429
Anderson-Darling Test Statistic 0.42	95% Standard Bootstrap UCL 0.424
Anderson-Darling 5% Critical Value 0.75	95% Bootstrap-t UCL 0.441
Kolmogorov-Smirnov Test Statistic 0.131	95% Hall's Bootstrap UCL 0.44
Kolmogorov-Smirnov 5% Critical Value 0.183	95% Percentile Bootstrap UCL 0.424
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 0.434
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 0.542
95% Approximate Gamma UCL 0.439	97.5% Chebyshev(Mean, Sd) UCL 0.623
95% Adjusted Gamma UCL 0.445	99% Chebyshev(Mean, Sd) UCL 0.781
Potential UCL to Use	Use 95% Approximate Gamma UCL 0.439

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). For additional insight, the user may want to consult a statistician.

Table F-4
ProUCL Output - Area 4 Surface Soil
Second Supplemental Remedial Investigation
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Chromium

General Statistics	
Number of Valid Observations 25	Number of Distinct Observations 24
Raw Statistics	Log-transformed Statistics
Minimum 12.7	Minimum of Log Data 2.542
Maximum 28.2	Maximum of Log Data 3.339
Mean 18.47	Mean of log Data 2.896
Median 18.6	SD of log Data 0.205
SD 3.838	
Std. Error of Mean 0.768	
Coefficient of Variation 0.208	
Skewness 0.592	
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.955	Shapiro Wilk Test Statistic 0.972
Shapiro Wilk Critical Value 0.918	Shapiro Wilk Critical Value 0.918
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 19.79	95% H-UCL 19.9
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 19.83	95% Chebyshev (MVUE) UCL 21.8
95% Modified-t UCL (Johnson-1978) 19.8	97.5% Chebyshev (MVUE) UCL 23.24
	99% Chebyshev (MVUE) UCL 26.08
Gamma Distribution Test	Data Distribution
k star (bias corrected) 21.84	
Theta Star 0.846	
MLE of Mean 18.47	
MLE of Standard Deviation 3.953	
nu star 1092	
Approximate Chi Square Value (.05) 1016	Nonparametric Statistics
Adjusted Level of Significance 0.0395	95% CLT UCL 19.73
Adjusted Chi Square Value 1011	95% Jackknife UCL 19.79
Anderson-Darling Test Statistic 0.26	95% Standard Bootstrap UCL 19.73
Anderson-Darling 5% Critical Value 0.743	95% Bootstrap-t UCL 19.87
Kolmogorov-Smirnov Test Statistic 0.0843	95% Hall's Bootstrap UCL 19.88
Kolmogorov-Smirnov 5% Critical Value 0.174	95% Percentile Bootstrap UCL 19.66
	95% BCA Bootstrap UCL 19.83

Table F-4
ProUCL Output - Area 4 Surface Soil
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Data appear Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 21.82 97.5% Chebyshev(Mean, Sd) UCL 23.27 99% Chebyshev(Mean, Sd) UCL 26.11
Assuming Gamma Distribution	95% Approximate Gamma UCL 19.85 95% Adjusted Gamma UCL 19.95
Potential UCL to Use	Use 95% Student's-t UCL 19.79

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). For additional insight, the user may want to consult a statistician.

Copper

General Statistics	
Number of Valid Observations 25	Number of Distinct Observations 23
Raw Statistics	
Minimum 14.5	Minimum of Log Data 2.674
Maximum 50.9	Maximum of Log Data 3.93
Mean 27.89	Mean of log Data 3.286
Median 28.6	SD of log Data 0.301
SD 8.334	
Std. Error of Mean 1.667	
Coefficient of Variation 0.299	
Skewness 0.653	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.956	Shapiro Wilk Test Statistic 0.979
Shapiro Wilk Critical Value 0.918	Shapiro Wilk Critical Value 0.918
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	
95% Student's-t UCL 30.74	95% H-UCL 31.26
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 30.87	95% Chebyshev (MVUE) UCL 35.34
95% Modified-t UCL (Johnson-1978) 30.78	97.5% Chebyshev (MVUE) UCL 38.56
	99% Chebyshev (MVUE) UCL 44.88
Gamma Distribution Test	
k star (bias corrected) 10.45	Data Distribution
	Data appear Normal at 5% Significance Level

Table F-4
ProUCL Output - Area 4 Surface Soil
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Theta Star 2.668	
MLE of Mean 27.89	
MLE of Standard Deviation 8.627	
nu star 522.7	
Approximate Chi Square Value (.05) 470.6	Nonparametric Statistics
Adjusted Level of Significance 0.0395	95% CLT UCL 30.63
Adjusted Chi Square Value 467.3	95% Jackknife UCL 30.74
	95% Standard Bootstrap UCL 30.61
Anderson-Darling Test Statistic 0.231	95% Bootstrap-t UCL 31.07
Anderson-Darling 5% Critical Value 0.745	95% Hall's Bootstrap UCL 31.1
Kolmogorov-Smirnov Test Statistic 0.0928	95% Percentile Bootstrap UCL 30.64
Kolmogorov-Smirnov 5% Critical Value 0.174	95% BCA Bootstrap UCL 30.7
Data appear Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 35.16
Assuming Gamma Distribution	97.5% Chebyshev(Mean, Sd) UCL 38.3
95% Approximate Gamma UCL 30.97	99% Chebyshev(Mean, Sd) UCL 44.48
95% Adjusted Gamma UCL 31.2	
Potential UCL to Use	Use 95% Student's-t UCL 30.74

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). For additional insight, the user may want to consult a statistician.

Lead

General Statistics	
Number of Valid Observations 25	Number of Distinct Observations 25
Raw Statistics	Log-transformed Statistics
Minimum 85.8	Minimum of Log Data 4.452
Maximum 305	Maximum of Log Data 5.72
Mean 163	Mean of log Data 5.042
Median 169	SD of log Data 0.33
SD 53.06	
Std. Error of Mean 10.61	
Coefficient of Variation 0.326	
Skewness 0.623	
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test

Table F-4
ProUCL Output - Area 4 Surface Soil
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Shapiro Wilk Test Statistic 0.954	Shapiro Wilk Test Statistic 0.966
Shapiro Wilk Critical Value 0.918	Shapiro Wilk Critical Value 0.918
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 181.1	95% H-UCL 185
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 210.9
95% Adjusted-CLT UCL (Chen-1995) 181.9	97.5% Chebyshev (MVUE) UCL 231.6
95% Modified-t UCL (Johnson-1978) 181.4	99% Chebyshev (MVUE) UCL 272.2
Gamma Distribution Test	Data Distribution
k star (bias corrected) 8.756	Data appear Normal at 5% Significance Level
Theta Star 18.61	
MLE of Mean 163	
MLE of Standard Deviation 55.08	
nu star 437.8	
Approximate Chi Square Value (.05) 390.3	Nonparametric Statistics
Adjusted Level of Significance 0.0395	95% CLT UCL 180.4
Adjusted Chi Square Value 387.2	95% Jackknife UCL 181.1
Anderson-Darling Test Statistic 0.293	95% Standard Bootstrap UCL 180.1
Anderson-Darling 5% Critical Value 0.745	95% Bootstrap-t UCL 183.8
Kolmogorov-Smirnov Test Statistic 0.133	95% Hall's Bootstrap UCL 184
Kolmogorov-Smirnov 5% Critical Value 0.175	95% Percentile Bootstrap UCL 180.8
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 180.8
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 209.2
95% Approximate Gamma UCL 182.8	97.5% Chebyshev(Mean, Sd) UCL 229.3
95% Adjusted Gamma UCL 184.3	99% Chebyshev(Mean, Sd) UCL 268.6
Potential UCL to Use	Use 95% Student's-t UCL 181.1

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). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics	
Number of Valid Observations 25	Number of Distinct Observations 25

Table F-4
ProUCL Output - Area 4 Surface Soil
Second Supplemental Remedial Investigation
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Raw Statistics	Log-transformed Statistics
Minimum 207	Minimum of Log Data 5.333
Maximum 566	Maximum of Log Data 6.339
Mean 357.8	Mean of log Data 5.849
Median 351	SD of log Data 0.256
SD 90.43	
Std. Error of Mean 18.09	
Coefficient of Variation 0.253	
Skewness 0.407	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.975	Shapiro Wilk Test Statistic 0.985
Shapiro Wilk Critical Value 0.918	Shapiro Wilk Critical Value 0.918
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	
95% Student's-t UCL 388.8	95% H-UCL 393.5
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 389.2	95% Chebyshev (MVUE) UCL 438.6
95% Modified-t UCL (Johnson-1978) 389	97.5% Chebyshev (MVUE) UCL 473.5
	99% Chebyshev (MVUE) UCL 542.1
Gamma Distribution Test	
k star (bias corrected) 14.4	
Theta Star 24.86	
MLE of Mean 357.8	
MLE of Standard Deviation 94.31	
nu star 719.8	
Approximate Chi Square Value (.05) 658.6	
Adjusted Level of Significance 0.0395	
Adjusted Chi Square Value 654.6	
Anderson-Darling Test Statistic 0.153	
Anderson-Darling 5% Critical Value 0.744	
Kolmogorov-Smirnov Test Statistic 0.0844	
Kolmogorov-Smirnov 5% Critical Value 0.174	
Data appear Gamma Distributed at 5% Significance Level	Data Distribution
Assuming Gamma Distribution	
95% Approximate Gamma UCL 391.1	95% CLT UCL 387.6
95% Adjusted Gamma UCL 393.5	95% Jackknife UCL 388.8
	95% Standard Bootstrap UCL 386.3
	95% Bootstrap-t UCL 388.6
	95% Hall's Bootstrap UCL 391
	95% Percentile Bootstrap UCL 387.6
	95% BCA Bootstrap UCL 387.7
	95% Chebyshev(Mean, Sd) UCL 436.7
	97.5% Chebyshev(Mean, Sd) UCL 470.8
	99% Chebyshev(Mean, Sd) UCL 537.8

Table F-4
ProUCL Output - Area 4 Surface Soil
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Potential UCL to Use Use 95% Student's-t UCL 388.8

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). For additional insight, the user may want to consult a statistician.

Mercury

General Statistics			
Number of Valid Data	28	Number of Detected Data	27
Number of Distinct Detected Data	23	Number of Non-Detect Data	1
		Percent Non-Detects	3.57%
Raw Statistics			
Minimum Detected	0.08	Minimum Detected	-2.526
Maximum Detected	0.79	Maximum Detected	-0.236
Mean of Detected	0.288	Mean of Detected	-1.464
SD of Detected	0.199	SD of Detected	0.678
Minimum Non-Detect	0.06	Minimum Non-Detect	-2.813
Maximum Non-Detect	0.06	Maximum Non-Detect	-2.813
Log-transformed Statistics			
UCL Statistics			
t Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.86	Shapiro Wilk Test Statistic	0.959
5% Shapiro Wilk Critical Value	0.923	5% Shapiro Wilk Critical Value	0.923
Normal at 5% Significance Level			
Assuming Normal Distribution			
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.278	Mean	-1.537
SD	0.201	SD	0.769
95% DL/2 (t) UCL	0.343	95% H-Stat (DL/2) UCL	0.4
Assuming Lognormal Distribution			
ML Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.276	Mean in Log Scale	-1.525
SD	0.202	SD in Log Scale	0.739
95% MLE (t) UCL	0.341	Mean in Original Scale	0.279
95% MLE (Tiku) UCL	0.338	SD in Original Scale	0.201
		95% t UCL	0.342
		95% Percentile Bootstrap UCL	0.342

Table F-4
ProUCL Output - Area 4 Surface Soil
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		95% BCA Bootstrap UCL	0.354
		95% H UCL	0.389
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
			Data appear Gamma Distributed at 5% Significance Level
k star (bias corrected)	2.198		
Theta Star	0.131		
nu star	118.7		
A-D Test Statistic	0.388	Nonparametric Statistics	
5% A-D Critical Value	0.754	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.754	Mean	0.28
5% K-S Critical Value	0.17	SD	0.196
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0377
		95% KM (t) UCL	0.344
Assuming Gamma Distribution		95% KM (z) UCL	0.342
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.344
Minimum	0.000001	95% KM (bootstrap t) UCL	0.36
Maximum	0.79	95% KM (BCA) UCL	0.35
Mean	0.277	95% KM (Percentile Bootstrap) UCL	0.341
Median	0.21	95% KM (Chebyshev) UCL	0.444
SD	0.203	97.5% KM (Chebyshev) UCL	0.515
k star	0.858	99% KM (Chebyshev) UCL	0.655
Theta star	0.323		
Nu star	48.04	Potential UCLs to Use	
AppChi2	33.13	95% KM (BCA) UCL	0.35
95% Gamma Approximate UCL	0.402		
95% Adjusted Gamma UCL	0.412		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Mercury, Inorganic Salts

General Statistics			
Number of Valid Data	24	Number of Detected Data	23
Number of Distinct Detected Data	19	Number of Non-Detect Data	1
		Percent Non-Detects	4.17%

Raw Statistics

Log-transformed Statistics

Table F-4
ProUCL Output - Area 4 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Minimum Detected	0.08	Minimum Detected	-2.526
Maximum Detected	0.79	Maximum Detected	-0.236
Mean of Detected	0.313	Mean of Detected	-1.373
SD of Detected	0.205	SD of Detected	0.681
Minimum Non-Detect	0.06	Minimum Non-Detect	-2.813
Maximum Non-Detect	0.06	Maximum Non-Detect	-2.813

UCL Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.889
5% Shapiro Wilk Critical Value	0.914

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.962
5% Shapiro Wilk Critical Value	0.914

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.301
SD	0.209
95% DL/2 (t) UCL	0.374

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean	-1.462
SD	0.796
95% H-Stat (DL/2) UCL	0.465

Maximum Likelihood Estimate(MLE) Method

Mean	0.298
SD	0.21
95% MLE (t) UCL	0.371
95% MLE (Tiku) UCL	0.369

Log ROS Method

Mean in Log Scale	-1.444
SD in Log Scale	0.751
Mean in Original Scale	0.302
SD in Original Scale	0.208
95% t UCL	0.374
95% Percentile Bootstrap UCL	0.372
95% BCA Bootstrap UCL	0.377
95% H UCL	0.444

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	2.233
Theta Star	0.14
nu star	102.7

Data Distribution Test with Detected Values Only

Data appear Gamma Distributed at 5% Significance Level

A-D Test Statistic	0.265
5% A-D Critical Value	0.752
K-S Test Statistic	0.752
5% K-S Critical Value	0.183

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	0.303
SD	0.202
SE of Mean	0.0421

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% KM (t) UCL	0.375
95% KM (z) UCL	0.372

Table F-4
ProUCL Output - Area 4 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.375
Minimum	0.000001	95% KM (bootstrap t) UCL	0.388
Maximum	0.79	95% KM (BCA) UCL	0.374
Mean	0.3	95% KM (Percentile Bootstrap) UCL	0.375
Median	0.265	95% KM (Chebyshev) UCL	0.486
SD	0.21	97.5% KM (Chebyshev) UCL	0.566
k star	0.778	99% KM (Chebyshev) UCL	0.722
Theta star	0.385		
Nu star	37.35	Potential UCLs to Use	
AppChi2	24.36	95% KM (BCA) UCL	0.374
95% Gamma Approximate UCL	0.459		
95% Adjusted Gamma UCL	0.474		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Vanadium

General Statistics	
Number of Valid Observations 25	Number of Distinct Observations 25

Raw Statistics	Log-transformed Statistics
Minimum 19.2	Minimum of Log Data 2.955
Maximum 37	Maximum of Log Data 3.611
Mean 27.46	Mean of log Data 3.299
Median 27.4	SD of log Data 0.17
SD 4.646	
Std. Error of Mean 0.929	
Coefficient of Variation 0.169	
Skewness 0.279	

Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.978	Shapiro Wilk Test Statistic 0.984
Data appear Normal at 5% Significance Level	
Shapiro Wilk Critical Value 0.918	Shapiro Wilk Critical Value 0.918
Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 29.05	95% H-UCL 29.19

Table F-4
ProUCL Output - Area 4 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
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95% UCLs (Adjusted for Skewness)		
95% Adjusted-CLT UCL (Chen-1995)	29.05	95% Chebyshev (MVUE) UCL 31.56
95% Modified-t UCL (Johnson-1978)	29.06	97.5% Chebyshev (MVUE) UCL 33.33
		99% Chebyshev (MVUE) UCL 36.8
Gamma Distribution Test		Data Distribution
k star (bias corrected)		32.1
Theta Star		0.856
MLE of Mean		27.46
MLE of Standard Deviation		4.848
nu star		1605
Approximate Chi Square Value (.05)		1513
Adjusted Level of Significance		0.0395
Adjusted Chi Square Value		1507
Anderson-Darling Test Statistic		0.143
Anderson-Darling 5% Critical Value		0.743
Kolmogorov-Smirnov Test Statistic		0.0756
Kolmogorov-Smirnov 5% Critical Value		0.174
Data appear Gamma Distributed at 5% Significance Level		Nonparametric Statistics
Assuming Gamma Distribution		95% CLT UCL 28.99
95% Approximate Gamma UCL		29.13
95% Adjusted Gamma UCL		29.25
Potential UCL to Use		Use 95% Student's-t UCL 29.05

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). For additional insight, the user may want to consult a statistician.

Table F-5
ProUCL Output - Area 5 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Area5.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Antimony

General Statistics			
Number of Valid Data	15	Number of Detected Data	9
Number of Distinct Detected Data	9	Number of Non-Detect Data	6
		Percent Non-Detects	40.00%
Raw Statistics			
Minimum Detected	0.24	Minimum Detected	-1.427
Maximum Detected	1.4	Maximum Detected	0.336
Mean of Detected	0.656	Mean of Detected	-0.604
SD of Detected	0.421	SD of Detected	0.64
Minimum Non-Detect	0.21	Minimum Non-Detect	-1.561
Maximum Non-Detect	0.44	Maximum Non-Detect	-0.821
 Note: Data have multiple DLs - Use of KM Method is recommended			
For all methods (except KM, DL/2, and ROS Methods),			
Observations < Largest ND are treated as NDs			
Number treated as Non-Detect 10			
Number treated as Detected 5			
Single DL Non-Detect Percentage 66.67%			

Warning: There are only 9 Detected Values in this data

**Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions**

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.873
5% Shapiro Wilk Critical Value	0.829

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.935
5% Shapiro Wilk Critical Value	0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Assuming Lognormal Distribution

DL/2 Substitution Method

Table F-5
ProUCL Output - Area 5 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Mean	0.47	Mean	-1.033
SD	0.396	SD	0.748
95% DL/2 (t) UCL	0.651	95% H-Stat (DL/2) UCL	0.756
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.145	Mean in Log Scale	-0.993
SD	0.702	SD in Log Scale	0.73
95% MLE (t) UCL	0.464	Mean in Original Scale	0.481
95% MLE (Tiku) UCL	0.656	SD in Original Scale	0.391
		95% t UCL	0.659
		95% Percentile Bootstrap UCL	0.654
		95% BCA Bootstrap UCL	0.686
		95% H UCL	0.764
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	2.014	Data appear Normal at 5% Significance Level	
Theta Star	0.325		
nu star	36.25		
A-D Test Statistic	0.355	Nonparametric Statistics	
5% A-D Critical Value	0.727	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.727	Mean	0.505
5% K-S Critical Value	0.281	SD	0.361
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.1
Assuming Gamma Distribution		95% KM (t) UCL	0.681
Gamma ROS Statistics using Extrapolated Data		95% KM (z) UCL	0.67
Minimum	0.000001	95% KM (jackknife) UCL	0.678
Maximum	1.4	95% KM (bootstrap t) UCL	0.752
Mean	0.443	95% KM (BCA) UCL	0.708
Median	0.369	95% KM (Percentile Bootstrap) UCL	0.685
SD	0.428	95% KM (Chebyshev) UCL	0.941
k star	0.259	97.5% KM (Chebyshev) UCL	1.13
Theta star	1.71	99% KM (Chebyshev) UCL	1.501
Nu star	7.776	Potential UCLs to Use	
AppChi2	2.606	95% KM (t) UCL	0.681
95% Gamma Approximate UCL	1.323	95% KM (Percentile Bootstrap) UCL	0.685
95% Adjusted Gamma UCL	1.531		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

Table F-5
ProUCL Output - Area 5 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

For additional insight, the user may want to consult a statistician.

Arsenic

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 14
Raw Statistics	Log-transformed Statistics
Minimum 1.7	Minimum of Log Data 0.531
Maximum 13.3	Maximum of Log Data 2.588
Mean 4.433	Mean of log Data 1.355
Median 3.5	SD of log Data 0.507
SD 2.812	
Std. Error of Mean 0.726	
Coefficient of Variation 0.634	
Skewness 2.439	
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.743	Shapiro Wilk Test Statistic 0.951
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 5.712	95% H-UCL 5.843
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 6.939
95% Adjusted-CLT UCL (Chen-1995) 6.116	97.5% Chebyshev (MVUE) UCL 8.051
95% Modified-t UCL (Johnson-1978) 5.788	99% Chebyshev (MVUE) UCL 10.24
Gamma Distribution Test	Data Distribution
k star (bias corrected) 3.152	
Theta Star 1.406	
MLE of Mean 4.433	
MLE of Standard Deviation 2.497	
nu star 94.57	
Approximate Chi Square Value (.05) 73.14	Data appear Gamma Distributed at 5% Significance Level
Adjusted Level of Significance 0.0324	
Adjusted Chi Square Value 70.82	
Anderson-Darling Test Statistic 0.519	Nonparametric Statistics
Anderson-Darling 5% Critical Value 0.741	95% CLT UCL 5.627
	95% Jackknife UCL 5.712
	95% Standard Bootstrap UCL 5.585
	95% Bootstrap-t UCL 6.724
	95% Hall's Bootstrap UCL 10.81

Table F-5
ProUCL Output - Area 5 Surface Soil
Second Supplemental Remedial Investigation
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Queens, New York

Kolmogorov-Smirnov Test Statistic	0.142	95% Percentile Bootstrap UCL	5.727
Kolmogorov-Smirnov 5% Critical Value	0.223	95% BCA Bootstrap UCL	6.24
Data appear Gamma Distributed at 5% Significance Level			95% Chebyshev(Mean, Sd) UCL
7.598			97.5% Chebyshev(Mean, Sd) UCL
8.967			99% Chebyshev(Mean, Sd) UCL
11.66			
Assuming Gamma Distribution			
95% Approximate Gamma UCL			5.732
95% Adjusted Gamma UCL			5.92
Potential UCL to Use		Use 95% Approximate Gamma UCL	5.732

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). For additional insight, the user may want to consult a statistician.

Cobalt

General Statistics			
Number of Valid Observations		15	Number of Distinct Observations
14			
Raw Statistics			
Minimum		2.7	Minimum of Log Data
Maximum		35.5	3.57
Mean		7.393	Mean of log Data
Median		4.7	1.715
SD		8.251	SD of log Data
Std. Error of Mean		2.13	0.666
Coefficient of Variation		1.116	
Skewness		3.218	
Relevant UCL Statistics			
Normal Distribution Test		Log-transformed Statistics	
Shapiro Wilk Test Statistic		0.546	0.993
Shapiro Wilk Critical Value		0.881	3.57
Data not Normal at 5% Significance Level		Mean of log Data	
		1.715	
Lognormal Distribution Test			
Shapiro Wilk Test Statistic		0.837	
Shapiro Wilk Critical Value		0.881	
Data not Lognormal at 5% Significance Level			
Assuming Normal Distribution			
95% Student's-t UCL		11.15	95% H-UCL
10.38			
95% UCLs (Adjusted for Skewness)			
95% Adjusted-CLT UCL (Chen-1995)		12.79	95% Chebyshev (MVUE) UCL
12.18			
95% Modified-t UCL (Johnson-1978)		11.44	97.5% Chebyshev (MVUE) UCL
14.5			
99% Chebyshev (MVUE) UCL		19.06	

Table F-5
ProUCL Output - Area 5 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Gamma Distribution Test		Data Distribution
k star (bias corrected)	1.566	Data do not follow a Discernable Distribution (0.05)
Theta Star	4.721	
MLE of Mean	7.393	
MLE of Standard Deviation	5.908	
nu star	46.98	
Approximate Chi Square Value (.05)	32.26	Nonparametric Statistics
Adjusted Level of Significance	0.0324	95% CLT UCL 10.9
Adjusted Chi Square Value	30.76	95% Jackknife UCL 11.15
Anderson-Darling Test Statistic	1.457	95% Standard Bootstrap UCL 10.8
Anderson-Darling 5% Critical Value	0.748	95% Bootstrap-t UCL 20.84
Kolmogorov-Smirnov Test Statistic	0.279	95% Hall's Bootstrap UCL 22.8
Kolmogorov-Smirnov 5% Critical Value	0.225	95% Percentile Bootstrap UCL 11.25
Data not Gamma Distributed at 5% Significance Level		95% BCA Bootstrap UCL 13.7
Assuming Gamma Distribution		95% Chebyshev(Mean, Sd) UCL 16.68
95% Approximate Gamma UCL	10.77	97.5% Chebyshev(Mean, Sd) UCL 20.7
95% Adjusted Gamma UCL	11.29	99% Chebyshev(Mean, Sd) UCL 28.59
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL 16.68

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). For additional insight, the user may want to consult a statistician.

Thallium

General Statistics			
Number of Valid Data	14	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	13
		Percent Non-Detects	92.86%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Thallium was not processed!

Aluminum

Table F-5
ProUCL Output - Area 5 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 15
Raw Statistics	
Minimum 2160	Minimum of Log Data 7.678
Maximum 9380	Maximum of Log Data 9.146
Mean 4929	Mean of log Data 8.401
Median 4570	SD of log Data 0.475
SD 2237	
Std. Error of Mean 577.6	
Coefficient of Variation 0.454	
Skewness 0.467	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.94	Shapiro Wilk Test Statistic 0.948
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data appear Normal at 5% Significance Level	
Lognormal Distribution Test	
Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution	
95% Student's-t UCL 5946	95% H-UCL 6461
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 5953	95% Chebyshev (MVUE) UCL 7661
95% Modified-t UCL (Johnson-1978) 5958	97.5% Chebyshev (MVUE) UCL 8837
99% Chebyshev (MVUE) UCL 11146	
Gamma Distribution Test	
Data Distribution	
Data appear Normal at 5% Significance Level	
Nonparametric Statistics	
K star (bias corrected) 4.11	95% CLT UCL 5879
Theta Star 1199	95% Jackknife UCL 5946
MLE of Mean 4929	95% Standard Bootstrap UCL 5847
MLE of Standard Deviation 2431	95% Bootstrap-t UCL 6020
nu star 123.3	95% Hall's Bootstrap UCL 5952
Approximate Chi Square Value (.05) 98.65	95% Percentile Bootstrap UCL 5869
Adjusted Level of Significance 0.0324	95% BCA Bootstrap UCL 5917
Adjusted Chi Square Value 95.94	95% Chebyshev(Mean, Sd) UCL 7447
Anderson-Darling Test Statistic 0.296	97.5% Chebyshev(Mean, Sd) UCL 8536
Anderson-Darling 5% Critical Value 0.739	
Kolmogorov-Smirnov Test Statistic 0.146	
Kolmogorov-Smirnov 5% Critical Value 0.222	
Data appear Gamma Distributed at 5% Significance Level	

Table F-5
ProUCL Output - Area 5 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Assuming Gamma Distribution	99% Chebyshev(Mean, Sd) UCL 10676
95% Approximate Gamma UCL 6160	
95% Adjusted Gamma UCL 6334	

Potential UCL to Use	Use 95% Student's-t UCL 5946
-----------------------------	------------------------------

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). For additional insight, the user may want to consult a statistician.

Barium

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 15
Raw Statistics	Log-transformed Statistics
Minimum 23.5	Minimum of Log Data 3.157
Maximum 84.8	Maximum of Log Data 4.44
Mean 54.75	Mean of log Data 3.957
Median 53.4	SD of log Data 0.323
SD 16.54	
Std. Error of Mean 4.272	
Coefficient of Variation 0.302	
Skewness 0.358	
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.94	Shapiro Wilk Test Statistic 0.93
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 62.27	95% H-UCL 64.91
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 62.19	95% Chebyshev (MVUE) UCL 75.1
95% Modified-t UCL (Johnson-1978) 62.34	97.5% Chebyshev (MVUE) UCL 83.85
	99% Chebyshev (MVUE) UCL 101
Gamma Distribution Test	Data Distribution
k star (bias corrected) 8.93	Data appear Normal at 5% Significance Level
Theta Star 6.13	
MLE of Mean 54.75	

Table F-5
ProUCL Output - Area 5 Surface Soil
Second Supplemental Remedial Investigation
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Queens, New York

MLE of Standard Deviation 18.32	Nonparametric Statistics
nu star 267.9	
Approximate Chi Square Value (.05) 231	95% CLT UCL 61.77
Adjusted Level of Significance 0.0324	95% Jackknife UCL 62.27
Adjusted Chi Square Value 226.8	95% Standard Bootstrap UCL 61.67
Anderson-Darling Test Statistic 0.386	95% Bootstrap-t UCL 62.85
Anderson-Darling 5% Critical Value 0.737	95% Hall's Bootstrap UCL 62.87
Kolmogorov-Smirnov Test Statistic 0.145	95% Percentile Bootstrap UCL 61.43
Kolmogorov-Smirnov 5% Critical Value 0.221	95% BCA Bootstrap UCL 62.33
Data appear Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 73.37
Assuming Gamma Distribution	97.5% Chebyshev(Mean, Sd) UCL 81.42
95% Approximate Gamma UCL 63.49	99% Chebyshev(Mean, Sd) UCL 97.25
95% Adjusted Gamma UCL 64.67	
Potential UCL to Use	Use 95% Student's-t UCL 62.27

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). For additional insight, the user may want to consult a statistician.

Cadmium

General Statistics	
Number of Valid Observations 14	Number of Distinct Observations 14
Raw Statistics	Log-transformed Statistics
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.866	Shapiro Wilk Test Statistic 0.94
Shapiro Wilk Critical Value 0.874	Shapiro Wilk Critical Value 0.874

Table F-5
ProUCL Output - Area 5 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Data not Normal at 5% Significance Level **Data appear Lognormal at 5% Significance Level**

Assuming Normal Distribution

95% Student's-t UCL 0.714

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 0.751

95% Modified-t UCL (Johnson-1978) 0.722

Assuming Lognormal Distribution

95% H-UCL 1.529

95% Chebyshev (MVUE) UCL 1.36

97.5% Chebyshev (MVUE) UCL 1.708

99% Chebyshev (MVUE) UCL 2.392

Gamma Distribution Test

k star (bias corrected) 1

Theta Star 0.5

MLE of Mean 0.5

MLE of Standard Deviation 0.5

nu star 27.99

Approximate Chi Square Value (.05) 16.92

Adjusted Level of Significance 0.0312

Adjusted Chi Square Value 15.79

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 0.699

95% Jackknife UCL 0.714

95% Standard Bootstrap UCL 0.695

95% Bootstrap-t UCL 0.823

95% Hall's Bootstrap UCL 0.954

95% Percentile Bootstrap UCL 0.699

95% BCA Bootstrap UCL 0.747

95% Chebyshev(Mean, Sd) UCL 1.028

97.5% Chebyshev(Mean, Sd) UCL 1.256

99% Chebyshev(Mean, Sd) UCL 1.705

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 0.826

95% Adjusted Gamma UCL 0.886

Potential UCL to Use

Use 95% Approximate Gamma UCL 0.826

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). For additional insight, the user may want to consult a statistician.

Chromium

General Statistics

Number of Valid Observations 15

Number of Distinct Observations 14

Raw Statistics

Minimum 4.9

Log-transformed Statistics

Minimum of Log Data 1.589

Table F-5
ProUCL Output - Area 5 Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Maximum 29.7	Maximum of Log Data 3.391
Mean 13.58	Mean of log Data 2.48
Median 15.4	SD of log Data 0.541
SD 6.875	
Std. Error of Mean 1.775	
Coefficient of Variation 0.506	
Skewness 0.65	

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.882
 Shapiro Wilk Critical Value 0.881

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.902
 Shapiro Wilk Critical Value 0.881

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 16.71

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 16.82
 95% Modified-t UCL (Johnson-1978) 16.76

Assuming Lognormal Distribution

95% H-UCL 18.76

95% Chebyshev (MVUE) UCL 22.28
 97.5% Chebyshev (MVUE) UCL 26.01
 99% Chebyshev (MVUE) UCL 33.33

Gamma Distribution Test

k star (bias corrected) 3.272
 Theta Star 4.15
 MLE of Mean 13.58
 MLE of Standard Deviation 7.507
 nu star 98.16

Approximate Chi Square Value (.05) 76.31
 Adjusted Level of Significance 0.0324
 Adjusted Chi Square Value 73.94

Anderson-Darling Test Statistic 0.775
 Anderson-Darling 5% Critical Value 0.74
 Kolmogorov-Smirnov Test Statistic 0.203
 Kolmogorov-Smirnov 5% Critical Value 0.223

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 16.5
 95% Jackknife UCL 16.71
 95% Standard Bootstrap UCL 16.42
 95% Bootstrap-t UCL 16.96
 95% Hall's Bootstrap UCL 17.38
 95% Percentile Bootstrap UCL 16.47
 95% BCA Bootstrap UCL 16.75
 95% Chebyshev(Mean, Sd) UCL 21.32
 97.5% Chebyshev(Mean, Sd) UCL 24.67
 99% Chebyshev(Mean, Sd) UCL 31.24

Data follow Appr. Gamma Distribution at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 17.47
 95% Adjusted Gamma UCL 18.03

Potential UCL to Use

Use 95% Student's-t UCL 16.71

Table F-5
ProUCL Output - Area 5 Surface Soil
Second Supplemental Remedial Investigation
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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). For additional insight, the user may want to consult a statistician.

Copper

General Statistics																	
Number of Valid Observations 15	Number of Distinct Observations 15																
Raw Statistics	Log-transformed Statistics																
<table border="0"> <tr> <td style="width: 50%;">Minimum 9.5</td><td style="width: 50%;">Minimum of Log Data 2.251</td></tr> <tr> <td>Maximum 310</td><td>Maximum of Log Data 5.737</td></tr> <tr> <td>Mean 73.03</td><td>Mean of log Data 3.786</td></tr> <tr> <td>Median 38</td><td>SD of log Data 1.016</td></tr> <tr> <td>SD 85.6</td><td></td></tr> <tr> <td>Std. Error of Mean 22.1</td><td></td></tr> <tr> <td>Coefficient of Variation 1.172</td><td></td></tr> <tr> <td>Skewness 2.078</td><td></td></tr> </table>		Minimum 9.5	Minimum of Log Data 2.251	Maximum 310	Maximum of Log Data 5.737	Mean 73.03	Mean of log Data 3.786	Median 38	SD of log Data 1.016	SD 85.6		Std. Error of Mean 22.1		Coefficient of Variation 1.172		Skewness 2.078	
Minimum 9.5	Minimum of Log Data 2.251																
Maximum 310	Maximum of Log Data 5.737																
Mean 73.03	Mean of log Data 3.786																
Median 38	SD of log Data 1.016																
SD 85.6																	
Std. Error of Mean 22.1																	
Coefficient of Variation 1.172																	
Skewness 2.078																	
Relevant UCL Statistics																	
Normal Distribution Test	Lognormal Distribution Test																
Shapiro Wilk Test Statistic 0.709	Shapiro Wilk Test Statistic 0.963																
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881																
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level																
Assuming Normal Distribution	Assuming Lognormal Distribution																
95% Student's-t UCL 112	95% H-UCL 156.5																
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 158.4																
95% Adjusted-CLT UCL (Chen-1995) 122.1	97.5% Chebyshev (MVUE) UCL 196.5																
95% Modified-t UCL (Johnson-1978) 113.9	99% Chebyshev (MVUE) UCL 271.3																
Gamma Distribution Test	Data Distribution																
k star (bias corrected) 0.946	Data appear Gamma Distributed at 5% Significance Level																
Theta Star 77.16																	
MLE of Mean 73.03																	
MLE of Standard Deviation 75.06																	
nu star 28.39																	
Approximate Chi Square Value (.05) 17.23																	
Adjusted Level of Significance 0.0324																	
Adjusted Chi Square Value 16.17																	
Nonparametric Statistics																	
95% CLT UCL 109.4																	
95% Jackknife UCL 112																	
95% Standard Bootstrap UCL 107.4																	

Table F-5
ProUCL Output - Area 5 Surface Soil
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Anderson-Darling Test Statistic	0.564	95% Bootstrap-t UCL	172
Anderson-Darling 5% Critical Value	0.761	95% Hall's Bootstrap UCL	300
Kolmogorov-Smirnov Test Statistic	0.162	95% Percentile Bootstrap UCL	111
Kolmogorov-Smirnov 5% Critical Value	0.227	95% BCA Bootstrap UCL	123.7
Data appear Gamma Distributed at 5% Significance Level			95% Chebyshev(Mean, Sd) UCL 169.4
Assuming Gamma Distribution			97.5% Chebyshev(Mean, Sd) UCL 211.1
			99% Chebyshev(Mean, Sd) UCL 292.9
Potential UCL to Use		Use 95% Approximate Gamma UCL 120.3	

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). For additional insight, the user may want to consult a statistician.

Lead

General Statistics	
Number of Valid Observations	15
Number of Distinct Observations	15
Raw Statistics	
Minimum	13.6
Maximum	793
Mean	254.5
Median	143
SD	246.8
Std. Error of Mean	63.73
Coefficient of Variation	0.97
Skewness	0.864
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic	0.873
Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level	
Log-transformed Statistics	
Minimum of Log Data	2.61
Maximum of Log Data	6.676
Mean of log Data	4.892
SD of log Data	1.335
Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.928
Shapiro Wilk Critical Value	0.881
Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution	
95% Student's-t UCL	366.8
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995)	374.5
Assuming Lognormal Distribution	
95% H-UCL	1058
95% Chebyshev (MVUE) UCL	793.7
97.5% Chebyshev (MVUE) UCL	1010

Table F-5
ProUCL Output - Area 5 Surface Soil
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95% Modified-t UCL (Johnson-1978) 369.1	99% Chebyshev (MVUE) UCL 1434
Gamma Distribution Test	Data Distribution
k star (bias corrected) 0.767	Data appear Gamma Distributed at 5% Significance Level
Theta Star 331.9	
MLE of Mean 254.5	
MLE of Standard Deviation 290.7	
nu star 23	
Approximate Chi Square Value (.05) 13.09	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 359.4
Adjusted Chi Square Value 12.18	95% Jackknife UCL 366.8
Anderson-Darling Test Statistic 0.403	95% Standard Bootstrap UCL 355.3
Anderson-Darling 5% Critical Value 0.768	95% Bootstrap-t UCL 390.1
Kolmogorov-Smirnov Test Statistic 0.152	95% Hall's Bootstrap UCL 372
Kolmogorov-Smirnov 5% Critical Value 0.229	95% Percentile Bootstrap UCL 358
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 370.6
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 532.3
95% Approximate Gamma UCL 447.2	97.5% Chebyshev(Mean, Sd) UCL 652.5
95% Adjusted Gamma UCL 480.7	99% Chebyshev(Mean, Sd) UCL 888.6
Potential UCL to Use	Use 95% Approximate Gamma UCL 447.2

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). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 15
Raw Statistics	Log-transformed Statistics
Minimum 46.6	Minimum of Log Data 3.842
Maximum 438	Maximum of Log Data 6.082
Mean 159.7	Mean of log Data 4.878
Median 155	SD of log Data 0.666
SD 103	
Std. Error of Mean 26.6	
Coefficient of Variation 0.645	

Table F-5
ProUCL Output - Area 5 Surface Soil
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Skewness 1.325

Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.876	Shapiro Wilk Test Statistic 0.943
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 206.6	95% H-UCL 245.3
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 287.9
95% Adjusted-CLT UCL (Chen-1995) 213.2	97.5% Chebyshev (MVUE) UCL 342.8
95% Modified-t UCL (Johnson-1978) 208.1	99% Chebyshev (MVUE) UCL 450.6
Gamma Distribution Test	Data Distribution
k star (bias corrected) 2.214	Data appear Gamma Distributed at 5% Significance Level
Theta Star 72.14	
MLE of Mean 159.7	
MLE of Standard Deviation 107.3	
nu star 66.42	
Approximate Chi Square Value (.05) 48.66	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 203.5
Adjusted Chi Square Value 46.79	95% Jackknife UCL 206.6
Anderson-Darling Test Statistic 0.347	95% Standard Bootstrap UCL 201.3
Anderson-Darling 5% Critical Value 0.745	95% Bootstrap-t UCL 221.6
Kolmogorov-Smirnov Test Statistic 0.135	95% Hall's Bootstrap UCL 237
Kolmogorov-Smirnov 5% Critical Value 0.224	95% Percentile Bootstrap UCL 203.8
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 215
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 275.7
95% Approximate Gamma UCL 218	97.5% Chebyshev(Mean, Sd) UCL 325.8
95% Adjusted Gamma UCL 226.7	99% Chebyshev(Mean, Sd) UCL 424.4
Potential UCL to Use	Use 95% Approximate Gamma UCL 218

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). For additional insight, the user may want to consult a statistician.

Table F-5
ProUCL Output - Area 5 Surface Soil
Second Supplemental Remedial Investigation
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General Statistics	
Number of Valid Observations 7	Number of Distinct Observations 7
Raw Statistics	
Minimum 0.178	Minimum of Log Data -1.726
Maximum 4.8	Maximum of Log Data 1.569
Mean 1.817	Mean of log Data -0.035
Median 0.77	SD of log Data 1.283
SD 1.991	
Std. Error of Mean 0.753	
Coefficient of Variation 1.096	
Skewness 1.029	
Log-transformed Statistics	

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.778	Shapiro Wilk Test Statistic 0.932
Shapiro Wilk Critical Value 0.803	Shapiro Wilk Critical Value 0.803
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 3.279	95% H-UCL 23.55
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 5.746
95% Adjusted-CLT UCL (Chen-1995) 3.368	97.5% Chebyshev (MVUE) UCL 7.43
95% Modified-t UCL (Johnson-1978) 3.328	99% Chebyshev (MVUE) UCL 10.74
Gamma Distribution Test	Data Distribution
k star (bias corrected) 0.622	Data appear Gamma Distributed at 5% Significance Level
Theta Star 2.92	

Table F-5
ProUCL Output - Area 5 Surface Soil
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MLE of Mean 1.817	
MLE of Standard Deviation 2.303	
nu star 8.71	
Approximate Chi Square Value (.05) 3.153	Nonparametric Statistics
Adjusted Level of Significance 0.0158	95% CLT UCL 3.055
Adjusted Chi Square Value 2.233	95% Jackknife UCL 3.279
	95% Standard Bootstrap UCL 2.938
Anderson-Darling Test Statistic 0.39	95% Bootstrap-t UCL 6.587
Anderson-Darling 5% Critical Value 0.73	95% Hall's Bootstrap UCL 10.17
Kolmogorov-Smirnov Test Statistic 0.21	95% Percentile Bootstrap UCL 2.995
Kolmogorov-Smirnov 5% Critical Value 0.321	95% BCA Bootstrap UCL 3.224
Data appear Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 5.098
Assuming Gamma Distribution	97.5% Chebyshev(Mean, Sd) UCL 6.517
95% Approximate Gamma UCL 5.019	99% Chebyshev(Mean, Sd) UCL 9.306
95% Adjusted Gamma UCL 7.087	
Potential UCL to Use	Use 95% Approximate Gamma UCL 5.019
Recommended UCL exceeds the maximum observation	

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). For additional insight, the user may want to consult a statistician.

Vanadium

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 14
Raw Statistics	Log-transformed Statistics
Minimum 11	Minimum of Log Data 2.398
Maximum 40.1	Maximum of Log Data 3.691
Mean 20.89	Mean of log Data 2.975
Median 19.6	SD of log Data 0.364
SD 8.179	
Std. Error of Mean 2.112	
Coefficient of Variation 0.392	
Skewness 1.269	
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test

Table F-5
ProUCL Output - Area 5 Surface Soil
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Shapiro Wilk Test Statistic 0.865	Shapiro Wilk Test Statistic 0.941
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 24.61	95% H-UCL 25.27
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 29.52
95% Adjusted-CLT UCL (Chen-1995) 25.1	97.5% Chebyshev (MVUE) UCL 33.28
95% Modified-t UCL (Johnson-1978) 24.72	99% Chebyshev (MVUE) UCL 40.66
Gamma Distribution Test	Data Distribution
k star (bias corrected) 6.42	Data appear Gamma Distributed at 5% Significance Level
Theta Star 3.253	
MLE of Mean 20.89	
MLE of Standard Deviation 8.243	
nu star 192.6	
Approximate Chi Square Value (.05) 161.5	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 24.36
Adjusted Chi Square Value 158	95% Jackknife UCL 24.61
Anderson-Darling Test Statistic 0.519	95% Standard Bootstrap UCL 24.21
Anderson-Darling 5% Critical Value 0.738	95% Bootstrap-t UCL 26.05
Kolmogorov-Smirnov Test Statistic 0.195	95% Hall's Bootstrap UCL 29.98
Kolmogorov-Smirnov 5% Critical Value 0.222	95% Percentile Bootstrap UCL 24.61
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 25.06
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 30.09
95% Approximate Gamma UCL 24.91	97.5% Chebyshev(Mean, Sd) UCL 34.08
95% Adjusted Gamma UCL 25.46	99% Chebyshev(Mean, Sd) UCL 41.9
Potential UCL to Use	Use 95% Approximate Gamma UCL 24.91

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). For additional insight, the user may want to consult a statistician.

Table F-6
ProUCL Output - Background Surface Soil
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General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Background.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Number of Valid Observations 15	Number of Distinct Observations 15
---------------------------------	------------------------------------

Raw Statistics

Minimum 0.035
Maximum 0.59
Mean 0.159
Median 0.1
SD 0.148
Std. Error of Mean 0.0381
Coefficient of Variation 0.925
Skewness 2.04

Log-transformed Statistics

Minimum of Log Data -3.352
Maximum of Log Data -0.528
Mean of log Data -2.146
SD of log Data 0.787

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.747
Shapiro Wilk Critical Value 0.881

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.95
Shapiro Wilk Critical Value 0.881

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 0.227

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 0.244
95% Modified-t UCL (Johnson-1978) 0.23

Assuming Lognormal Distribution

95% H-UCL 0.266
95% Chebyshev (MVUE) UCL 0.302
97.5% Chebyshev (MVUE) UCL 0.366
99% Chebyshev (MVUE) UCL 0.49

Gamma Distribution Test

k star (bias corrected) 1.455
Theta Star 0.11
MLE of Mean 0.159
MLE of Standard Deviation 0.132
nu star 43.65
Approximate Chi Square Value (.05) 29.5

Data Distribution

Data Follow Appr. Gamma Distribution at 5% Significance Level

Nonparametric Statistics

Table F-6
ProUCL Output - Background Surface Soil
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Adjusted Level of Significance	0.0324	95% CLT UCL	0.222
Adjusted Chi Square Value	28.07	95% Jackknife UCL	0.227
		95% Standard Bootstrap UCL	0.221
Anderson-Darling Test Statistic	0.665	95% Bootstrap-t UCL	0.278
Anderson-Darling 5% Critical Value	0.75	95% Hall's Bootstrap UCL	0.278
Kolmogorov-Smirnov Test Statistic	0.235	95% Percentile Bootstrap UCL	0.225
Kolmogorov-Smirnov 5% Critical Value	0.225	95% BCA Bootstrap UCL	0.247
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.326
		97.5% Chebyshev(Mean, Sd) UCL	0.397
		99% Chebyshev(Mean, Sd) UCL	0.539
Assuming Gamma Distribution			
95% Approximate Gamma UCL	0.236		
95% Adjusted Gamma UCL	0.248		
Potential UCL to Use		Use 95% Approximate Gamma UCL	0.236

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). For additional insight, the user may want to consult a statistician.

Benzo(a)pyrene

General Statistics	
Number of Valid Observations	15
Number of Distinct Observations	12
Raw Statistics	
Minimum	0.034
Maximum	0.35
Mean	0.141
Median	0.12
SD	0.0985
Std. Error of Mean	0.0254
Coefficient of Variation	0.698
Skewness	1.068
Log-transformed Statistics	
Minimum of Log Data	-3.381
Maximum of Log Data	-1.05
Mean of log Data	-2.185
SD of log Data	0.711
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic	0.861
Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level	
Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.953
Shapiro Wilk Critical Value	0.881
	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	
Assuming Lognormal Distribution	

Table F-6
ProUCL Output - Background Surface Soil
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95% Student's-t UCL 0.186	95% H-UCL 0.225
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 0.19	95% Chebyshev (MVUE) UCL 0.262
95% Modified-t UCL (Johnson-1978) 0.187	97.5% Chebyshev (MVUE) UCL 0.314
	99% Chebyshev (MVUE) UCL 0.416
Gamma Distribution Test	Data Distribution
k star (bias corrected) 1.932	Data appear Gamma Distributed at 5% Significance Level
Theta Star 0.0731	
MLE of Mean 0.141	
MLE of Standard Deviation 0.102	
nu star 57.96	
Approximate Chi Square Value (.05) 41.46	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 0.183
Adjusted Chi Square Value 39.74	95% Jackknife UCL 0.186
Anderson-Darling Test Statistic 0.394	95% Standard Bootstrap UCL 0.182
Anderson-Darling 5% Critical Value 0.746	95% Bootstrap-t UCL 0.199
Kolmogorov-Smirnov Test Statistic 0.175	95% Hall's Bootstrap UCL 0.189
Kolmogorov-Smirnov 5% Critical Value 0.224	95% Percentile Bootstrap UCL 0.184
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 0.188
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 0.252
95% Approximate Gamma UCL 0.197	97.5% Chebyshev(Mean, Sd) UCL 0.3
95% Adjusted Gamma UCL 0.206	99% Chebyshev(Mean, Sd) UCL 0.394
Potential UCL to Use	Use 95% Approximate Gamma UCL 0.197

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). For additional insight, the user may want to consult a statistician.

Benzo(b)fluoranthene

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 14
Raw Statistics	Log-transformed Statistics
Minimum 0.051	Minimum of Log Data -2.976
Maximum 0.58	Maximum of Log Data -0.545
Mean 0.236	Mean of log Data -1.679
Median 0.18	SD of log Data 0.725

Table F-6
ProUCL Output - Background Surface Soil
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SD 0.17

Std. Error of Mean 0.0438

Coefficient of Variation 0.718

Skewness 1.111

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.857

Shapiro Wilk Critical Value 0.881

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.971

Shapiro Wilk Critical Value 0.881

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 0.314

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 0.322

95% Modified-t UCL (Johnson-1978) 0.316

Assuming Lognormal Distribution

95% H-UCL 0.381

95% Chebyshev (MVUE) UCL 0.442

97.5% Chebyshev (MVUE) UCL 0.531

99% Chebyshev (MVUE) UCL 0.705

Gamma Distribution Test

k star (bias corrected) 1.855

Theta Star 0.127

MLE of Mean 0.236

MLE of Standard Deviation 0.174

nu star 55.65

Approximate Chi Square Value (.05) 39.5

Adjusted Level of Significance 0.0324

Adjusted Chi Square Value 37.83

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 0.308

95% Jackknife UCL 0.314

95% Standard Bootstrap UCL 0.305

95% Bootstrap-t UCL 0.337

95% Hall's Bootstrap UCL 0.311

95% Percentile Bootstrap UCL 0.309

95% BCA Bootstrap UCL 0.314

95% Chebyshev(Mean, Sd) UCL 0.427

97.5% Chebyshev(Mean, Sd) UCL 0.51

99% Chebyshev(Mean, Sd) UCL 0.672

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 0.333

95% Adjusted Gamma UCL 0.348

Potential UCL to Use

Use 95% Approximate Gamma UCL 0.333

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). For additional insight, the user may want to consult a statistician.

Table F-6
ProUCL Output - Background Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Carbazole

General Statistics			
Number of Valid Data	15	Number of Detected Data	12
Number of Distinct Detected Data	12	Number of Non-Detect Data	3
		Percent Non-Detects	20.00%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0056	Minimum Detected	-5.185
Maximum Detected	0.1	Maximum Detected	-2.303
Mean of Detected	0.0229	Mean of Detected	-4.168
SD of Detected	0.0264	SD of Detected	0.85
Minimum Non-Detect	0.0048	Minimum Non-Detect	-5.339
Maximum Non-Detect	0.0057	Maximum Non-Detect	-5.167
Note: Data have multiple DLs - Use of KM Method is recommended For all methods (except KM, DL/2, and ROS Methods), Observations < Largest ND are treated as NDs		Number treated as Non-Detect	4
		Number treated as Detected	11
		Single DL Non-Detect Percentage	26.67%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.656	Shapiro Wilk Test Statistic	0.917
5% Shapiro Wilk Critical Value	0.859	5% Shapiro Wilk Critical Value	0.859
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0188	Mean	-4.53
SD	0.0249	SD	1.062
95% DL/2 (t) UCL	0.0302	95% H-Stat (DL/2) UCL	0.0425
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.014	Mean in Log Scale	-4.555
SD	0.0294	SD in Log Scale	1.105
95% MLE (t) UCL	0.0273	Mean in Original Scale	0.0188
95% MLE (Tiku) UCL	0.0276	SD in Original Scale	0.0249
		95% t UCL	0.0301
		95% Percentile Bootstrap UCL	0.0294
		95% BCA Bootstrap UCL	0.0349
		95% H UCL	0.0458

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Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only		
k star (bias corrected)		Data appear Gamma Distributed at 5% Significance Level		
Theta Star		Data appear Gamma Distributed at 5% Significance Level		
nu star		Data appear Gamma Distributed at 5% Significance Level		
A-D Test Statistic		Nonparametric Statistics		
5% A-D Critical Value		Kaplan-Meier (KM) Method		
K-S Test Statistic		Mean		
5% K-S Critical Value		SD		
Data appear Gamma Distributed at 5% Significance Level		SE of Mean		
		95% KM (t) UCL		
Assuming Gamma Distribution		95% KM (z) UCL		
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL		
Minimum		95% KM (bootstrap t) UCL		
Maximum		95% KM (BCA) UCL		
Mean		95% KM (Percentile Bootstrap) UCL		
Median		95% KM (Chebyshev) UCL		
SD		97.5% KM (Chebyshev) UCL		
k star		99% KM (Chebyshev) UCL		
Theta star		Potential UCLs to Use		
Nu star		95% KM (BCA) UCL		
AppChi2		95% KM (BCA) UCL		
95% Gamma Approximate UCL		95% KM (BCA) UCL		
95% Adjusted Gamma UCL		95% KM (BCA) UCL		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Dibenz(a,h)anthracene

General Statistics			
Number of Valid Data	15	Number of Detected Data	13
Number of Distinct Detected Data	13	Number of Non-Detect Data	2
		Percent Non-Detects	13.33%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0044	Minimum Detected	-5.426
Maximum Detected	0.042	Maximum Detected	-3.17

Table F-6
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Mean of Detected	0.019	Mean of Detected	-4.15
SD of Detected	0.012	SD of Detected	0.657
Minimum Non-Detect	0.0042	Minimum Non-Detect	-5.473
Maximum Non-Detect	0.0047	Maximum Non-Detect	-5.36

Note: Data have multiple DLs - Use of KM Method is recommended

Number treated as Non-Detect 3

For all methods (except KM, DL/2, and ROS Methods),

Number treated as Detected 12

Observations < Largest ND are treated as NDs

Single DL Non-Detect Percentage 20.00%

UCL Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.89
5% Shapiro Wilk Critical Value	0.866

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.97
5% Shapiro Wilk Critical Value	0.866

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.0168
SD	0.0126
95% DL/2 (t) UCL	0.0225

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean	-4.411
SD	0.92
95% H-Stat (DL/2) UCL	0.0353

Maximum Likelihood Estimate(MLE) Method

Mean	0.0155
SD	0.0141
95% MLE (t) UCL	0.0219
95% MLE (Tiku) UCL	0.0221

Log ROS Method

Mean in Log Scale	-4.345
SD in Log Scale	0.799
Mean in Original Scale	0.017
SD in Original Scale	0.0124
95% t UCL	0.0226
95% Percentile Bootstrap UCL	0.0224
95% BCA Bootstrap UCL	0.023
95% H UCL	0.0301

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	2.208
Theta Star	0.00862
nu star	57.42

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

A-D Test Statistic	0.276
5% A-D Critical Value	0.74
K-S Test Statistic	0.74
5% K-S Critical Value	0.238

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	0.0171
SD	0.0118
SE of Mean	0.00318
95% KM (t) UCL	0.0227

Data appear Gamma Distributed at 5% Significance Level

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ProUCL Output - Background Surface Soil
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Assuming Gamma Distribution		95% KM (z) UCL	0.0223
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.0225
Minimum	0.000001	95% KM (bootstrap t) UCL	0.0248
Maximum	0.042	95% KM (BCA) UCL	0.0227
Mean	0.0165	95% KM (Percentile Bootstrap) UCL	0.0229
Median	0.014	95% KM (Chebyshev) UCL	0.031
SD	0.013	97.5% KM (Chebyshev) UCL	0.037
k star	0.428	99% KM (Chebyshev) UCL	0.0488
Theta star	0.0386		
Nu star	12.83	Potential UCLs to Use	
AppChi2	5.781	95% KM (t) UCL	0.0227
95% Gamma Approximate UCL	0.0366	95% KM (Percentile Bootstrap) UCL	0.0229
95% Adjusted Gamma UCL	0.0407		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Indeno(1,2,3-cd)pyrene

General Statistics	
Number of Valid Observations	15
Number of Distinct Observations	15
Raw Statistics	
Minimum	0.02
Maximum	0.17
Mean	0.0672
Median	0.053
SD	0.0427
Std. Error of Mean	0.011
Coefficient of Variation	0.635
Skewness	1.173
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic	0.89
Shapiro Wilk Critical Value	0.881
Data appear Normal at 5% Significance Level	
Log-transformed Statistics	
Minimum of Log Data	-3.912
Maximum of Log Data	-1.772
Mean of log Data	-2.884
SD of log Data	0.64
Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.959
Shapiro Wilk Critical Value	0.881
Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution	
Assuming Lognormal Distribution	

Table F-6
ProUCL Output - Background Surface Soil
Second Supplemental Remedial Investigation
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Queens, New York

95% Student's-t UCL 0.0866	95% H-UCL 0.1
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 0.0889	95% Chebyshev (MVUE) UCL 0.118
95% Modified-t UCL (Johnson-1978) 0.0872	97.5% Chebyshev (MVUE) UCL 0.14
	99% Chebyshev (MVUE) UCL 0.184
Gamma Distribution Test	Data Distribution
k star (bias corrected) 2.34	Data appear Normal at 5% Significance Level
Theta Star 0.0287	
MLE of Mean 0.0672	
MLE of Standard Deviation 0.0439	
nu star 70.19	
Approximate Chi Square Value (.05) 51.9	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 0.0853
Adjusted Chi Square Value 49.97	95% Jackknife UCL 0.0866
Anderson-Darling Test Statistic 0.286	95% Standard Bootstrap UCL 0.0846
Anderson-Darling 5% Critical Value 0.745	95% Bootstrap-t UCL 0.0925
Kolmogorov-Smirnov Test Statistic 0.151	95% Hall's Bootstrap UCL 0.0941
Kolmogorov-Smirnov 5% Critical Value 0.223	95% Percentile Bootstrap UCL 0.0849
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 0.0883
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 0.115
95% Approximate Gamma UCL 0.0909	97.5% Chebyshev(Mean, Sd) UCL 0.136
95% Adjusted Gamma UCL 0.0944	99% Chebyshev(Mean, Sd) UCL 0.177
Potential UCL to Use	Use 95% Student's-t UCL 0.0866

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). For additional insight, the user may want to consult a statistician.

Antimony

General Statistics			
Number of Valid Data	15	Number of Detected Data	13
Number of Distinct Detected Data	12	Number of Non-Detect Data	2
		Percent Non-Detects	13.33%
Raw Statistics			
Minimum Detected	0.32	Minimum Detected	-1.139
Maximum Detected	1.5	Maximum Detected	0.405
Log-transformed Statistics			

Table F-6
ProUCL Output - Background Surface Soil
Second Supplemental Remedial Investigation
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Mean of Detected	0.704	Mean of Detected	-0.465
SD of Detected	0.355	SD of Detected	0.496
Minimum Non-Detect	0.24	Minimum Non-Detect	-1.427
Maximum Non-Detect	0.25	Maximum Non-Detect	-1.386

Note: Data have multiple DLs - Use of KM Method is recommended

Number treated as Non-Detect 2

For all methods (except KM, DL/2, and ROS Methods),

Number treated as Detected 13

Observations < Largest ND are treated as NDs

Single DL Non-Detect Percentage 13.33%

UCL Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.91
5% Shapiro Wilk Critical Value	0.866

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.953
5% Shapiro Wilk Critical Value	0.866

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.626
SD	0.387
95% DL/2 (t) UCL	0.802

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean	-0.683
SD	0.736
95% H-Stat (DL/2) UCL	1.053

Maximum Likelihood Estimate(MLE) Method

Mean	0.615
SD	0.396
95% MLE (t) UCL	0.795
95% MLE (Tiku) UCL	0.795

Log ROS Method

Mean in Log Scale	-0.621
SD in Log Scale	0.618
Mean in Original Scale	0.636
SD in Original Scale	0.375
95% t UCL	0.806
95% Percentile Bootstrap UCL	0.791
95% BCA Bootstrap UCL	0.811
95% H UCL	0.935

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	3.559
Theta Star	0.198
nu star	92.53

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

A-D Test Statistic	0.28
5% A-D Critical Value	0.737
K-S Test Statistic	0.737
5% K-S Critical Value	0.238

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	0.653
SD	0.343
SE of Mean	0.0923
95% KM (t) UCL	0.815

Data appear Gamma Distributed at 5% Significance Level

Table F-6
ProUCL Output - Background Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Assuming Gamma Distribution		95% KM (z) UCL	0.804
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.814
Minimum	0.000001	95% KM (bootstrap t) UCL	0.866
Maximum	1.5	95% KM (BCA) UCL	0.82
Mean	0.61	95% KM (Percentile Bootstrap) UCL	0.807
Median	0.53	95% KM (Chebyshev) UCL	1.055
SD	0.412	97.5% KM (Chebyshev) UCL	1.229
k star	0.348	99% KM (Chebyshev) UCL	1.571
Theta star	1.754		
Nu star	10.43	Potential UCLs to Use	
AppChi2	4.214	95% KM (t) UCL	0.815
95% Gamma Approximate UCL	1.51	95% KM (Percentile Bootstrap) UCL	0.807
95% Adjusted Gamma UCL	1.702		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Arsenic

General Statistics	
Number of Valid Observations	15
Number of Distinct Observations	13
Raw Statistics	
Minimum	3.4
Maximum	11.5
Mean	6.467
Median	6
SD	2.002
Std. Error of Mean	0.517
Coefficient of Variation	0.31
Skewness	1.139
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic	0.898
Shapiro Wilk Critical Value	0.881
Data appear Normal at 5% Significance Level	
Log-transformed Statistics	
Minimum of Log Data	1.224
Maximum of Log Data	2.442
Mean of log Data	1.825
SD of log Data	0.295
Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.952
Shapiro Wilk Critical Value	0.881
Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution	
Assuming Lognormal Distribution	

Table F-6
ProUCL Output - Background Surface Soil
Second Supplemental Remedial Investigation
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95% Student's-t UCL 7.377	95% H-UCL 7.516
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 7.479	95% Chebyshev (MVUE) UCL 8.632
95% Modified-t UCL (Johnson-1978) 7.402	97.5% Chebyshev (MVUE) UCL 9.571
	99% Chebyshev (MVUE) UCL 11.42
Gamma Distribution Test	Data Distribution
k star (bias corrected) 9.83	Data appear Normal at 5% Significance Level
Theta Star 0.658	
MLE of Mean 6.467	
MLE of Standard Deviation 2.063	
nu star 294.9	
Approximate Chi Square Value (.05) 256.1	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 7.317
Adjusted Chi Square Value 251.7	95% Jackknife UCL 7.377
Anderson-Darling Test Statistic 0.535	95% Standard Bootstrap UCL 7.302
Anderson-Darling 5% Critical Value 0.737	95% Bootstrap-t UCL 7.681
Kolmogorov-Smirnov Test Statistic 0.231	95% Hall's Bootstrap UCL 7.869
Kolmogorov-Smirnov 5% Critical Value 0.221	95% Percentile Bootstrap UCL 7.353
Data follow Appr. Gamma Distribution at 5% Significance Level	95% BCA Bootstrap UCL 7.487
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 8.72
95% Approximate Gamma UCL 7.446	97.5% Chebyshev(Mean, Sd) UCL 9.695
95% Adjusted Gamma UCL 7.577	99% Chebyshev(Mean, Sd) UCL 11.61
Potential UCL to Use	Use 95% Student's-t UCL 7.377

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). For additional insight, the user may want to consult a statistician.

Cobalt

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 11
Raw Statistics	
Minimum 3.9	Minimum of Log Data 1.361
Maximum 8.6	Maximum of Log Data 2.152
Mean 5.84	Mean of log Data 1.741
Median 6.1	SD of log Data 0.227

Table F-6
ProUCL Output - Background Surface Soil
Second Supplemental Remedial Investigation
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SD 1.296

Std. Error of Mean 0.335

Coefficient of Variation 0.222

Skewness 0.213

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.951

Shapiro Wilk Critical Value 0.881

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.944

Shapiro Wilk Critical Value 0.881

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 6.429

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 6.41

95% Modified-t UCL (Johnson-1978) 6.432

Assuming Lognormal Distribution

95% H-UCL 6.541

95% Chebyshev (MVUE) UCL 7.348

97.5% Chebyshev (MVUE) UCL 8

99% Chebyshev (MVUE) UCL 9.28

Gamma Distribution Test

k star (bias corrected) 17.09

Theta Star 0.342

MLE of Mean 5.84

MLE of Standard Deviation 1.413

nu star 512.6

Approximate Chi Square Value (.05) 461.1

Adjusted Level of Significance 0.0324

Adjusted Chi Square Value 455.1

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 6.39

95% Jackknife UCL 6.429

95% Standard Bootstrap UCL 6.371

95% Bootstrap-t UCL 6.426

95% Hall's Bootstrap UCL 6.476

95% Percentile Bootstrap UCL 6.36

95% BCA Bootstrap UCL 6.38

95% Chebyshev(Mean, Sd) UCL 7.299

97.5% Chebyshev(Mean, Sd) UCL 7.93

99% Chebyshev(Mean, Sd) UCL 9.17

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 6.492

95% Adjusted Gamma UCL 6.578

Potential UCL to Use

Use 95% Student's-t UCL 6.429

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). For additional insight, the user may want to consult a statistician.

Table F-6
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Thallium

General Statistics			
Number of Valid Data	15	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	12
		Percent Non-Detects	80.00%
Raw Statistics			
Minimum Detected	0.64	Minimum Detected	-0.446
Maximum Detected	1.4	Maximum Detected	0.336
Mean of Detected	0.9	Mean of Detected	-0.175
SD of Detected	0.433	SD of Detected	0.443
Minimum Non-Detect	0.48	Minimum Non-Detect	-0.734
Maximum Non-Detect	0.61	Maximum Non-Detect	-0.494
Note: Data have multiple DLs - Use of KM Method is recommended			
For all methods (except KM, DL/2, and ROS Methods),			
Observations < Largest ND are treated as NDs			
Number treated as Non-Detect			
Number treated as Detected			
Single DL Non-Detect Percentage			

Warning: There are only 3 Distinct Detected Values in this data set

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.77	Shapiro Wilk Test Statistic	0.779
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.397	Mean	-1.082
SD	0.308	SD	0.503
95% DL/2 (t) UCL	0.537	95% H-Stat (DL/2) UCL	0.508

Table F-6
ProUCL Output - Background Surface Soil
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Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.0875	Mean in Log Scale	-1.882
SD	0.601	SD in Log Scale	0.969
95% MLE (t) UCL	0.361	Mean in Original Scale	0.266
95% MLE (Tiku) UCL	0.753	SD in Original Scale	0.369
		95% t UCL	0.433
		95% Percentile Bootstrap UCL	0.429
		95% BCA Bootstrap UCL	0.485
		95% H UCL	0.489
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data appear Normal at 5% Significance Level	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	0.692
5% K-S Critical Value	N/A	SD	0.189
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0599
		95% KM (t) UCL	0.797
Assuming Gamma Distribution		95% KM (z) UCL	0.79
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.771
Minimum	N/A	95% KM (bootstrap t) UCL	2.731
Maximum	N/A	95% KM (BCA) UCL	1.4
Mean	N/A	95% KM (Percentile Bootstrap) UCL	1.4
Median	N/A	95% KM (Chebyshev) UCL	0.953
SD	N/A	97.5% KM (Chebyshev) UCL	1.066
k star	N/A	99% KM (Chebyshev) UCL	1.288
Theta star	N/A	Potential UCLs to Use	
Nu star	N/A	95% KM (t) UCL	0.797
AppChi2	N/A	95% KM (Percentile Bootstrap) UCL	1.4
95% Gamma Approximate UCL	N/A		
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Benzo(k)fluoranthene

Table F-6
ProUCL Output - Background Surface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 13
Raw Statistics	
Minimum 0.015	Minimum of Log Data -4.2
Maximum 0.12	Maximum of Log Data -2.12
Mean 0.0567	Mean of log Data -3.073
Median 0.042	SD of log Data 0.685
SD 0.0357	
Std. Error of Mean 0.00922	
Coefficient of Variation 0.63	
Skewness 0.664	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.898	Shapiro Wilk Test Statistic 0.941
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data appear Normal at 5% Significance Level	
Lognormal Distribution Test	
Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution	
95% Student's-t UCL 0.073	95% H-UCL 0.0889
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 0.0736	95% Chebyshev (MVUE) UCL 0.104
95% Modified-t UCL (Johnson-1978) 0.0732	97.5% Chebyshev (MVUE) UCL 0.124
99% Chebyshev (MVUE) UCL 0.164	
Gamma Distribution Test	
Data Distribution	
Data appear Normal at 5% Significance Level	
Nonparametric Statistics	
Approximate Chi Square Value (.05) 46.53	95% CLT UCL 0.0719
Adjusted Level of Significance 0.0324	95% Jackknife UCL 0.073
Adjusted Chi Square Value 44.7	95% Standard Bootstrap UCL 0.0712
Anderson-Darling Test Statistic 0.339	95% Bootstrap-t UCL 0.0742
Anderson-Darling 5% Critical Value 0.745	95% Hall's Bootstrap UCL 0.0725
Kolmogorov-Smirnov Test Statistic 0.132	95% Percentile Bootstrap UCL 0.0718
Kolmogorov-Smirnov 5% Critical Value 0.224	95% BCA Bootstrap UCL 0.072
Data appear Gamma Distributed at 5% Significance Level	
95% Chebyshev(Mean, Sd) UCL 0.0969	
97.5% Chebyshev(Mean, Sd) UCL 0.114	

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Assuming Gamma Distribution	99% Chebyshev(Mean, Sd) UCL 0.148
95% Approximate Gamma UCL 0.0779	
95% Adjusted Gamma UCL 0.0811	

Potential UCL to Use	Use 95% Student's-t UCL 0.073
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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). For additional insight, the user may want to consult a statistician.

Chrysene

General Statistics																	
Number of Valid Observations 15	Number of Distinct Observations 12																
Raw Statistics	Log-transformed Statistics																
<table border="0"> <tr> <td>Minimum 0.033</td><td>Minimum of Log Data -3.411</td></tr> <tr> <td>Maximum 0.41</td><td>Maximum of Log Data -0.892</td></tr> <tr> <td>Mean 0.134</td><td>Mean of log Data -2.249</td></tr> <tr> <td>Median 0.1</td><td>SD of log Data 0.72</td></tr> <tr> <td>SD 0.101</td><td></td></tr> <tr> <td>Std. Error of Mean 0.026</td><td></td></tr> <tr> <td>Coefficient of Variation 0.751</td><td></td></tr> <tr> <td>Skewness 1.633</td><td></td></tr> </table>		Minimum 0.033	Minimum of Log Data -3.411	Maximum 0.41	Maximum of Log Data -0.892	Mean 0.134	Mean of log Data -2.249	Median 0.1	SD of log Data 0.72	SD 0.101		Std. Error of Mean 0.026		Coefficient of Variation 0.751		Skewness 1.633	
Minimum 0.033	Minimum of Log Data -3.411																
Maximum 0.41	Maximum of Log Data -0.892																
Mean 0.134	Mean of log Data -2.249																
Median 0.1	SD of log Data 0.72																
SD 0.101																	
Std. Error of Mean 0.026																	
Coefficient of Variation 0.751																	
Skewness 1.633																	
Relevant UCL Statistics																	
Normal Distribution Test	Lognormal Distribution Test																
Shapiro Wilk Test Statistic 0.846	Shapiro Wilk Test Statistic 0.975																
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881																
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level																
Assuming Normal Distribution	Assuming Lognormal Distribution																
95% Student's-t UCL 0.18	95% H-UCL 0.214																
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 0.249																
95% Adjusted-CLT UCL (Chen-1995) 0.188	97.5% Chebyshev (MVUE) UCL 0.298																
95% Modified-t UCL (Johnson-1978) 0.182	99% Chebyshev (MVUE) UCL 0.396																
Gamma Distribution Test	Data Distribution																
k star (bias corrected) 1.846	Data appear Gamma Distributed at 5% Significance Level																
Theta Star 0.0726																	
MLE of Mean 0.134																	

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MLE of Standard Deviation 0.0986	Nonparametric Statistics
nu star 55.37	
Approximate Chi Square Value (.05) 39.27	95% CLT UCL 0.177
Adjusted Level of Significance 0.0324	95% Jackknife UCL 0.18
Adjusted Chi Square Value 37.6	95% Standard Bootstrap UCL 0.176
Anderson-Darling Test Statistic 0.235	95% Bootstrap-t UCL 0.2
Anderson-Darling 5% Critical Value 0.746	95% Hall's Bootstrap UCL 0.217
Kolmogorov-Smirnov Test Statistic 0.123	95% Percentile Bootstrap UCL 0.179
Kolmogorov-Smirnov 5% Critical Value 0.224	95% BCA Bootstrap UCL 0.186
Data appear Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 0.247
Assuming Gamma Distribution	97.5% Chebyshev(Mean, Sd) UCL 0.296
95% Approximate Gamma UCL 0.189	99% Chebyshev(Mean, Sd) UCL 0.392
95% Adjusted Gamma UCL 0.197	
Potential UCL to Use	Use 95% Approximate Gamma UCL 0.189

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). For additional insight, the user may want to consult a statistician.

Aluminum

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 15
Raw Statistics	
Minimum 3630	Minimum of Log Data 8.197
Maximum 13200	Maximum of Log Data 9.488
Mean 9586	Mean of log Data 9.107
Median 10500	SD of log Data 0.39
SD 2996	
Std. Error of Mean 773.6	
Coefficient of Variation 0.313	
Skewness -0.843	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.898	Shapiro Wilk Test Statistic 0.831
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Lognormal Distribution Test	

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ProUCL Output - Background Surface Soil
Second Supplemental Remedial Investigation
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General Statistics

Number of Valid Observations 15	Number of Distinct Observations 15
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Raw Statistics

Minimum 42.6	Maximum of Log Data 3.752
Maximum 102	Maximum of Log Data 4.625
Mean 72.34	Mean of log Data 4.257
Median 71.2	SD of log Data 0.234
SD 16.27	
Std. Error of Mean 4.2	
Coefficient of Variation 0.225	
Skewness 0.0321	

Log-transformed Statistics

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.976	Shapiro Wilk Test Statistic 0.964
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 79.74	95% H-UCL 81.36
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95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 79.29	95% Chebyshev (MVUE) UCL 91.64
95% Modified-t UCL (Johnson-1978) 79.74	97.5% Chebyshev (MVUE) UCL 99.96
	99% Chebyshev (MVUE) UCL 116.3

Assuming Lognormal Distribution

Gamma Distribution Test

k star (bias corrected) 16.28	MLE of Mean 72.34
Theta Star 4.443	MLE of Standard Deviation 17.93
MLE of Mean 72.34	nu star 488.5
Approximate Chi Square Value (.05) 438.2	
Adjusted Level of Significance 0.0324	
Adjusted Chi Square Value 432.4	

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 79.25	95% Bootstrap-t UCL 79.75
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95% Jackknife UCL 79.74	95% Hall's Bootstrap UCL 79.69
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95% Standard Bootstrap UCL 78.87	95% Percentile Bootstrap UCL 79.03
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95% Bootstrap-t UCL 79.75	95% BCA Bootstrap UCL 79.16
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95% Hall's Bootstrap UCL 79.69	95% Chebyshev(Mean, Sd) UCL 90.65
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95% Percentile Bootstrap UCL 79.03	97.5% Chebyshev(Mean, Sd) UCL 98.57
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95% BCA Bootstrap UCL 79.16	99% Chebyshev(Mean, Sd) UCL 114.1
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Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

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95% Approximate Gamma UCL 80.63

95% Adjusted Gamma UCL 81.73

Potential UCL to Use	Use 95% Student's-t UCL 79.74
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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). For additional insight, the user may want to consult a statistician.

Cadmium

General Statistics

Number of Valid Observations 15	Number of Distinct Observations 13
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Raw Statistics

Minimum 0.086
Maximum 2.5
Mean 0.628
Median 0.5
SD 0.553
Std. Error of Mean 0.143
Coefficient of Variation 0.882
Skewness 3.083

Log-transformed Statistics

Minimum of Log Data -2.453
Maximum of Log Data 0.916
Mean of log Data -0.699
SD of log Data 0.698

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.618
Shapiro Wilk Critical Value 0.881

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.877
Shapiro Wilk Critical Value 0.881

Data not Normal at 5% Significance Level

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

Assuming Lognormal Distribution

95% Student's-t UCL 0.879

95% H-UCL 0.974

95% UCLs (Adjusted for Skewness)

95% Chebyshev (MVUE) UCL 1.136
97.5% Chebyshev (MVUE) UCL 1.359
99% Chebyshev (MVUE) UCL 1.796

95% Adjusted-CLT UCL (Chen-1995) 0.984

95% Modified-t UCL (Johnson-1978) 0.898

Gamma Distribution Test

Data Distribution

k star (bias corrected) 1.88

Data Follow Appr. Gamma Distribution at 5% Significance Level

Theta Star 0.334

MLE of Mean 0.628

MLE of Standard Deviation 0.458

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nu star	56.41	Nonparametric Statistics
Approximate Chi Square Value (.05)	40.14	
Adjusted Level of Significance	0.0324	
Adjusted Chi Square Value	38.46	
Anderson-Darling Test Statistic	0.983	95% CLT UCL 0.863
Anderson-Darling 5% Critical Value	0.746	95% Jackknife UCL 0.879
Kolmogorov-Smirnov Test Statistic	0.204	95% Standard Bootstrap UCL 0.851
Kolmogorov-Smirnov 5% Critical Value	0.224	95% Bootstrap-t UCL 1.271
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Hall's Bootstrap UCL 1.914
Assuming Gamma Distribution		95% Percentile Bootstrap UCL 0.873
95% Approximate Gamma UCL	0.882	95% BCA Bootstrap UCL 1.033
95% Adjusted Gamma UCL	0.921	95% Chebyshev(Mean, Sd) UCL 1.251
Potential UCL to Use		97.5% Chebyshev(Mean, Sd) UCL 1.52
		99% Chebyshev(Mean, Sd) UCL 2.049
		Use 95% Approximate Gamma UCL 0.882

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). For additional insight, the user may want to consult a statistician.

Chromium

General Statistics	
Number of Valid Observations	15
Number of Distinct Observations	15
Raw Statistics	
Minimum	14.5
Maximum	31.8
Mean	21.55
Median	21.6
SD	4.552
Std. Error of Mean	1.175
Coefficient of Variation	0.211
Skewness	0.429
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic	0.97
Shapiro Wilk Critical Value	0.881
Data appear Normal at 5% Significance Level	
Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.974
Shapiro Wilk Critical Value	0.881
Data appear Lognormal at 5% Significance Level	

Table F-6
ProUCL Output - Background Surface Soil
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Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 23.62	95% H-UCL 23.94
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 26.75
95% Adjusted-CLT UCL (Chen-1995) 23.63	97.5% Chebyshev (MVUE) UCL 29
95% Modified-t UCL (Johnson-1978) 23.64	99% Chebyshev (MVUE) UCL 33.41
Gamma Distribution Test	Data Distribution
k star (bias corrected) 19.31	Data appear Normal at 5% Significance Level
Theta Star 1.116	
MLE of Mean 21.55	
MLE of Standard Deviation 4.905	
nu star 579.3	
Approximate Chi Square Value (.05) 524.5	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 23.49
Adjusted Chi Square Value 518.1	95% Jackknife UCL 23.62
 	95% Standard Bootstrap UCL 23.41
Anderson-Darling Test Statistic 0.195	95% Bootstrap-t UCL 23.59
Anderson-Darling 5% Critical Value 0.735	95% Hall's Bootstrap UCL 23.83
Kolmogorov-Smirnov Test Statistic 0.104	95% Percentile Bootstrap UCL 23.45
Kolmogorov-Smirnov 5% Critical Value 0.221	95% BCA Bootstrap UCL 23.49
Data appear Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 26.68
 	97.5% Chebyshev(Mean, Sd) UCL 28.89
Assuming Gamma Distribution	99% Chebyshev(Mean, Sd) UCL 33.25
95% Approximate Gamma UCL 23.81	
95% Adjusted Gamma UCL 24.1	
Potential UCL to Use	Use 95% Student's-t UCL 23.62

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). For additional insight, the user may want to consult a statistician.

Copper

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 15
Raw Statistics	
Minimum 22.9	Minimum of Log Data 3.131
Maximum 84.9	Maximum of Log Data 4.441

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Mean 41.12	Mean of log Data 3.631
Median 34.2	SD of log Data 0.417
SD 18.89	
Std. Error of Mean 4.879	
Coefficient of Variation 0.459	
Skewness 1.254	

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.846
 Shapiro Wilk Critical Value 0.881

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.914
 Shapiro Wilk Critical Value 0.881

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 49.71

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 50.83
 95% Modified-t UCL (Johnson-1978) 49.98

Assuming Lognormal Distribution

95% H-UCL 51.33

95% Chebyshev (MVUE) UCL 60.49
 97.5% Chebyshev (MVUE) UCL 68.97
 99% Chebyshev (MVUE) UCL 85.62

Gamma Distribution Test

k star (bias corrected) 4.831
 Theta Star 8.512
 MLE of Mean 41.12
 MLE of Standard Deviation 18.71
 nu star 144.9
 Approximate Chi Square Value (.05) 118.1
 Adjusted Level of Significance 0.0324
 Adjusted Chi Square Value 115.1

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 49.14
 95% Jackknife UCL 49.71
 95% Standard Bootstrap UCL 49.01
 95% Bootstrap-t UCL 52.83
 95% Hall's Bootstrap UCL 55.71
 95% Percentile Bootstrap UCL 49.65
 95% BCA Bootstrap UCL 50.45
 95% Chebyshev(Mean, Sd) UCL 62.39
 97.5% Chebyshev(Mean, Sd) UCL 71.59
 99% Chebyshev(Mean, Sd) UCL 89.66

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 50.46
 95% Adjusted Gamma UCL 51.76

Potential UCL to Use

Use 95% Approximate Gamma UCL 50.46

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

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These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Lead

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 15
Raw Statistics	
Minimum 61.9	Minimum of Log Data 4.126
Maximum 3000	Maximum of Log Data 8.006
Mean 367.7	Mean of log Data 5.156
Median 143	SD of log Data 1.011
SD 746	
Std. Error of Mean 192.6	
Coefficient of Variation 2.029	
Skewness 3.593	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.424	Lognormal Distribution Test
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Test Statistic 0.813
Data not Normal at 5% Significance Level	
Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution	
95% Student's-t UCL 707	95% H-UCL 610.2
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 875.5	95% Chebyshev (MVUE) UCL 619.3
95% Modified-t UCL (Johnson-1978) 736.8	97.5% Chebyshev (MVUE) UCL 767.9
Assuming Lognormal Distribution	
	99% Chebyshev (MVUE) UCL 1060
Gamma Distribution Test	
k star (bias corrected) 0.677	Data Distribution
Theta Star 543.2	
MLE of Mean 367.7	Data do not follow a Discernable Distribution (0.05)
MLE of Standard Deviation 446.9	
nu star 20.31	
Approximate Chi Square Value (.05) 11.08	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 684.5
Adjusted Chi Square Value 10.25	95% Jackknife UCL 707
Anderson-Darling Test Statistic 2.052	95% Standard Bootstrap UCL 672.4
	95% Bootstrap-t UCL 3507

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Anderson-Darling 5% Critical Value 0.773	95% Hall's Bootstrap UCL 2301
Kolmogorov-Smirnov Test Statistic 0.34	95% Percentile Bootstrap UCL 707.6
Kolmogorov-Smirnov 5% Critical Value 0.23	95% BCA Bootstrap UCL 937.7
Data not Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
95% Approximate Gamma UCL 674.1	95% Chebyshev(Mean, Sd) UCL 1207
95% Adjusted Gamma UCL 728.8	97.5% Chebyshev(Mean, Sd) UCL 1571
Potential UCL to Use	
Use 95% Chebyshev (Mean, Sd) UCL 1207	

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). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics	
Number of Valid Observations	15
Number of Distinct Observations	15
Raw Statistics	
Minimum	156
Maximum	653
Mean	333
Median	300
SD	128.4
Std. Error of Mean	33.15
Coefficient of Variation	0.386
Skewness	1.155
Log-transformed Statistics	
Minimum of Log Data	5.05
Maximum of Log Data	6.482
Mean of log Data	5.744
SD of log Data	0.367
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic	0.922
Shapiro Wilk Critical Value	0.881
Normal at 5% Significance Level	
Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.989
Shapiro Wilk Critical Value	0.881
Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution	
95% Student's-t UCL	391.4
Assuming Lognormal Distribution	
95% H-UCL	404.1
Adjusted for Skewness	
Adjusted-CLT UCL (Chen-1995)	398.1
Modified-t UCL (Johnson-1978)	393
95% Chebyshev (MVUE) UCL	
95% Chebyshev (MVUE) UCL	472.3
97.5% Chebyshev (MVUE) UCL	
97.5% Chebyshev (MVUE) UCL	532.7
99% Chebyshev (MVUE) UCL	
99% Chebyshev (MVUE) UCL	651.5

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Gamma Distribution Test		Data Distribution
k star (bias corrected) 6.425		Data appear Normal at 5% Significance Level
Theta Star 51.83		
MLE of Mean 333		
MLE of Standard Deviation 131.4		
nu star 192.7		
Approximate Chi Square Value (.05) 161.6		Nonparametric Statistics
Adjusted Level of Significance 0.0324		95% CLT UCL 387.5
Adjusted Chi Square Value 158.1		95% Jackknife UCL 391.4
Anderson-Darling Test Statistic 0.211		95% Standard Bootstrap UCL 385.7
Anderson-Darling 5% Critical Value 0.738		95% Bootstrap-t UCL 407
Kolmogorov-Smirnov Test Statistic 0.103		95% Hall's Bootstrap UCL 419.1
Kolmogorov-Smirnov 5% Critical Value 0.222		95% Percentile Bootstrap UCL 389.2
Data appear Gamma Distributed at 5% Significance Level		95% BCA Bootstrap UCL 398.7
Assuming Gamma Distribution		95% Chebyshev(Mean, Sd) UCL 477.5
95% Approximate Gamma UCL 397.1		97.5% Chebyshev(Mean, Sd) UCL 540
95% Adjusted Gamma UCL 405.9		99% Chebyshev(Mean, Sd) UCL 662.9
Potential UCL to Use		Use 95% Student's-t UCL 391.4

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). For additional insight, the user may want to consult a statistician.

Mercury

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 11
Raw Statistics	Log-transformed Statistics
Minimum 0.11	Minimum of Log Data -2.207
Maximum 1.2	Maximum of Log Data 0.182
Mean 0.269	Mean of log Data -1.566
Median 0.17	SD of log Data 0.632
SD 0.276	
Std. Error of Mean 0.0712	
Coefficient of Variation 1.026	
Skewness 3.135	

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Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.564	Shapiro Wilk Test Statistic 0.831
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data not Normal at 5% Significance Level	Data not Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 0.394	95% H-UCL 0.371
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 0.438
95% Adjusted-CLT UCL (Chen-1995) 0.447	97.5% Chebyshev (MVUE) UCL 0.519
95% Modified-t UCL (Johnson-1978) 0.404	99% Chebyshev (MVUE) UCL 0.677
Gamma Distribution Test	Data Distribution
k star (bias corrected) 1.753	Data do not follow a Discernable Distribution (0.05)
Theta Star 0.153	
MLE of Mean 0.269	
MLE of Standard Deviation 0.203	
nu star 52.59	
Approximate Chi Square Value (.05) 36.93	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 0.386
Adjusted Chi Square Value 35.32	95% Jackknife UCL 0.394
Anderson-Darling Test Statistic 1.409	95% Standard Bootstrap UCL 0.381
Anderson-Darling 5% Critical Value 0.747	95% Bootstrap-t UCL 0.646
Kolmogorov-Smirnov Test Statistic 0.278	95% Hall's Bootstrap UCL 0.805
Kolmogorov-Smirnov 5% Critical Value 0.224	95% Percentile Bootstrap UCL 0.395
Data not Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 0.479
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 0.579
95% Approximate Gamma UCL 0.383	97.5% Chebyshev(Mean, Sd) UCL 0.713
95% Adjusted Gamma UCL 0.4	99% Chebyshev(Mean, Sd) UCL 0.977
Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL 0.579

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). For additional insight, the user may want to consult a statistician.

Mercury, Inorganic Salts

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General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 11
Raw Statistics	Log-transformed Statistics
Minimum 0.11	Minimum of Log Data -2.207
Maximum 1.2	Maximum of Log Data 0.182
Mean 0.269	Mean of log Data -1.566
Median 0.17	SD of log Data 0.632
SD 0.276	
Std. Error of Mean 0.0712	
Coefficient of Variation 1.026	
Skewness 3.135	
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.564	Shapiro Wilk Test Statistic 0.831
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data not Normal at 5% Significance Level	Data not Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 0.394	95% H-UCL 0.371
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 0.438
95% Adjusted-CLT UCL (Chen-1995) 0.447	97.5% Chebyshev (MVUE) UCL 0.519
95% Modified-t UCL (Johnson-1978) 0.404	99% Chebyshev (MVUE) UCL 0.677
Gamma Distribution Test	Data Distribution
k star (bias corrected) 1.753	
Theta Star 0.153	
MLE of Mean 0.269	
MLE of Standard Deviation 0.203	
nu star 52.59	
Approximate Chi Square Value (.05) 36.93	
Adjusted Level of Significance 0.0324	Data do not follow a Discernable Distribution (0.05)
Adjusted Chi Square Value 35.32	
Anderson-Darling Test Statistic 1.409	
Anderson-Darling 5% Critical Value 0.747	
Kolmogorov-Smirnov Test Statistic 0.278	
Kolmogorov-Smirnov 5% Critical Value 0.224	
Data not Gamma Distributed at 5% Significance Level	Nonparametric Statistics
Assuming Gamma Distribution	95% CLT UCL 0.386
	95% Jackknife UCL 0.394
	95% Standard Bootstrap UCL 0.382
	95% Bootstrap-t UCL 0.665
	95% Hall's Bootstrap UCL 0.808
	95% Percentile Bootstrap UCL 0.402
	95% BCA Bootstrap UCL 0.464
	95% Chebyshev(Mean, Sd) UCL 0.579
	97.5% Chebyshev(Mean, Sd) UCL 0.713
	99% Chebyshev(Mean, Sd) UCL 0.977

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95% Approximate Gamma UCL 0.383

95% Adjusted Gamma UCL 0.4

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL 0.579

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). For additional insight, the user may want to consult a statistician.

Vanadium

General Statistics

Number of Valid Observations 15

Number of Distinct Observations 15

Raw Statistics

Minimum 22.1
 Maximum 47.5
 Mean 33.18
 Median 34.2
 SD 7.495
 Std. Error of Mean 1.935
 Coefficient of Variation 0.226
 Skewness 0.216

Log-transformed Statistics

Minimum of Log Data 3.096
 Maximum of Log Data 3.861
 Mean of log Data 3.478
 SD of log Data 0.23

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.954
 Shapiro Wilk Critical Value 0.881

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.951
 Shapiro Wilk Critical Value 0.881

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 36.59

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 36.48
 95% Modified-t UCL (Johnson-1978) 36.61

Assuming Lognormal Distribution

95% H-UCL 37.21

95% Chebyshev (MVUE) UCL 41.84
 97.5% Chebyshev (MVUE) UCL 45.58
 99% Chebyshev (MVUE) UCL 52.93

Gamma Distribution Test

k star (bias corrected) 16.62
 Theta Star 1.996
 MLE of Mean 33.18
 MLE of Standard Deviation 8.138

Data Distribution

Data appear Normal at 5% Significance Level

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nu star	498.7	Nonparametric Statistics
Approximate Chi Square Value (.05)	447.9	
Adjusted Level of Significance	0.0324	
Adjusted Chi Square Value	442	
Anderson-Darling Test Statistic	0.36	
Anderson-Darling 5% Critical Value	0.735	
Kolmogorov-Smirnov Test Statistic	0.161	
Kolmogorov-Smirnov 5% Critical Value	0.221	
Data appear Gamma Distributed at 5% Significance Level		
Assuming Gamma Distribution		
95% Approximate Gamma UCL	36.94	
95% Adjusted Gamma UCL	37.44	
Potential UCL to Use		Use 95% Student's-t UCL 36.59

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). For additional insight, the user may want to consult a statistician.

Table F-7
ProUCL Output - Area 1 Subsurface Soil
Second Supplemental Remedial Investigation
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Queens, New York

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Area1.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Number of Valid Data	3	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	1
		Percent Non-Detects	33.33%

Warning: This data set only has 3 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Benzo(a)anthracene was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Benzo(a)pyrene

General Statistics

Number of Valid Data	3	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	1
		Percent Non-Detects	33.33%

Warning: This data set only has 3 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Benzo(a)pyrene was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Benzo(b)fluoranthene

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General Statistics

Number of Valid Data	3	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	1
		Percent Non-Detects	33.33%

Warning: This data set only has 3 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Benzo(b)fluoranthene was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Carbazole

General Statistics

Number of Valid Data	3	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	1
		Percent Non-Detects	33.33%

Warning: This data set only has 3 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Carbazole was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Dibenz(a,h)anthracene

General Statistics

Number of Valid Data	3	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	2
		Percent Non-Detects	66.67%

Warning: This data set only has 3 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Dibenz(a,h)anthracene was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

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If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Indeno(1,2,3-cd)pyrene

General Statistics			
Number of Valid Data	3	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	1
		Percent Non-Detects	33.33%

Warning: This data set only has 3 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Indeno(1,2,3-cd)pyrene was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Antimony

General Statistics	
Number of Valid Observations 2	Number of Distinct Observations 2

Warning: This data set only has 2 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Antimony was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Arsenic

General Statistics	
Number of Valid Observations 2	Number of Distinct Observations 2

Warning: This data set only has 2 observations!

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Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Arsenic was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Cobalt

General Statistics

Number of Valid Observations 2

Number of Distinct Observations 2

Warning: This data set only has 2 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Cobalt was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Thallium

General Statistics

Number of Valid Observations 2

Number of Distinct Observations 1

Warning: This data set only has 2 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Thallium was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Chrysene

General Statistics

Number of Valid Data

3

Number of Detected Data

2

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Number of Distinct Detected Data	2	Number of Non-Detect Data	1
		Percent Non-Detects	33.33%

Warning: This data set only has 3 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Chrysene was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Aluminum

General Statistics

Number of Valid Observations 2	Number of Distinct Observations 2
--------------------------------	-----------------------------------

Warning: This data set only has 2 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Aluminum was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Barium

General Statistics

Number of Valid Observations 2	Number of Distinct Observations 2
--------------------------------	-----------------------------------

Warning: This data set only has 2 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Barium was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

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Chromium

General Statistics	
Number of Valid Observations 2	Number of Distinct Observations 2

Warning: This data set only has 2 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Chromium was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Copper

General Statistics	
Number of Valid Observations 2	Number of Distinct Observations 2

Warning: This data set only has 2 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Copper was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Lead

General Statistics	
Number of Valid Observations 2	Number of Distinct Observations 2

Warning: This data set only has 2 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Lead was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

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Manganese

General Statistics

Number of Valid Observations 2	Number of Distinct Observations 2
--------------------------------	-----------------------------------

Warning: This data set only has 2 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Manganese was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Mercury

General Statistics

Number of Valid Observations 2	Number of Distinct Observations 2
--------------------------------	-----------------------------------

Warning: This data set only has 2 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Mercury was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Mercury, Inorganic Salts

General Statistics

Number of Valid Observations 2	Number of Distinct Observations 2
--------------------------------	-----------------------------------

Warning: This data set only has 2 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Mercury, Inorganic Salts was not processed!

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It is suggested to collect at least 8 to 10 observations before using these statistical methods!
If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Vanadium

General Statistics

Number of Valid Observations 2	Number of Distinct Observations 2
--------------------------------	-----------------------------------

Warning: This data set only has 2 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Vanadium was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!
If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Table F-8
ProUCL Output - Area 2 Subsurface Soil
Second Supplemental Remedial Investigation
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General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Area2.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics			
Number of Valid Data	13	Number of Detected Data	12
Number of Distinct Detected Data	12	Number of Non-Detect Data	1
		Percent Non-Detects	7.69%
Raw Statistics			
Minimum Detected	0.0041	Minimum Detected	-5.497
Maximum Detected	0.24	Maximum Detected	-1.427
Mean of Detected	0.0697	Mean of Detected	-3.163
SD of Detected	0.0685	SD of Detected	1.181
Minimum Non-Detect	0.033	Minimum Non-Detect	-3.411
Maximum Non-Detect	0.033	Maximum Non-Detect	-3.411
Log-transformed Statistics			
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.821	Shapiro Wilk Test Statistic	0.937
5% Shapiro Wilk Critical Value	0.859	5% Shapiro Wilk Critical Value	0.859
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution			
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0656	Mean	-3.235
SD	0.0672	SD	1.16
95% DL/2 (t) UCL	0.0989	95% H-Stat (DL/2) UCL	0.22
Assuming Lognormal Distribution			
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.0474	Mean in Log Scale	-3.257
SD	0.0858	SD in Log Scale	1.18
95% MLE (t) UCL	0.0898	Mean in Original Scale	0.0653
95% MLE (Tiku) UCL	0.0945	SD in Original Scale	0.0675
		95% t UCL	0.0987

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		95% Percentile Bootstrap UCL	0.0964
		95% BCA Bootstrap UCL	0.11
		95% H UCL	0.228
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
			Data appear Gamma Distributed at 5% Significance Level
k star (bias corrected)	0.91		
Theta Star	0.0766		
nu star	21.84		
		Nonparametric Statistics	
A-D Test Statistic	0.225		
5% A-D Critical Value	0.754	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.754		
5% K-S Critical Value	0.252		
Data appear Gamma Distributed at 5% Significance Level			
			Mean
			0.0656
			SD
			0.0647
			SE of Mean
			0.0188
			95% KM (t) UCL
			0.0991
			95% KM (z) UCL
			0.0965
Assuming Gamma Distribution			
Gamma ROS Statistics using Extrapolated Data			
Minimum	0.00107		
Maximum	0.24		
Mean	0.0644	95% KM (Percentile Bootstrap) UCL	
Median	0.049	95% KM (Chebyshev) UCL	
SD	0.0683	97.5% KM (Chebyshev) UCL	
k star	0.696	99% KM (Chebyshev) UCL	
Theta star	0.0926		
Nu star	18.1	Potential UCLs to Use	
AppChi2	9.463	95% KM (Chebyshev) UCL	
95% Gamma Approximate UCL	0.123		
95% Adjusted Gamma UCL	0.136		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Benzo(a)pyrene

General Statistics			
Number of Valid Data	13	Number of Detected Data	12
Number of Distinct Detected Data	12	Number of Non-Detect Data	1
		Percent Non-Detects	7.69%

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Raw Statistics		Log-transformed Statistics			
Minimum Detected	0.0036	Minimum Detected	-5.627		
Maximum Detected	0.31	Maximum Detected	-1.171		
Mean of Detected	0.0862	Mean of Detected	-3.014		
SD of Detected	0.0874	SD of Detected	1.281		
Minimum Non-Detect	0.033	Minimum Non-Detect	-3.411		
Maximum Non-Detect	0.033	Maximum Non-Detect	-3.411		
UCL Statistics					
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only			
Shapiro Wilk Test Statistic	0.822	Shapiro Wilk Test Statistic	0.931		
5% Shapiro Wilk Critical Value	0.859	5% Shapiro Wilk Critical Value	0.859		
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level			
Assuming Normal Distribution					
DL/2 Substitution Method					
Mean	0.0808	Mean	-3.098		
SD	0.0859	SD	1.263		
95% DL/2 (t) UCL	0.123	95% H-Stat (DL/2) UCL	0.337		
Maximum Likelihood Estimate(MLE) Method					
Log ROS Method					
Mean	0.0646	Mean in Log Scale	-3.135		
SD	0.102	SD in Log Scale	1.302		
95% MLE (t) UCL	0.115	Mean in Original Scale	0.0803		
95% MLE (Tiku) UCL	0.118	SD in Original Scale	0.0863		
		95% t UCL	0.123		
		95% Percentile Bootstrap UCL	0.117		
		95% BCA Bootstrap UCL	0.132		
		95% H UCL	0.364		
Gamma Distribution Test with Detected Values Only					
Data Distribution Test with Detected Values Only					
k star (bias corrected)	0.823	Data appear Gamma Distributed at 5% Significance Level			
Theta Star	0.105				
nu star	19.75				
A-D Test Statistic					
5% A-D Critical Value	0.756	Nonparametric Statistics			
K-S Test Statistic	0.756	Kaplan-Meier (KM) Method			
5% K-S Critical Value	0.252	Mean	0.0806		
Data appear Gamma Distributed at 5% Significance Level					
		SD	0.0827		
		SE of Mean	0.024		
		95% KM (t) UCL	0.123		

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Assuming Gamma Distribution		95% KM (z) UCL	0.12
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.123
Minimum	0.000001	95% KM (bootstrap t) UCL	0.148
Maximum	0.31	95% KM (BCA) UCL	0.128
Mean	0.0796	95% KM (Percentile Bootstrap) UCL	0.12
Median	0.049	95% KM (Chebyshev) UCL	0.185
SD	0.087	97.5% KM (Chebyshev) UCL	0.23
k star	0.425	99% KM (Chebyshev) UCL	0.319
Theta star	0.187		
Nu star	11.05	Potential UCLs to Use	
AppChi2	4.607	95% KM (Chebyshev) UCL	0.185
95% Gamma Approximate UCL	0.191		
95% Adjusted Gamma UCL	0.218		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Benzo(b)fluoranthene

General Statistics			
Number of Valid Data	13	Number of Detected Data	12
Number of Distinct Detected Data	10	Number of Non-Detect Data	1
		Percent Non-Detects	7.69%
Raw Statistics			
Minimum Detected	0.006	Minimum Detected	-5.116
Maximum Detected	0.45	Maximum Detected	-0.799
Mean of Detected	0.112	Mean of Detected	-2.817
SD of Detected	0.131	SD of Detected	1.257
Minimum Non-Detect	0.066	Minimum Non-Detect	-2.718
Maximum Non-Detect	0.066	Maximum Non-Detect	-2.718
Log-transformed Statistics			
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.766	Shapiro Wilk Test Statistic	0.973
5% Shapiro Wilk Critical Value	0.859	5% Shapiro Wilk Critical Value	0.859
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

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ProUCL Output - Area 2 Subsurface Soil
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Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.106	Mean	-2.863
SD	0.127	SD	1.215
95% DL/2 (t) UCL	0.169	95% H-Stat (DL/2) UCL	0.372
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-2.876
		SD in Log Scale	1.222
		Mean in Original Scale	0.106
		SD in Original Scale	0.127
		95% t UCL	0.169
		95% Percentile Bootstrap UCL	0.167
		95% BCA Bootstrap UCL	0.186
		95% H-UCL	0.374
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)		Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.15		
nu star	17.98		
A-D Test Statistic		Nonparametric Statistics	
5% A-D Critical Value	0.759	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.759	Mean	
5% K-S Critical Value	0.253	SD	
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	
		95% KM (t) UCL	
		95% KM (z) UCL	
		95% KM (jackknife) UCL	
		95% KM (bootstrap t) UCL	
		95% KM (BCA) UCL	
		95% KM (Percentile Bootstrap) UCL	
		95% KM (Chebyshev) UCL	
		97.5% KM (Chebyshev) UCL	
		99% KM (Chebyshev) UCL	
Assuming Gamma Distribution		Potential UCLs to Use	
Gamma ROS Statistics using Extrapolated Data		95% KM (Chebyshev) UCL	
Minimum	0.006	0.261	
Maximum	0.45		
Mean	0.106		
Median	0.054		
SD	0.128		
k star	0.759		
Theta star	0.139		
Nu star	19.72		
AppChi2	10.65		
95% Gamma Approximate UCL	0.196		
95% Adjusted Gamma UCL	0.214		

Note: DL/2 is not a recommended method.

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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, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Carbazole

General Statistics			
Number of Valid Data	1	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	1
		Percent Non-Detects	100.00%

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Carbazole was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Dibenz(a,h)anthracene

General Statistics			
Number of Valid Data	13	Number of Detected Data	10
Number of Distinct Detected Data	9	Number of Non-Detect Data	3
		Percent Non-Detects	23.08%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0036	Minimum Detected	-5.627
Maximum Detected	0.06	Maximum Detected	-2.813
Mean of Detected	0.0225	Mean of Detected	-4.062
SD of Detected	0.0171	SD of Detected	0.813
Minimum Non-Detect	0.0024	Minimum Non-Detect	-6.032
Maximum Non-Detect	0.66	Maximum Non-Detect	-0.416

Note: Data have multiple DLs - Use of KM Method is recommended

Number treated as Non-Detect 13

For all methods (except KM, DL/2, and ROS Methods),

Number treated as Detected 0

Observations < Largest ND are treated as NDs

Single DL Non-Detect Percentage 100.00%

UCL Statistics

Normal Distribution Test with Detected Values Only

Lognormal Distribution Test with Detected Values Only

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ProUCL Output - Area 2 Subsurface Soil
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Shapiro Wilk Test Statistic	0.887	Shapiro Wilk Test Statistic	0.971
5% Shapiro Wilk Critical Value	0.842	5% Shapiro Wilk Critical Value	0.842
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0429	Mean	-4.245
SD	0.0879	SD	1.539
95% DL/2 (t) UCL	0.0863	95% H-Stat (DL/2) UCL	0.26
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-4.384
		SD in Log Scale	1.012
		Mean in Original Scale	0.0187
		SD in Original Scale	0.0167
		95% t UCL	0.0269
		95% Percentile Bootstrap UCL	0.0262
		95% BCA Bootstrap UCL	0.0284
		95% H-UCL	0.0482
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)		Data appear Normal at 5% Significance Level	
Theta Star	0.0154		
nu star	29.37		
A-D Test Statistic	0.22	Nonparametric Statistics	
5% A-D Critical Value	0.736	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.736	Mean	0.0194
5% K-S Critical Value	0.27	SD	0.0164
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.00499
Assuming Gamma Distribution		95% KM (t) UCL	0.0283
Gamma ROS Statistics using Extrapolated Data		95% KM (z) UCL	0.0276
Minimum	0.000001	95% KM (jackknife) UCL	0.0279
Maximum	0.06	95% KM (bootstrap t) UCL	0.0329
Mean	0.0187	95% KM (BCA) UCL	0.0293
Median	0.016	95% KM (Percentile Bootstrap) UCL	0.0278
SD	0.017	95% KM (Chebyshev) UCL	0.0411
k star	0.37	97.5% KM (Chebyshev) UCL	0.0505
Theta star	0.0506	99% KM (Chebyshev) UCL	0.069
Nu star	9.609	Potential UCLs to Use	
AppChi2	3.699	95% KM (t) UCL	0.0283

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95% Gamma Approximate UCL	0.0485	95% KM (Percentile Bootstrap) UCL	0.0278
95% Adjusted Gamma UCL	0.0562		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Indeno(1,2,3-cd)pyrene

General Statistics			
Number of Valid Data	13	Number of Detected Data	12
Number of Distinct Detected Data	11	Number of Non-Detect Data	1
		Percent Non-Detects	7.69%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0031	Minimum Detected	-5.776
Maximum Detected	0.19	Maximum Detected	-1.661
Mean of Detected	0.0609	Mean of Detected	-3.3
SD of Detected	0.0537	SD of Detected	1.249
Minimum Non-Detect	0.033	Minimum Non-Detect	-3.411
Maximum Non-Detect	0.033	Maximum Non-Detect	-3.411

UCL Statistics

Normal Distribution Test with Detected Values Only

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.886	Shapiro Wilk Test Statistic	0.895
5% Shapiro Wilk Critical Value	0.859	5% Shapiro Wilk Critical Value	0.859

Data appear Normal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.0575
SD	0.0529
95% DL/2 (t) UCL	0.0837

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean	-3.362
SD	1.216
95% H-Stat (DL/2) UCL	0.226

Maximum Likelihood Estimate(MLE) Method

Mean	0.0383
SD	0.0728
95% MLE (t) UCL	0.0743
95% MLE (Tiku) UCL	0.0809

Log ROS Method

Mean in Log Scale	-3.382
SD in Log Scale	1.232
Mean in Original Scale	0.0572
SD in Original Scale	0.0531

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		95% t UCL	0.0835
		95% Percentile Bootstrap UCL	0.0843
		95% BCA Bootstrap UCL	0.0882
		95% H UCL	0.232
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.905	Data appear Normal at 5% Significance Level	
Theta Star	0.0673		
nu star	21.72		
A-D Test Statistic	0.267	Nonparametric Statistics	
5% A-D Critical Value	0.754	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.754	Mean	0.0577
5% K-S Critical Value	0.252	SD	0.0508
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0148
		95% KM (t) UCL	0.084
Assuming Gamma Distribution		95% KM (z) UCL	0.082
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.084
Minimum	0.0031	95% KM (bootstrap t) UCL	0.0952
Maximum	0.19	95% KM (BCA) UCL	0.0837
Mean	0.0571	95% KM (Percentile Bootstrap) UCL	0.0828
Median	0.034	95% KM (Chebyshev) UCL	0.122
SD	0.0532	97.5% KM (Chebyshev) UCL	0.15
k star	0.883	99% KM (Chebyshev) UCL	0.205
Theta star	0.0647	Potential UCLs to Use	
Nu star	22.95	95% KM (t) UCL	0.084
AppChi2	13.06	95% KM (Percentile Bootstrap) UCL	0.0828
95% Gamma Approximate UCL	0.1		
95% Adjusted Gamma UCL	0.109		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Antimony

General Statistics			
Number of Valid Data	13	Number of Detected Data	7
Number of Distinct Detected Data	7	Number of Non-Detect Data	6
		Percent Non-Detects	46.15%

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Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.2	Minimum Detected	-1.609
Maximum Detected	0.86	Maximum Detected	-0.151
Mean of Detected	0.441	Mean of Detected	-0.938
SD of Detected	0.247	SD of Detected	0.515
Minimum Non-Detect	0.37	Minimum Non-Detect	-0.994
Maximum Non-Detect	0.48	Maximum Non-Detect	-0.734

Note: Data have multiple DLs - Use of KM Method is recommended

Number treated as Non-Detect 11

For all methods (except KM, DL/2, and ROS Methods),

Number treated as Detected 2

Observations < Largest ND are treated as NDs

Single DL Non-Detect Percentage 84.62%

Warning: There are only 7 Detected Values in this data

**Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions**

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.812	Shapiro Wilk Test Statistic	0.893
5% Shapiro Wilk Critical Value	0.803	5% Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.341	Mean	-1.199
SD	0.208	SD	0.473
95% DL/2 (t) UCL	0.444	95% H-Stat (DL/2) UCL	0.448
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-1.045
		SD in Log Scale	0.402
		Mean in Original Scale	0.383
		SD in Original Scale	0.19
		95% t UCL	0.477
		95% Percentile Bootstrap UCL	0.474
		95% BCA Bootstrap UCL	0.505
		95% H-UCL	0.481

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Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	2.568	Data appear Normal at 5% Significance Level	
Theta Star	0.172		
nu star	35.95		
		Nonparametric Statistics	
A-D Test Statistic	0.601	Kaplan-Meier (KM) Method	
5% A-D Critical Value	0.71	Mean	0.377
K-S Test Statistic	0.71	SD	0.185
5% K-S Critical Value	0.313	SE of Mean	0.0579
Data follow Appr. Gamma Distribution at 5% Significance Level		95% KM (t) UCL	0.48
		95% KM (z) UCL	0.472
Assuming Gamma Distribution		95% KM (jackknife) UCL	0.479
Gamma ROS Statistics using Extrapolated Data		95% KM (bootstrap t) UCL	0.586
Minimum	0.191	95% KM (BCA) UCL	0.476
Maximum	0.86	95% KM (Percentile Bootstrap) UCL	0.468
Mean	0.406	95% KM (Chebyshev) UCL	0.63
Median	0.37	97.5% KM (Chebyshev) UCL	0.739
SD	0.191	99% KM (Chebyshev) UCL	0.953
k star	4.591	Potential UCLs to Use	
Theta star	0.0883	95% KM (t) UCL	0.48
Nu star	119.4	95% KM (Percentile Bootstrap) UCL	0.468
AppChi2	95.15		
95% Gamma Approximate UCL	0.509		
95% Adjusted Gamma UCL	0.526		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Arsenic

General Statistics	
Number of Valid Observations	13
Number of Distinct Observations	11
Raw Statistics	
Minimum	2.1
Maximum	5.5
Mean	3.331
Median	3.2
SD	0.915
Log-transformed Statistics	
Minimum of Log Data	0.742
Maximum of Log Data	1.705
Mean of log Data	1.171
SD of log Data	0.26

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Std. Error of Mean 0.254
 Coefficient of Variation 0.275
 Skewness 1.109

Relevant UCL Statistics

Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.907	Shapiro Wilk Test Statistic 0.958
Shapiro Wilk Critical Value 0.866	Shapiro Wilk Critical Value 0.866
Data appear Normal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 3.783	95% H-UCL 3.842
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 3.832	95% Chebyshev (MVUE) UCL 4.383
95% Modified-t UCL (Johnson-1978) 3.796	97.5% Chebyshev (MVUE) UCL 4.84
	99% Chebyshev (MVUE) UCL 5.737
Gamma Distribution Test	Data Distribution
k star (bias corrected) 12.13	Data appear Normal at 5% Significance Level
Theta Star 0.275	
MLE of Mean 3.331	
MLE of Standard Deviation 0.956	
nu star 315.4	
Approximate Chi Square Value (.05) 275.2	
Adjusted Level of Significance 0.0301	
Adjusted Chi Square Value 269.9	
Anderson-Darling Test Statistic 0.4	Nonparametric Statistics
Anderson-Darling 5% Critical Value 0.734	95% CLT UCL 3.748
Kolmogorov-Smirnov Test Statistic 0.203	95% Jackknife UCL 3.783
Kolmogorov-Smirnov 5% Critical Value 0.236	95% Standard Bootstrap UCL 3.721
Data appear Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	95% Bootstrap-t UCL 3.901
95% Approximate Gamma UCL 3.817	95% Hall's Bootstrap UCL 4.117
95% Adjusted Gamma UCL 3.892	95% Percentile Bootstrap UCL 3.769
Potential UCL to Use	95% BCA Bootstrap UCL 3.815
	95% Chebyshev(Mean, Sd) UCL 4.437
	97.5% Chebyshev(Mean, Sd) UCL 4.916
	99% Chebyshev(Mean, Sd) UCL 5.856
Use 95% Student's-t UCL 3.783	

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). For additional insight, the user may want to consult a statistician.

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Cobalt

General Statistics	
Number of Valid Observations 13	Number of Distinct Observations 11
Raw Statistics	Log-transformed Statistics
Minimum 4.8	Minimum of Log Data 1.569
Maximum 7.6	Maximum of Log Data 2.028
Mean 6.431	Mean of log Data 1.853
Median 6.5	SD of log Data 0.132
SD 0.812	
Std. Error of Mean 0.225	
Coefficient of Variation 0.126	
Skewness -0.488	
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.972	Shapiro Wilk Test Statistic 0.953
Shapiro Wilk Critical Value 0.866	Shapiro Wilk Critical Value 0.866
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 6.832	95% H-UCL 6.887
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 6.769	95% Chebyshev (MVUE) UCL 7.457
95% Modified-t UCL (Johnson-1978) 6.827	97.5% Chebyshev (MVUE) UCL 7.901
	99% Chebyshev (MVUE) UCL 8.772
Gamma Distribution Test	Data Distribution
k star (bias corrected) 49.75	
Theta Star 0.129	
MLE of Mean 6.431	
MLE of Standard Deviation 0.912	
nu star 1293	
Approximate Chi Square Value (.05) 1211	
Data appear Normal at 5% Significance Level	
Adjusted Level of Significance 0.0301	95% CLT UCL 6.801
Adjusted Chi Square Value 1200	95% Jackknife UCL 6.832
Anderson-Darling Test Statistic 0.229	95% Standard Bootstrap UCL 6.786
Anderson-Darling 5% Critical Value 0.732	95% Bootstrap-t UCL 6.813
Kolmogorov-Smirnov Test Statistic 0.117	95% Hall's Bootstrap UCL 6.771
Kolmogorov-Smirnov 5% Critical Value 0.236	95% Percentile Bootstrap UCL 6.792
	95% BCA Bootstrap UCL 6.754
Nonparametric Statistics	

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Data appear Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 7.412 97.5% Chebyshev(Mean, Sd) UCL 7.837 99% Chebyshev(Mean, Sd) UCL 8.671
Assuming Gamma Distribution	95% Approximate Gamma UCL 6.869 95% Adjusted Gamma UCL 6.934
Potential UCL to Use	Use 95% Student's-t UCL 6.832

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). For additional insight, the user may want to consult a statistician.

Note: For highly negative-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positively skewed data sets.

Thallium

General Statistics			
Number of Valid Data	13	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	12
		Percent Non-Detects	92.31%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Thallium was not processed!

Chrysene

General Statistics			
Number of Valid Data	13	Number of Detected Data	12
Number of Distinct Detected Data	11	Number of Non-Detect Data	1
		Percent Non-Detects	7.69%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0034	Minimum Detected	-5.684
Maximum Detected	0.29	Maximum Detected	-1.238

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Mean of Detected	0.0831	Mean of Detected	-3.035
SD of Detected	0.0806	SD of Detected	1.302
Minimum Non-Detect	0.033	Minimum Non-Detect	-3.411
Maximum Non-Detect	0.033	Maximum Non-Detect	-3.411
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.832	Shapiro Wilk Test Statistic	0.894
5% Shapiro Wilk Critical Value	0.859	5% Shapiro Wilk Critical Value	0.859
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution			
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.078	Mean	-3.118
SD	0.0793	SD	1.282
95% DL/2 (t) UCL	0.117	95% H-Stat (DL/2) UCL	0.349
Assuming Lognormal Distribution			
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.0705	Mean in Log Scale	-3.182
SD	0.0867	SD in Log Scale	1.355
95% MLE (t) UCL	0.113	Mean in Original Scale	0.0773
95% MLE (Tiku) UCL	0.114	SD in Original Scale	0.08
		95% t UCL	0.117
		95% Percentile Bootstrap UCL	0.114
		95% BCA Bootstrap UCL	0.123
		95% H UCL	0.408
Gamma Distribution Test with Detected Values Only			
k star (bias corrected)	0.841	Data Distribution Test with Detected Values Only	
Theta Star	0.0988	Data appear Gamma Distributed at 5% Significance Level	
nu star	20.19		
Assuming Gamma Distribution			
Gamma ROS Statistics using Extrapolated Data		Nonparametric Statistics	
A-D Test Statistic	0.308	Kaplan-Meier (KM) Method	
5% A-D Critical Value	0.756	Mean	0.0771
K-S Test Statistic	0.756	SD	0.077
5% K-S Critical Value	0.252	SE of Mean	0.0223
Data appear Gamma Distributed at 5% Significance Level		95% KM (t) UCL	0.117
		95% KM (z) UCL	0.114
		95% KM (jackknife) UCL	0.117
		95% KM (bootstrap t) UCL	0.14

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Maximum	0.29	95% KM (BCA) UCL	0.119
Mean	0.0767	95% KM (Percentile Bootstrap) UCL	0.117
Median	0.052	95% KM (Chebyshev) UCL	0.174
SD	0.0805	97.5% KM (Chebyshev) UCL	0.216
k star	0.429	99% KM (Chebyshev) UCL	0.299
Theta star	0.179		
Nu star	11.15	Potential UCLs to Use	
AppChi2	4.675	95% KM (Chebyshev) UCL	0.174
95% Gamma Approximate UCL	0.183		
95% Adjusted Gamma UCL	0.209		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Aluminum

General Statistics	
Number of Valid Observations 13	Number of Distinct Observations 13

Raw Statistics	Log-transformed Statistics
Minimum 6920	Minimum of Log Data 8.842
Maximum 12600	Maximum of Log Data 9.441
Mean 9575	Mean of log Data 9.157
Median 9490	SD of log Data 0.15
SD 1424	
Std. Error of Mean 394.9	
Coefficient of Variation 0.149	
Skewness 0.3	

Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.98	Shapiro Wilk Test Statistic 0.981
Shapiro Wilk Critical Value 0.866	Shapiro Wilk Critical Value 0.866

Data appear Normal at 5% Significance Level **Data appear Lognormal at 5% Significance Level**

Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 10278	95% H-UCL 10358
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 11316
95% Adjusted-CLT UCL (Chen-1995) 10259	97.5% Chebyshev (MVUE) UCL 12068

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95% Modified-t UCL (Johnson-1978) 10284	99% Chebyshev (MVUE) UCL 13547
Gamma Distribution Test	
k star (bias corrected) 37.6	Data Distribution
Theta Star 254.7	Data appear Normal at 5% Significance Level
MLE of Mean 9575	
MLE of Standard Deviation 1562	
nu star 977.5	
Approximate Chi Square Value (.05) 905.9	Nonparametric Statistics
Adjusted Level of Significance 0.0301	95% CLT UCL 10224
Adjusted Chi Square Value 896.1	95% Jackknife UCL 10278
Anderson-Darling Test Statistic 0.183	95% Standard Bootstrap UCL 10197
Anderson-Darling 5% Critical Value 0.733	95% Bootstrap-t UCL 10336
Kolmogorov-Smirnov Test Statistic 0.117	95% Hall's Bootstrap UCL 10427
Kolmogorov-Smirnov 5% Critical Value 0.236	95% Percentile Bootstrap UCL 10214
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 10238
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 11296
95% Approximate Gamma UCL 10331	97.5% Chebyshev(Mean, Sd) UCL 12041
95% Adjusted Gamma UCL 10444	99% Chebyshev(Mean, Sd) UCL 13504
Potential UCL to Use	Use 95% Student's-t UCL 10278

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). For additional insight, the user may want to consult a statistician.

Barium

General Statistics	
Number of Valid Observations 13	Number of Distinct Observations 13
Raw Statistics	
Minimum 52.3	Minimum of Log Data 3.957
Maximum 102	Maximum of Log Data 4.625
Mean 74.52	Mean of log Data 4.296
Median 70.8	SD of log Data 0.182
SD 13.86	
Std. Error of Mean 3.844	
Coefficient of Variation 0.186	
Log-transformed Statistics	

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Skewness 0.641

Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.941	Shapiro Wilk Test Statistic 0.962
Shapiro Wilk Critical Value 0.866	Shapiro Wilk Critical Value 0.866
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 81.37	95% H-UCL 82.09
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 90.99
95% Adjusted-CLT UCL (Chen-1995) 81.57	97.5% Chebyshev (MVUE) UCL 98.12
95% Modified-t UCL (Johnson-1978) 81.48	99% Chebyshev (MVUE) UCL 112.1
Gamma Distribution Test	Data Distribution
k star (bias corrected) 24.99	Data appear Normal at 5% Significance Level
Theta Star 2.981	
MLE of Mean 74.52	
MLE of Standard Deviation 14.9	
nu star 649.9	
Approximate Chi Square Value (.05) 591.7	Nonparametric Statistics
Adjusted Level of Significance 0.0301	95% CLT UCL 80.84
Adjusted Chi Square Value 583.8	95% Jackknife UCL 81.37
Anderson-Darling Test Statistic 0.354	95% Standard Bootstrap UCL 80.49
Anderson-Darling 5% Critical Value 0.733	95% Bootstrap-t UCL 82.62
Kolmogorov-Smirnov Test Statistic 0.191	95% Hall's Bootstrap UCL 82.53
Kolmogorov-Smirnov 5% Critical Value 0.236	95% Percentile Bootstrap UCL 80.65
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 81.36
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 91.27
95% Approximate Gamma UCL 81.84	97.5% Chebyshev(Mean, Sd) UCL 98.52
95% Adjusted Gamma UCL 82.95	99% Chebyshev(Mean, Sd) UCL 112.8
Potential UCL to Use	Use 95% Student's-t UCL 81.37

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). For additional insight, the user may want to consult a statistician.

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ProUCL Output - Area 2 Subsurface Soil
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Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

General Statistics	
Number of Valid Observations 13	Number of Distinct Observations 12
Raw Statistics	
Minimum 15.3	Minimum of Log Data 2.728
Maximum 26	Maximum of Log Data 3.258
Mean 19.02	Mean of log Data 2.932
Median 17.7	SD of log Data 0.168
SD 3.395	
Std. Error of Mean 0.942	
Coefficient of Variation 0.179	
Skewness 1.069	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.875	Shapiro Wilk Test Statistic 0.905
Shapiro Wilk Critical Value 0.866	Shapiro Wilk Critical Value 0.866
Data appear Normal at 5% Significance Level	
Lognormal Distribution Test	
Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution	
95% Student's-t UCL 20.69	95% H-UCL 20.78
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 20.86	95% Chebyshev (MVUE) UCL 22.89
95% Modified-t UCL (Johnson-1978) 20.74	97.5% Chebyshev (MVUE) UCL 24.57
Assuming Lognormal Distribution	
99% Chebyshev (MVUE) UCL 27.87	
Gamma Distribution Test	
Data Distribution	
Data appear Normal at 5% Significance Level	
Nonparametric Statistics	
Approximate Chi Square Value (.05) 677.4	95% CLT UCL 20.56
Adjusted Level of Significance 0.0301	95% Jackknife UCL 20.69
Adjusted Chi Square Value 669	95% Standard Bootstrap UCL 20.54
Anderson-Darling Test Statistic 0.573	95% Bootstrap-t UCL 21.41
Anderson-Darling 5% Critical Value 0.733	95% Hall's Bootstrap UCL 21.31
Kolmogorov-Smirnov Test Statistic 0.185	95% Percentile Bootstrap UCL 20.52
Kolmogorov-Smirnov 5% Critical Value 0.236	95% BCA Bootstrap UCL 20.71
Data appear Gamma Distributed at 5% Significance Level	
95% Chebyshev(Mean, Sd) UCL 23.12	
97.5% Chebyshev(Mean, Sd) UCL 24.9	

Table F-8
ProUCL Output - Area 2 Subsurface Soil
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Assuming Gamma Distribution	99% Chebyshev(Mean, Sd) UCL 28.38
95% Approximate Gamma UCL 20.76	
95% Adjusted Gamma UCL 21.02	

Potential UCL to Use	Use 95% Student's-t UCL 20.69
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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). For additional insight, the user may want to consult a statistician.

Copper

General Statistics	
Number of Valid Observations 13	Number of Distinct Observations 13
Raw Statistics	Log-transformed Statistics
Minimum 9.6	Minimum of Log Data 2.262
Maximum 75.1	Maximum of Log Data 4.319
Mean 30.05	Mean of log Data 3.25
Median 23.7	SD of log Data 0.559
SD 18.95	
Std. Error of Mean 5.257	
Coefficient of Variation 0.631	
Skewness 1.519	
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.81	Shapiro Wilk Test Statistic 0.936
Shapiro Wilk Critical Value 0.866	Shapiro Wilk Critical Value 0.866
Data appear Normal at 5% Significance Level	
Assuming Lognormal Distribution	
95% Student's-t UCL 39.42	95% H-UCL 42.86
UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 41.07	95% Chebyshev (MVUE) UCL 50.46
99% Modified-t UCL (Johnson-1978) 39.79	97.5% Chebyshev (MVUE) UCL 59.43
99% Chebyshev (MVUE) UCL 77.04	
Gamma Distribution Test	Data Distribution
k star (bias corrected) 2.684	Data appear Gamma Distributed at 5% Significance Level
Theta Star 11.2	
MI E of Mean 30.05	

Table F-8
ProUCL Output - Area 2 Subsurface Soil
Second Supplemental Remedial Investigation
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MLE of Standard Deviation 18.34	Nonparametric Statistics
nu star 69.8	
Approximate Chi Square Value (.05) 51.56	95% CLT UCL 38.7
Adjusted Level of Significance 0.0301	95% Jackknife UCL 39.42
Adjusted Chi Square Value 49.34	95% Standard Bootstrap UCL 38.33
Anderson-Darling Test Statistic 0.66	95% Bootstrap-t UCL 45.67
Anderson-Darling 5% Critical Value 0.738	95% Hall's Bootstrap UCL 46.18
Kolmogorov-Smirnov Test Statistic 0.216	95% Percentile Bootstrap UCL 39.08
Kolmogorov-Smirnov 5% Critical Value 0.238	95% BCA Bootstrap UCL 40.8
Data appear Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 52.97
Assuming Gamma Distribution	97.5% Chebyshev(Mean, Sd) UCL 62.88
95% Approximate Gamma UCL 40.68	99% Chebyshev(Mean, Sd) UCL 82.36
95% Adjusted Gamma UCL 42.52	
Potential UCL to Use	Use 95% Approximate Gamma UCL 40.68

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). For additional insight, the user may want to consult a statistician.

Lead

General Statistics	
Number of Valid Observations 13	Number of Distinct Observations 13
Raw Statistics	
Minimum 11	Minimum of Log Data 2.398
Maximum 225	Maximum of Log Data 5.416
Mean 86.35	Mean of log Data 4.158
Median 57.6	SD of log Data 0.853
SD 67.18	
Std. Error of Mean 18.63	
Coefficient of Variation 0.778	
Skewness 1.134	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.868	Shapiro Wilk Test Statistic 0.969
Shapiro Wilk Critical Value 0.866	Shapiro Wilk Critical Value 0.866
Lognormal Distribution Test	

Table F-8
ProUCL Output - Area 2 Subsurface Soil
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Data appear Normal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 119.6

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 123.3

95% Modified-t UCL (Johnson-1978) 120.5

Assuming Lognormal Distribution

95% H-UCL 174.7

95% Chebyshev (MVUE) UCL 186.1

97.5% Chebyshev (MVUE) UCL 228.2

99% Chebyshev (MVUE) UCL 311

Gamma Distribution Test

k star (bias corrected) 1.448

Theta Star 59.63

MLE of Mean 86.35

MLE of Standard Deviation 71.76

nu star 37.65

Approximate Chi Square Value (.05) 24.6

Adjusted Level of Significance 0.0301

Adjusted Chi Square Value 23.1

Data Distribution

Data appear Normal at 5% Significance Level

95% CLT UCL 117

95% Jackknife UCL 119.6

95% Standard Bootstrap UCL 115.8

95% Bootstrap-t UCL 133.9

95% Hall's Bootstrap UCL 142.2

95% Percentile Bootstrap UCL 116.8

95% BCA Bootstrap UCL 119.7

95% Chebyshev(Mean, Sd) UCL 167.6

97.5% Chebyshev(Mean, Sd) UCL 202.7

99% Chebyshev(Mean, Sd) UCL 271.7

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 132.2

95% Adjusted Gamma UCL 140.7

Potential UCL to Use

Use 95% Student's-t UCL 119.6

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). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics

Number of Valid Observations 13

Number of Distinct Observations 13

Raw Statistics

Minimum 274

Log-transformed Statistics

Minimum of Log Data 5.613

Table F-8
ProUCL Output - Area 2 Subsurface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Maximum 557	Maximum of Log Data 6.323
Mean 408.5	Mean of log Data 5.984
Median 378	SD of log Data 0.25
SD 100.8	
Std. Error of Mean 27.97	
Coefficient of Variation 0.247	
Skewness 0.191	

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.92
Shapiro Wilk Critical Value 0.866

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.928
Shapiro Wilk Critical Value 0.866

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 458.4

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 456.1
95% Modified-t UCL (Johnson-1978) 458.6

Assuming Lognormal Distribution

95% H-UCL 468.8

95% Chebyshev (MVUE) UCL 533.1
97.5% Chebyshev (MVUE) UCL 587
99% Chebyshev (MVUE) UCL 692.8

Gamma Distribution Test

k star (bias corrected) 13.61
Theta Star 30.01
MLE of Mean 408.5
MLE of Standard Deviation 110.7
nu star 353.9
Approximate Chi Square Value (.05) 311.3
Adjusted Level of Significance 0.0301
Adjusted Chi Square Value 305.6

Anderson-Darling Test Statistic 0.39
Anderson-Darling 5% Critical Value 0.733
Kolmogorov-Smirnov Test Statistic 0.143
Kolmogorov-Smirnov 5% Critical Value 0.236

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 454.5
95% Jackknife UCL 458.4
95% Standard Bootstrap UCL 452.2
95% Bootstrap-t UCL 459.1
95% Hall's Bootstrap UCL 450.5
95% Percentile Bootstrap UCL 455.4
95% BCA Bootstrap UCL 456.1
95% Chebyshev(Mean, Sd) UCL 530.5
97.5% Chebyshev(Mean, Sd) UCL 583.2
99% Chebyshev(Mean, Sd) UCL 686.8

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 464.4
95% Adjusted Gamma UCL 473.1

Potential UCL to Use

Use 95% Student's-t UCL 458.4

Table F-8
ProUCL Output - Area 2 Subsurface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
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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). For additional insight, the user may want to consult a statistician.

Mercury

General Statistics																	
Number of Valid Observations 11	Number of Distinct Observations 11																
Raw Statistics	Log-transformed Statistics																
<table border="0"> <tr> <td style="width: 50%;">Minimum 0.028</td><td style="width: 50%;">Minimum of Log Data -3.576</td></tr> <tr> <td>Maximum 1.76</td><td>Maximum of Log Data 0.565</td></tr> <tr> <td>Mean 0.357</td><td>Mean of log Data -1.606</td></tr> <tr> <td>Median 0.18</td><td>SD of log Data 1.106</td></tr> <tr> <td>SD 0.487</td><td></td></tr> <tr> <td>Std. Error of Mean 0.147</td><td></td></tr> <tr> <td>Coefficient of Variation 1.366</td><td></td></tr> <tr> <td>Skewness 2.813</td><td></td></tr> </table>		Minimum 0.028	Minimum of Log Data -3.576	Maximum 1.76	Maximum of Log Data 0.565	Mean 0.357	Mean of log Data -1.606	Median 0.18	SD of log Data 1.106	SD 0.487		Std. Error of Mean 0.147		Coefficient of Variation 1.366		Skewness 2.813	
Minimum 0.028	Minimum of Log Data -3.576																
Maximum 1.76	Maximum of Log Data 0.565																
Mean 0.357	Mean of log Data -1.606																
Median 0.18	SD of log Data 1.106																
SD 0.487																	
Std. Error of Mean 0.147																	
Coefficient of Variation 1.366																	
Skewness 2.813																	
Relevant UCL Statistics																	
Normal Distribution Test	Lognormal Distribution Test																
Shapiro Wilk Test Statistic 0.618	Shapiro Wilk Test Statistic 0.975																
Shapiro Wilk Critical Value 0.85	Shapiro Wilk Critical Value 0.85																
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level																
Assuming Normal Distribution	Assuming Lognormal Distribution																
95% Student's-t UCL 0.623	95% H-UCL 1.136																
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 0.872																
95% Adjusted-CLT UCL (Chen-1995) 0.731	97.5% Chebyshev (MVUE) UCL 1.102																
95% Modified-t UCL (Johnson-1978) 0.644	99% Chebyshev (MVUE) UCL 1.552																
Gamma Distribution Test	Data Distribution																
k star (bias corrected) 0.791	Data appear Gamma Distributed at 5% Significance Level																
Theta Star 0.451																	
MLE of Mean 0.357																	
MLE of Standard Deviation 0.401																	
nu star 17.4																	
Approximate Chi Square Value (.05) 8.958	Nonparametric Statistics																
Adjusted Level of Significance 0.0278	95% CLT UCL 0.598																
Adjusted Chi Square Value 7.989	95% Jackknife UCL 0.623																
	95% Standard Bootstrap UCL 0.592																

Table F-8
ProUCL Output - Area 2 Subsurface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
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Anderson-Darling Test Statistic 0.455	95% Bootstrap-t UCL 1.072
Anderson-Darling 5% Critical Value 0.751	95% Hall's Bootstrap UCL 1.497
Kolmogorov-Smirnov Test Statistic 0.184	95% Percentile Bootstrap UCL 0.617
Kolmogorov-Smirnov 5% Critical Value 0.262	95% BCA Bootstrap UCL 0.767
Data appear Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 0.997
	97.5% Chebyshev(Mean, Sd) UCL 1.274
	99% Chebyshev(Mean, Sd) UCL 1.818
Assuming Gamma Distribution	
95% Approximate Gamma UCL 0.692	
95% Adjusted Gamma UCL 0.777	
Potential UCL to Use	Use 95% Approximate Gamma UCL 0.692

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). For additional insight, the user may want to consult a statistician.

Mercury, Inorganic Salts

General Statistics	
Number of Valid Observations 1	Number of Distinct Observations 1

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Mercury, Inorganic Salts was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!
If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Vanadium

General Statistics	
Number of Valid Observations 13	Number of Distinct Observations 13

Raw Statistics	Log-transformed Statistics
Minimum 20	Minimum of Log Data 2.996
Maximum 30.6	Maximum of Log Data 3.421
Mean 23.47	Mean of log Data 3.148
Median 22.7	SD of log Data 0.123

Table F-8
ProUCL Output - Area 2 Subsurface Soil
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SD 3.041

Std. Error of Mean 0.844

Coefficient of Variation 0.13

Skewness 1.168

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.907

Shapiro Wilk Critical Value 0.866

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.936

Shapiro Wilk Critical Value 0.866

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 24.97

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 25.15

95% Modified-t UCL (Johnson-1978) 25.02

Assuming Lognormal Distribution

95% H-UCL 25.01

95% Chebyshev (MVUE) UCL 26.97

97.5% Chebyshev (MVUE) UCL 28.49

99% Chebyshev (MVUE) UCL 31.47

Gamma Distribution Test

k star (bias corrected) 53.16

Theta Star 0.442

MLE of Mean 23.47

MLE of Standard Deviation 3.219

nu star 1382

Approximate Chi Square Value (.05) 1297

Adjusted Level of Significance 0.0301

Adjusted Chi Square Value 1285

Anderson-Darling Test Statistic 0.365

Anderson-Darling 5% Critical Value 0.732

Kolmogorov-Smirnov Test Statistic 0.158

Kolmogorov-Smirnov 5% Critical Value 0.236

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 24.86

95% Jackknife UCL 24.97

95% Standard Bootstrap UCL 24.8

95% Bootstrap-t UCL 25.52

95% Hall's Bootstrap UCL 25.97

95% Percentile Bootstrap UCL 24.85

95% BCA Bootstrap UCL 25

95% Chebyshev(Mean, Sd) UCL 27.15

97.5% Chebyshev(Mean, Sd) UCL 28.74

99% Chebyshev(Mean, Sd) UCL 31.86

Assuming Gamma Distribution

95% Approximate Gamma UCL 25.01

95% Adjusted Gamma UCL 25.24

Potential UCL to Use

Use 95% Student's-t UCL 24.97

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). For additional insight, the user may want to consult a statistician.

Table F-8
ProUCL Output - Area 2 Subsurface Soil
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Table F-9
ProUCL Output - Area 3 Subsurface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Area3.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Number of Valid Data	17	Number of Detected Data	15
Number of Distinct Detected Data	14	Number of Non-Detect Data	2
		Percent Non-Detects	11.76%

Raw Statistics

Minimum Detected	0.0071
Maximum Detected	1.4
Mean of Detected	0.255
SD of Detected	0.358
Minimum Non-Detect	0.033
Maximum Non-Detect	0.033

Log-transformed Statistics

Minimum Detected	-4.948
Maximum Detected	0.336
Mean of Detected	-2.071
SD of Detected	1.287
Minimum Non-Detect	-3.411
Maximum Non-Detect	-3.411

UCL Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.653
5% Shapiro Wilk Critical Value	0.881

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.98
5% Shapiro Wilk Critical Value	0.881

Data not Normal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.227
SD	0.344
95% DL/2 (t) UCL	0.373

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean	-2.311
SD	1.381
95% H-Stat (DL/2) UCL	0.798

Maximum Likelihood Estimate(MLE) Method

Mean	0.186
SD	0.38
95% MLE (t) UCL	0.347
95% MLE (Tiku) UCL	0.342

Log ROS Method

Mean in Log Scale	-2.365
SD in Log Scale	1.466
Mean in Original Scale	0.227
SD in Original Scale	0.345
95% t UCL	0.373

Table F-9
ProUCL Output - Area 3 Subsurface Soil
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		95% Percentile Bootstrap UCL	0.374
		95% BCA Bootstrap UCL	0.453
		95% H UCL	0.966
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
			Data appear Gamma Distributed at 5% Significance Level
k star (bias corrected)	0.713		
Theta Star	0.358		
nu star	21.39		
		Nonparametric Statistics	
A-D Test Statistic	0.421		
5% A-D Critical Value	0.771	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.771	Mean	0.226
5% K-S Critical Value	0.229	SD	0.335
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0841
		95% KM (t) UCL	0.373
Assuming Gamma Distribution		95% KM (z) UCL	0.364
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.37
Minimum	0.000001	95% KM (bootstrap t) UCL	0.546
Maximum	1.4	95% KM (BCA) UCL	0.399
Mean	0.225	95% KM (Percentile Bootstrap) UCL	0.374
Median	0.11	95% KM (Chebyshev) UCL	0.593
SD	0.346	97.5% KM (Chebyshev) UCL	0.751
k star	0.322	99% KM (Chebyshev) UCL	1.063
Theta star	0.699		
Nu star	10.96	Potential UCLs to Use	
AppChi2	4.548	95% KM (Chebyshev) UCL	0.593
95% Gamma Approximate UCL	0.543		
95% Adjusted Gamma UCL	0.599		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Benzo(a)pyrene

General Statistics			
Number of Valid Data	17	Number of Detected Data	15
Number of Distinct Detected Data	14	Number of Non-Detect Data	2
		Percent Non-Detects	11.76%

Table F-9
ProUCL Output - Area 3 Subsurface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Raw Statistics		Log-transformed Statistics			
Minimum Detected	0.011	Minimum Detected	-4.51		
Maximum Detected	1.4	Maximum Detected	0.336		
Mean of Detected	0.262	Mean of Detected	-1.975		
SD of Detected	0.352	SD of Detected	1.199		
Minimum Non-Detect	0.033	Minimum Non-Detect	-3.411		
Maximum Non-Detect	0.033	Maximum Non-Detect	-3.411		
UCL Statistics					
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only			
Shapiro Wilk Test Statistic	0.656	Shapiro Wilk Test Statistic	0.989		
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881		
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level			
Assuming Normal Distribution					
DL/2 Substitution Method					
Mean	0.233	Mean	-2.225		
SD	0.339	SD	1.326		
95% DL/2 (t) UCL	0.376	95% H-Stat (DL/2) UCL	0.749		
Maximum Likelihood Estimate(MLE) Method					
Mean	0.192	Log ROS Method			
SD	0.375	Mean in Log Scale	-2.249		
95% MLE (t) UCL	0.351	SD in Log Scale	1.368		
95% MLE (Tiku) UCL	0.347	Mean in Original Scale	0.232		
		SD in Original Scale	0.34		
		95% t UCL	0.376		
		95% Percentile Bootstrap UCL	0.382		
		95% BCA Bootstrap UCL	0.432		
		95% H UCL	0.818		
Gamma Distribution Test with Detected Values Only					
k star (bias corrected)	0.781	Data Distribution Test with Detected Values Only			
Theta Star	0.335	Data appear Gamma Distributed at 5% Significance Level			
nu star	23.42				
A-D Test Statistic					
5% A-D Critical Value	0.767	Nonparametric Statistics			
K-S Test Statistic	0.767	Kaplan-Meier (KM) Method			
5% K-S Critical Value	0.229	Mean	0.232		
Data appear Gamma Distributed at 5% Significance Level					
		SD	0.33		
		SE of Mean	0.0828		
		95% KM (t) UCL	0.377		

Table F-9
ProUCL Output - Area 3 Subsurface Soil
Second Supplemental Remedial Investigation
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Assuming Gamma Distribution			95% KM (z) UCL	0.368
Gamma ROS Statistics using Extrapolated Data			95% KM (jackknife) UCL	0.374
Minimum	0.000001		95% KM (bootstrap t) UCL	0.545
Maximum	1.4		95% KM (BCA) UCL	0.375
Mean	0.231		95% KM (Percentile Bootstrap) UCL	0.376
Median	0.12		95% KM (Chebyshev) UCL	0.593
SD	0.341		97.5% KM (Chebyshev) UCL	0.749
k star	0.33		99% KM (Chebyshev) UCL	1.056
Theta star	0.699			
Nu star	11.22		Potential UCLs to Use	
AppChi2	4.719		95% KM (Chebyshev) UCL	0.593
95% Gamma Approximate UCL	0.549			
95% Adjusted Gamma UCL	0.604			

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Benzo(b)fluoranthene

General Statistics			
Number of Valid Data	17	Number of Detected Data	15
Number of Distinct Detected Data	13	Number of Non-Detect Data	2
		Percent Non-Detects	11.76%
Raw Statistics			
Minimum Detected	0.019	Minimum Detected	-3.963
Maximum Detected	2.2	Maximum Detected	0.788
Mean of Detected	0.383	Mean of Detected	-1.595
SD of Detected	0.548	SD of Detected	1.172
Minimum Non-Detect	0.66	Minimum Non-Detect	-0.416
Maximum Non-Detect	0.66	Maximum Non-Detect	-0.416
Log-transformed Statistics			
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.61	Shapiro Wilk Test Statistic	0.983
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

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Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.377	Mean	-1.538
SD	0.513	SD	1.108
95% DL/2 (t) UCL	0.594	95% H-Stat (DL/2) UCL	0.87
Maximum Likelihood Estimate(MLE) Method MLE method failed to converge properly		Log ROS Method	
		Mean in Log Scale	-1.625
		SD in Log Scale	1.112
		Mean in Original Scale	0.359
		SD in Original Scale	0.518
		95% t UCL	0.578
		95% Percentile Bootstrap UCL	0.583
		95% BCA Bootstrap UCL	0.703
		95% H-UCL	0.805
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)		Data appear Gamma Distributed at 5% Significance Level	
Theta Star		Data appear Gamma Distributed at 5% Significance Level	
nu star		Data appear Gamma Distributed at 5% Significance Level	
A-D Test Statistic		Nonparametric Statistics	
5% A-D Critical Value		Kaplan-Meier (KM) Method	
K-S Test Statistic		Mean	
5% K-S Critical Value		SD	
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	
		95% KM (t) UCL	
Assuming Gamma Distribution		95% KM (z) UCL	
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	
Minimum		95% KM (bootstrap t) UCL	
Maximum		95% KM (BCA) UCL	
Mean		95% KM (Percentile Bootstrap) UCL	
Median		95% KM (Chebyshev) UCL	
SD		97.5% KM (Chebyshev) UCL	
k star		99% KM (Chebyshev) UCL	
Theta star		Potential UCLs to Use	
Nu star		95% KM (Chebyshev) UCL	
AppChi2		0.915	
95% Gamma Approximate UCL			
95% Adjusted Gamma UCL			

Note: DL/2 is not a recommended method.

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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, Maichle, and Lee (2006).
 For additional insight, the user may want to consult a statistician.

Carbazole

General Statistics			
Number of Valid Data	4	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	2
		Percent Non-Detects	50.00%

Warning: This data set only has 4 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Carbazole was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Dibenz(a,h)anthracene

General Statistics			
Number of Valid Data	16	Number of Detected Data	13
Number of Distinct Detected Data	12	Number of Non-Detect Data	3
		Percent Non-Detects	18.75%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0084	Minimum Detected	-4.78
Maximum Detected	0.23	Maximum Detected	-1.47
Mean of Detected	0.062	Mean of Detected	-3.343
SD of Detected	0.0732	SD of Detected	1.082
Minimum Non-Detect	0.0026	Minimum Non-Detect	-5.952
Maximum Non-Detect	0.66	Maximum Non-Detect	-0.416

Note: Data have multiple DLs - Use of KM Method is recommended

Number treated as Non-Detect 16

For all methods (except KM, DL/2, and ROS Methods),

Number treated as Detected 0

Observations < Largest ND are treated as NDs

Single DL Non-Detect Percentage 100.00%

UCL Statistics

Normal Distribution Test with Detected Values Only

Lognormal Distribution Test with Detected Values Only

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Shapiro Wilk Test Statistic	0.719	Shapiro Wilk Test Statistic	0.93
5% Shapiro Wilk Critical Value	0.866	5% Shapiro Wilk Critical Value	0.866

Data not Normal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.0917
SD	0.115
95% DL/2 (t) UCL	0.142

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean	-3.27
SD	1.524
95% H-Stat (DL/2) UCL	0.498
Log ROS Method	
Mean in Log Scale	-3.529
SD in Log Scale	1.189
Mean in Original Scale	0.0549
SD in Original Scale	0.0679
95% t UCL	0.0847
95% Percentile Bootstrap UCL	0.0852
95% BCA Bootstrap UCL	0.0908
95% H-UCL	0.15

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.839
Theta Star	0.0739
nu star	21.81

Data Distribution Test with Detected Values Only

Data Follow Appr. Gamma Distribution at 5% Significance Level

A-D Test Statistic	0.721
5% A-D Critical Value	0.757
K-S Test Statistic	0.757
5% K-S Critical Value	0.243

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	0.0582
SD	0.0691

Data follow Appr. Gamma Distribution at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000001
Maximum	0.23
Mean	0.0568
Median	0.028
SD	0.0688
k star	0.488
Theta star	0.116
Nu star	15.62
AppChi2	7.697

Potential UCLs to Use

95% KM (jackknife) UCL	0.0919
95% KM (bootstrap t) UCL	0.123
95% KM (BCA) UCL	0.0947
95% KM (Percentile Bootstrap) UCL	0.091
95% KM (Chebyshev) UCL	0.142
97.5% KM (Chebyshev) UCL	0.178
99% KM (Chebyshev) UCL	0.25
95% KM (Chebyshev) UCL	0.142

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95% Gamma Approximate UCL	0.115
95% Adjusted Gamma UCL	0.126

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Indeno(1,2,3-cd)pyrene

General Statistics			
Number of Valid Data	17	Number of Detected Data	15
Number of Distinct Detected Data	13	Number of Non-Detect Data	2
		Percent Non-Detects	11.76%
Raw Statistics			
Minimum Detected	0.0085	Minimum Detected	-4.768
Maximum Detected	0.89	Maximum Detected	-0.117
Mean of Detected	0.186	Mean of Detected	-2.289
SD of Detected	0.232	SD of Detected	1.185
Minimum Non-Detect	0.033	Minimum Non-Detect	-3.411
Maximum Non-Detect	0.033	Maximum Non-Detect	-3.411
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.707	Shapiro Wilk Test Statistic	0.983
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level			
Assuming Normal Distribution			
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.166	Mean	-2.502
SD	0.225	SD	1.261
95% DL/2 (t) UCL	0.261	95% H-Stat (DL/2) UCL	0.479
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.113	Mean in Log Scale	-2.487
SD	0.277	SD in Log Scale	1.245
95% MLE (t) UCL	0.23	Mean in Original Scale	0.166
95% MLE (Tiku) UCL	0.235	SD in Original Scale	0.224

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		95% t UCL	0.261
		95% Percentile Bootstrap UCL	0.258
		95% BCA Bootstrap UCL	0.293
		95% H UCL	0.467
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.809	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.23		
nu star	24.28		
A-D Test Statistic	0.388	Nonparametric Statistics	
5% A-D Critical Value	0.765	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.765	Mean	0.167
5% K-S Critical Value	0.228	SD	0.217
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0546
		95% KM (t) UCL	0.262
Assuming Gamma Distribution		95% KM (z) UCL	0.257
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.262
Minimum	0.000001	95% KM (bootstrap t) UCL	0.343
Maximum	0.89	95% KM (BCA) UCL	0.266
Mean	0.164	95% KM (Percentile Bootstrap) UCL	0.263
Median	0.074	95% KM (Chebyshev) UCL	0.405
SD	0.226	97.5% KM (Chebyshev) UCL	0.508
k star	0.339	99% KM (Chebyshev) UCL	0.71
Theta star	0.485	Potential UCLs to Use	
Nu star	11.51	95% KM (Chebyshev) UCL	0.405
AppChi2	4.909		
95% Gamma Approximate UCL	0.385		
95% Adjusted Gamma UCL	0.423		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Antimony

General Statistics			
Number of Valid Data	20	Number of Detected Data	14
Number of Distinct Detected Data	14	Number of Non-Detect Data	6
		Percent Non-Detects	30.00%

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Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.07	Minimum Detected	-2.659
Maximum Detected	1.2	Maximum Detected	0.182
Mean of Detected	0.371	Mean of Detected	-1.243
SD of Detected	0.292	SD of Detected	0.743
Minimum Non-Detect	0.43	Minimum Non-Detect	-0.844
Maximum Non-Detect	0.5	Maximum Non-Detect	-0.693

Note: Data have multiple DLs - Use of KM Method is recommended

Number treated as Non-Detect 17

For all methods (except KM, DL/2, and ROS Methods),

Number treated as Detected 3

Observations < Largest ND are treated as NDs

Single DL Non-Detect Percentage 85.00%

UCL Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.812
5% Shapiro Wilk Critical Value	0.874

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.979
5% Shapiro Wilk Critical Value	0.874

Data not Normal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.328
SD	0.251
95% DL/2 (t) UCL	0.425

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean	-1.315
SD	0.625
95% H-Stat (DL/2) UCL	0.445

Maximum Likelihood Estimate(MLE) Method

Mean	0.903
SD	0.271
95% MLE (t) UCL	1.008
95% MLE (Tiku) UCL	1.166

Log ROS Method

Mean in Log Scale	-1.316
SD in Log Scale	0.632
Mean in Original Scale	0.328
SD in Original Scale	0.252
95% t UCL	0.425
95% Percentile Bootstrap UCL	0.427
95% BCA Bootstrap UCL	0.46
95% H UCL	0.448

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.737
Theta Star	0.213
nu star	48.64

Data Distribution Test with Detected Values Only

Data appear Gamma Distributed at 5% Significance Level

A-D Test Statistic	0.272
5% A-D Critical Value	0.745

Nonparametric Statistics

Kaplan-Meier (KM) Method

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K-S Test Statistic	0.745	Mean	0.334
5% K-S Critical Value	0.231	SD	0.249
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0604
		95% KM (t) UCL	0.439
Assuming Gamma Distribution		95% KM (z) UCL	0.433
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.438
Minimum	0.07	95% KM (bootstrap t) UCL	0.483
Maximum	1.2	95% KM (BCA) UCL	0.44
Mean	0.352	95% KM (Percentile Bootstrap) UCL	0.435
Median	0.312	95% KM (Chebyshev) UCL	0.597
SD	0.246	97.5% KM (Chebyshev) UCL	0.711
k star	2.448	99% KM (Chebyshev) UCL	0.935
Theta star	0.144		
Nu star	97.94	Potential UCLs to Use	
AppChi2	76.11	95% KM (Percentile Bootstrap) UCL	0.435
95% Gamma Approximate UCL	0.453		
95% Adjusted Gamma UCL	0.463		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006). For additional insight, the user may want to consult a statistician.

Arsenic

General Statistics	
Number of Valid Observations	20
Number of Distinct Observations	19
Raw Statistics	
Minimum	1.2
Maximum	18.9
Mean	6.36
Median	4.75
SD	4.762
Std. Error of Mean	1.065
Coefficient of Variation	0.749
Skewness	1.627
Log-transformed Statistics	
Minimum of Log Data	0.182
Maximum of Log Data	2.939
Mean of log Data	1.619
SD of log Data	0.697

Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.82	Shapiro Wilk Test Statistic 0.983

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Shapiro Wilk Critical Value 0.905 Data not Normal at 5% Significance Level	Shapiro Wilk Critical Value 0.905 Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 8.201	95% H-UCL 9.191
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 8.525	95% Chebyshev (MVUE) UCL 10.93
95% Modified-t UCL (Johnson-1978) 8.266	97.5% Chebyshev (MVUE) UCL 12.92
	99% Chebyshev (MVUE) UCL 16.82
Gamma Distribution Test	Data Distribution
k star (bias corrected) 2.002	Data appear Gamma Distributed at 5% Significance Level
Theta Star 3.176	
MLE of Mean 6.36	
MLE of Standard Deviation 4.494	
nu star 80.1	
Approximate Chi Square Value (.05) 60.48	Nonparametric Statistics
Adjusted Level of Significance 0.038	95% CLT UCL 8.111
Adjusted Chi Square Value 59.13	95% Jackknife UCL 8.201
Anderson-Darling Test Statistic 0.367	95% Standard Bootstrap UCL 8.049
Anderson-Darling 5% Critical Value 0.751	95% Bootstrap-t UCL 9.22
Kolmogorov-Smirnov Test Statistic 0.147	95% Hall's Bootstrap UCL 9.862
Kolmogorov-Smirnov 5% Critical Value 0.196	95% Percentile Bootstrap UCL 8.205
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 8.49
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 11
95% Approximate Gamma UCL 8.423	97.5% Chebyshev(Mean, Sd) UCL 13.01
95% Adjusted Gamma UCL 8.615	99% Chebyshev(Mean, Sd) UCL 16.95
Potential UCL to Use	Use 95% Approximate Gamma UCL 8.423

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). For additional insight, the user may want to consult a statistician.

Cobalt

General Statistics	
Number of Valid Observations 20	Number of Distinct Observations 16

Raw Statistics	Log-transformed Statistics
----------------	----------------------------

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Minimum 1.8	Minimum of Log Data 0.588
Maximum 7.7	Maximum of Log Data 2.041
Mean 5.85	Mean of log Data 1.729
Median 6	SD of log Data 0.315
SD 1.345	
Std. Error of Mean 0.301	
Coefficient of Variation 0.23	
Skewness -1.447	

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.894
 Shapiro Wilk Critical Value 0.905

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.722
 Shapiro Wilk Critical Value 0.905

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 6.37

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 6.241
 95% Modified-t UCL (Johnson-1978) 6.354

Assuming Lognormal Distribution

95% H-UCL 6.776
 95% Chebyshev (MVUE) UCL 7.75
 97.5% Chebyshev (MVUE) UCL 8.547
 99% Chebyshev (MVUE) UCL 10.11

Gamma Distribution Test

k star (bias corrected) 11.55
 Theta Star 0.507
 MLE of Mean 5.85
 MLE of Standard Deviation 1.722
 nu star 461.9

Approximate Chi Square Value (.05) 413
 Adjusted Level of Significance 0.038
 Adjusted Chi Square Value 409.4

Anderson-Darling Test Statistic 1.242
 Anderson-Darling 5% Critical Value 0.741
 Kolmogorov-Smirnov Test Statistic 0.224
 Kolmogorov-Smirnov 5% Critical Value 0.194

Data not Gamma Distributed at 5% Significance Level

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL 6.345
 95% Jackknife UCL 6.37
 95% Standard Bootstrap UCL 6.344
 95% Bootstrap-t UCL 6.318
 95% Hall's Bootstrap UCL 6.283
 95% Percentile Bootstrap UCL 6.3
 95% BCA Bootstrap UCL 6.26
 95% Chebyshev(Mean, Sd) UCL 7.161
 97.5% Chebyshev(Mean, Sd) UCL 7.728
 99% Chebyshev(Mean, Sd) UCL 8.842

Assuming Gamma Distribution

95% Approximate Gamma UCL 6.542
 95% Adjusted Gamma UCL 6.6

Potential UCL to Use

Use 95% Student's-t UCL 6.37

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or 95% Modified-t UCL 6.354

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). For additional insight, the user may want to consult a statistician.

**Note: For highly negative-skewed data, confidence limits
(e.g., Chen, Johnson, Lognormal, and Gamma) may not be
reliable. Chen's and Johnson's methods provide
adjustments for positively skewed data sets.**

Thallium

General Statistics			
Number of Valid Data	20	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	15
		Percent Non-Detects	75.00%
Raw Statistics			
Minimum Detected	0.092	Minimum Detected	-2.386
Maximum Detected	0.19	Maximum Detected	-1.661
Mean of Detected	0.134	Mean of Detected	-2.035
SD of Detected	0.0359	SD of Detected	0.262
Minimum Non-Detect	1.1	Minimum Non-Detect	0.0953
Maximum Non-Detect	1.2	Maximum Non-Detect	0.182
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	20
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

Warning: There are only 5 Detected Values in this data

**Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions**

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.951	Shapiro Wilk Test Statistic	0.979
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762

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Data appear Normal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean	0.454
SD	0.191
95% DL/2 (t) UCL	0.527

Maximum Likelihood Estimate(MLE) Method

MLE method failed to converge properly

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean	-0.944
SD	0.658
95% H-Stat (DL/2) UCL	0.672
Log ROS Method	
Mean in Log Scale	-2.035
SD in Log Scale	0.263
Mean in Original Scale	0.135
SD in Original Scale	0.0357
95% t UCL	0.149
95% Percentile Bootstrap UCL	0.148
95% BCA Bootstrap UCL	0.148
95% H-UCL	0.151

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	7.413
Theta Star	0.0181
nu star	74.13

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

A-D Test Statistic	0.235
5% A-D Critical Value	0.679
K-S Test Statistic	0.679
5% K-S Critical Value	0.357

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	0.134
SD	0.0321

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data	
Minimum	0.0578
Maximum	0.19
Mean	0.133
Median	0.137
SD	0.0342
k star	11.7
Theta star	0.0114
Nu star	467.8
AppChi2	418.7
95% Gamma Approximate UCL	0.149
95% Adjusted Gamma UCL	0.15

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	0.134
SD	0.0321
SE of Mean	0.016
95% KM (t) UCL	0.162
95% KM (z) UCL	0.161
95% KM (jackknife) UCL	0.165
95% KM (bootstrap t) UCL	0.179
95% KM (BCA) UCL	0.162
95% KM (Percentile Bootstrap) UCL	0.162
95% KM (Chebyshev) UCL	0.204
97.5% KM (Chebyshev) UCL	0.235
99% KM (Chebyshev) UCL	0.294

Potential UCLs to Use

95% KM (t) UCL	0.162
95% KM (Percentile Bootstrap) UCL	0.162

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Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Chrysene

General Statistics			
Number of Valid Data	17	Number of Detected Data	15
Number of Distinct Detected Data	15	Number of Non-Detect Data	2
		Percent Non-Detects	11.76%
Raw Statistics			
Minimum Detected	0.011	Minimum Detected	-4.51
Maximum Detected	1.3	Maximum Detected	0.262
Mean of Detected	0.251	Mean of Detected	-1.999
SD of Detected	0.329	SD of Detected	1.179
Minimum Non-Detect	0.033	Minimum Non-Detect	-3.411
Maximum Non-Detect	0.033	Maximum Non-Detect	-3.411
Log-transformed Statistics			
Shapiro Wilk Test Statistic	0.67	Shapiro Wilk Test Statistic	0.984
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.67	Shapiro Wilk Test Statistic	0.984
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881
Assuming Normal Distribution			
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.223	Mean	-2.246
SD	0.317	SD	1.306
95% DL/2 (t) UCL	0.357	95% H-Stat (DL/2) UCL	0.695
Assuming Lognormal Distribution			
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.186	Mean in Log Scale	-2.268
SD	0.351	SD in Log Scale	1.344
95% MLE (t) UCL	0.334	Mean in Original Scale	0.223
95% MLE (Tiku) UCL	0.33	SD in Original Scale	0.317
		95% t UCL	0.357
		95% Percentile Bootstrap UCL	0.357

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		95% BCA Bootstrap UCL	0.404
		95% H UCL	0.753
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
			Data appear Gamma Distributed at 5% Significance Level
k star (bias corrected)	0.801		
Theta Star	0.313		
nu star	24.02		
A-D Test Statistic	0.411	Nonparametric Statistics	
5% A-D Critical Value	0.766	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.766	Mean	0.222
5% K-S Critical Value	0.228	SD	0.308
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0774
		95% KM (t) UCL	0.357
Assuming Gamma Distribution		95% KM (z) UCL	0.35
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.355
Minimum	0.000001	95% KM (bootstrap t) UCL	0.498
Maximum	1.3	95% KM (BCA) UCL	0.378
Mean	0.221	95% KM (Percentile Bootstrap) UCL	0.361
Median	0.11	95% KM (Chebyshev) UCL	0.56
SD	0.319	97.5% KM (Chebyshev) UCL	0.705
k star	0.333	99% KM (Chebyshev) UCL	0.992
Theta star	0.664	Potential UCLs to Use	
Nu star	11.32	95% KM (Chebyshev) UCL	0.56
AppChi2	4.782		
95% Gamma Approximate UCL	0.523		
95% Adjusted Gamma UCL	0.576		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Aluminum

General Statistics	
Number of Valid Observations	20
Number of Distinct Observations	19
Raw Statistics	
Minimum	5940
Maximum	14900
Log-transformed Statistics	
Minimum of Log Data	8.689
Maximum of Log Data	9.609

Table F-9
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Mean	10292	Mean of log Data	9.21
Median	10150	SD of log Data	0.25
SD	2473		
Std. Error of Mean	553		
Coefficient of Variation	0.24		
Skewness	0.199		

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.969
 Shapiro Wilk Critical Value 0.905

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.963
 Shapiro Wilk Critical Value 0.905

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 11248

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 11227
 95% Modified-t UCL (Johnson-1978) 11252

Assuming Lognormal Distribution

95% H-UCL 11448

95% Chebyshev (MVUE) UCL 12831
 97.5% Chebyshev (MVUE) UCL 13926
 99% Chebyshev (MVUE) UCL 16076

Gamma Distribution Test

k star (bias corrected) 15.01

Theta Star 685.8

MLE of Mean 10292

MLE of Standard Deviation 2657

nu star 600.2

Approximate Chi Square Value (.05) 544.4

Adjusted Level of Significance 0.038

Adjusted Chi Square Value 540.2

Anderson-Darling Test Statistic 0.236

Anderson-Darling 5% Critical Value 0.741

Kolmogorov-Smirnov Test Statistic 0.103

Kolmogorov-Smirnov 5% Critical Value 0.194

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 11201

95% Jackknife UCL 11248

95% Standard Bootstrap UCL 11169

95% Bootstrap-t UCL 11301

95% Hall's Bootstrap UCL 11299

95% Percentile Bootstrap UCL 11238

95% BCA Bootstrap UCL 11192

95% Chebyshev(Mean, Sd) UCL 12702

97.5% Chebyshev(Mean, Sd) UCL 13745

99% Chebyshev(Mean, Sd) UCL 15794

Assuming Gamma Distribution

95% Approximate Gamma UCL 11347

95% Adjusted Gamma UCL 11435

Potential UCL to Use

Use 95% Student's-t UCL 11248

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

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These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Barium

General Statistics	
Number of Valid Observations 20	Number of Distinct Observations 19
Raw Statistics	
Minimum 25	Minimum of Log Data 3.219
Maximum 105	Maximum of Log Data 4.654
Mean 54.74	Mean of log Data 3.952
Median 51.4	SD of log Data 0.325
SD 18.25	
Std. Error of Mean 4.08	
Coefficient of Variation 0.333	
Skewness 1.097	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.916	Lognormal Distribution Test
Shapiro Wilk Critical Value 0.905	Shapiro Wilk Test Statistic 0.967
Data appear Normal at 5% Significance Level	Shapiro Wilk Critical Value 0.905
Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution	
95% Student's-t UCL 61.79	95% H-UCL 63.1
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 62.52	95% Chebyshev (MVUE) UCL 72.36
95% Modified-t UCL (Johnson-1978) 61.96	97.5% Chebyshev (MVUE) UCL 79.99
	99% Chebyshev (MVUE) UCL 94.97
Gamma Distribution Test	
k star (bias corrected) 8.661	Data Distribution
Theta Star 6.32	Data appear Normal at 5% Significance Level
MLE of Mean 54.74	
MLE of Standard Deviation 18.6	
nu star 346.4	
Approximate Chi Square Value (.05) 304.3	Nonparametric Statistics
Adjusted Level of Significance 0.038	95% CLT UCL 61.45
Adjusted Chi Square Value 301.2	95% Jackknife UCL 61.79
Anderson-Darling Test Statistic 0.421	95% Standard Bootstrap UCL 61.14
	95% Bootstrap-t UCL 63.18

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Anderson-Darling 5% Critical Value 0.742	95% Hall's Bootstrap UCL 64.95
Kolmogorov-Smirnov Test Statistic 0.186	95% Percentile Bootstrap UCL 61.73
Kolmogorov-Smirnov 5% Critical Value 0.194	95% BCA Bootstrap UCL 62.59
Data appear Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
95% Approximate Gamma UCL 62.31	95% Chebyshev(Mean, Sd) UCL 72.52
95% Adjusted Gamma UCL 62.96	97.5% Chebyshev(Mean, Sd) UCL 80.22
	99% Chebyshev(Mean, Sd) UCL 95.34
Potential UCL to Use	
	Use 95% Student's-t UCL 61.79

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). For additional insight, the user may want to consult a statistician.

Chromium

General Statistics	
Number of Valid Observations 20	Number of Distinct Observations 18
Raw Statistics	
Minimum 12.6	Minimum of Log Data 2.534
Maximum 26.2	Maximum of Log Data 3.266
Mean 19.23	Mean of log Data 2.94
Median 19.25	SD of log Data 0.188
SD 3.583	
Std. Error of Mean 0.801	
Coefficient of Variation 0.186	
Skewness 0.26	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.975	Shapiro Wilk Test Statistic 0.979
Shapiro Wilk Critical Value 0.905	Shapiro Wilk Critical Value 0.905
Data appear Normal at 5% Significance Level	
Lognormal Distribution Test	
Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution	
95% Student's-t UCL 20.62	95% H-UCL 20.79
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 20.6	95% Chebyshev (MVUE) UCL 22.78
95% Modified-t UCL (Johnson-1978) 20.62	97.5% Chebyshev (MVUE) UCL 24.32
	99% Chebyshev (MVUE) UCL 27.34

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Gamma Distribution Test		Data Distribution
k star (bias corrected) 25.67		Data appear Normal at 5% Significance Level
Theta Star 0.749		
MLE of Mean 19.23		
MLE of Standard Deviation 3.795		
nu star 1027		
Approximate Chi Square Value (.05) 953.5		Nonparametric Statistics
Adjusted Level of Significance 0.038		95% CLT UCL 20.55
Adjusted Chi Square Value 947.9		95% Jackknife UCL 20.62
Anderson-Darling Test Statistic 0.195		95% Standard Bootstrap UCL 20.51
Anderson-Darling 5% Critical Value 0.74		95% Bootstrap-t UCL 20.63
Kolmogorov-Smirnov Test Statistic 0.0979		95% Hall's Bootstrap UCL 20.67
Kolmogorov-Smirnov 5% Critical Value 0.193		95% Percentile Bootstrap UCL 20.44
Data appear Gamma Distributed at 5% Significance Level		95% BCA Bootstrap UCL 20.53
Assuming Gamma Distribution		95% Chebyshev(Mean, Sd) UCL 22.72
95% Approximate Gamma UCL 20.71		97.5% Chebyshev(Mean, Sd) UCL 24.23
95% Adjusted Gamma UCL 20.83		99% Chebyshev(Mean, Sd) UCL 27.2
Potential UCL to Use		Use 95% Student's-t UCL 20.62

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). For additional insight, the user may want to consult a statistician.

Copper

General Statistics	
Number of Valid Observations 20	Number of Distinct Observations 20
Raw Statistics	Log-transformed Statistics
Minimum 9.8	Minimum of Log Data 2.282
Maximum 2470	Maximum of Log Data 7.812
Mean 156.7	Mean of log Data 3.532
Median 28.2	SD of log Data 1.195
SD 545.5	
Std. Error of Mean 122	
Coefficient of Variation 3.48	
Skewness 4.445	

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ProUCL Output - Area 3 Subsurface Soil
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Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.273	Shapiro Wilk Test Statistic 0.725
Shapiro Wilk Critical Value 0.905	Shapiro Wilk Critical Value 0.905
Data not Normal at 5% Significance Level	Data not Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 367.7	95% H-UCL 155.7
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 154.5
95% Adjusted-CLT UCL (Chen-1995) 486.9	97.5% Chebyshev (MVUE) UCL 192.8
95% Modified-t UCL (Johnson-1978) 387.9	99% Chebyshev (MVUE) UCL 268
Gamma Distribution Test	Data Distribution
k star (bias corrected) 0.397	95% CLT UCL 357.4
Theta Star 395.1	95% Jackknife UCL 367.7
MLE of Mean 156.7	95% Standard Bootstrap UCL 363
MLE of Standard Deviation 248.8	95% Bootstrap-t UCL 5819
nu star 15.87	95% Hall's Bootstrap UCL 2037
Approximate Chi Square Value (.05) 7.87	95% Percentile Bootstrap UCL 399.8
Adjusted Level of Significance 0.038	95% BCA Bootstrap UCL 520.2
Adjusted Chi Square Value 7.427	95% Chebyshev(Mean, Sd) UCL 688.4
Anderson-Darling Test Statistic 4.336	97.5% Chebyshev(Mean, Sd) UCL 918.5
Anderson-Darling 5% Critical Value 0.818	99% Chebyshev(Mean, Sd) UCL 1370
Kolmogorov-Smirnov Test Statistic 0.395	
Kolmogorov-Smirnov 5% Critical Value 0.207	
Data not Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	Nonparametric Statistics
95% Approximate Gamma UCL 316	95% CLT UCL 357.4
95% Adjusted Gamma UCL 334.9	95% Jackknife UCL 367.7
Potential UCL to Use	95% Standard Bootstrap UCL 363
	95% Bootstrap-t UCL 5819
	95% Hall's Bootstrap UCL 2037
	95% Percentile Bootstrap UCL 399.8
	95% BCA Bootstrap UCL 520.2
	95% Chebyshev(Mean, Sd) UCL 688.4
	97.5% Chebyshev(Mean, Sd) UCL 918.5
	99% Chebyshev(Mean, Sd) UCL 1370
	Use 95% Chebyshev (Mean, Sd) UCL 688.4

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). For additional insight, the user may want to consult a statistician.

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ProUCL Output - Area 3 Subsurface Soil
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General Statistics	
Number of Valid Observations 20	Number of Distinct Observations 20
Raw Statistics	Log-transformed Statistics
Minimum 8.6	Minimum of Log Data 2.152
Maximum 265	Maximum of Log Data 5.58
Mean 96.26	Mean of log Data 4.197
Median 77.3	SD of log Data 0.987
SD 72.9	
Std. Error of Mean 16.3	
Coefficient of Variation 0.757	
Skewness 0.703	
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.928	Shapiro Wilk Test Statistic 0.94
Shapiro Wilk Critical Value 0.905	Shapiro Wilk Critical Value 0.905
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 124.4	95% H-UCL 195.5
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 216.9
95% Adjusted-CLT UCL (Chen-1995) 125.8	97.5% Chebyshev (MVUE) UCL 265.4
95% Modified-t UCL (Johnson-1978) 124.9	99% Chebyshev (MVUE) UCL 360.9
Gamma Distribution Test	Data Distribution
k star (bias corrected) 1.305	
Theta Star 73.76	
MLE of Mean 96.26	
MLE of Standard Deviation 84.26	
nu star 52.2	
Approximate Chi Square Value (.05) 36.6	
Adjusted Level of Significance 0.038	
Adjusted Chi Square Value 35.57	
Anderson-Darling Test Statistic 0.288	95% CLT UCL 123.1
Anderson-Darling 5% Critical Value 0.758	95% Jackknife UCL 124.4
Kolmogorov-Smirnov Test Statistic 0.136	95% Standard Bootstrap UCL 123.1
Kolmogorov-Smirnov 5% Critical Value 0.197	95% Bootstrap-t UCL 128.8
Data appear Gamma Distributed at 5% Significance Level	95% Hall's Bootstrap UCL 126.3
Assuming Gamma Distribution	95% Percentile Bootstrap UCL 124.1
	95% BCA Bootstrap UCL 124.6
	95% Chebyshev(Mean, Sd) UCL 167.3
	97.5% Chebyshev(Mean, Sd) UCL 198.1
	99% Chebyshev(Mean, Sd) UCL 258.5

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95% Approximate Gamma UCL 137.3

95% Adjusted Gamma UCL 141.3

Potential UCL to Use	Use 95% Student's-t UCL 124.4
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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). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics

Number of Valid Observations 20	Number of Distinct Observations 19
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Raw Statistics

Minimum 58.9
Maximum 463
Mean 267.5
Median 273.5
SD 83.41
Std. Error of Mean 18.65
Coefficient of Variation 0.312
Skewness -0.0672

Log-transformed Statistics

Minimum of Log Data 4.076
Maximum of Log Data 6.138
Mean of log Data 5.526
SD of log Data 0.411

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.958
Shapiro Wilk Critical Value 0.905

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.789
Shapiro Wilk Critical Value 0.905

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 299.8

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 297.9
95% Modified-t UCL (Johnson-1978) 299.7

Assuming Lognormal Distribution

95% H-UCL 328.2

95% Chebyshev (MVUE) UCL 384
97.5% Chebyshev (MVUE) UCL 432.4
99% Chebyshev (MVUE) UCL 527.5

Gamma Distribution Test

Data Distribution

k star (bias corrected) 6.889

Data appear Normal at 5% Significance Level

Theta Star 38.84

MLE of Mean 267.5

MLE of Standard Deviation 101.9

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nu star	275.6	Nonparametric Statistics
Approximate Chi Square Value (.05)	238.1	
Adjusted Level of Significance	0.038	
Adjusted Chi Square Value	235.4	
Anderson-Darling Test Statistic	0.725	
Anderson-Darling 5% Critical Value	0.743	
Kolmogorov-Smirnov Test Statistic	0.155	
Kolmogorov-Smirnov 5% Critical Value	0.194	
Data appear Gamma Distributed at 5% Significance Level		
Assuming Gamma Distribution		
95% Approximate Gamma UCL	309.6	95% CLT UCL 298.2
95% Adjusted Gamma UCL	313.2	95% Jackknife UCL 299.8
		95% Standard Bootstrap UCL 297.9
		95% Bootstrap-t UCL 298.6
		95% Hall's Bootstrap UCL 303.1
		95% Percentile Bootstrap UCL 298
		95% BCA Bootstrap UCL 297
		95% Chebyshev(Mean, Sd) UCL 348.8
		97.5% Chebyshev(Mean, Sd) UCL 384
		99% Chebyshev(Mean, Sd) UCL 453.1
Potential UCL to Use		Use 95% Student's-t UCL 299.8

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). For additional insight, the user may want to consult a statistician.

**Note: For highly negative-skewed data, confidence limits
(e.g., Chen, Johnson, Lognormal, and Gamma) may not be
reliable. Chen's and Johnson's methods provide
adjustments for positively skewed data sets.**

Mercury

General Statistics			
Number of Valid Data	9	Number of Detected Data	8
Number of Distinct Detected Data	8	Number of Non-Detect Data	1
		Percent Non-Detects	11.11%
Raw Statistics			
Minimum Detected	0.077	Minimum Detected	-2.564
Maximum Detected	2.7	Maximum Detected	0.993
Mean of Detected	0.614	Mean of Detected	-1.083
SD of Detected	0.871	SD of Detected	1.089
Minimum Non-Detect	0.0077	Minimum Non-Detect	-4.867
Maximum Non-Detect	0.0077	Maximum Non-Detect	-4.867
Log-transformed Statistics			

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Warning: There are only 8 Detected Values in this data

**Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions**

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.622	Shapiro Wilk Test Statistic	0.937
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.546	Mean	-1.58
SD	0.839	SD	1.807
95% DL/2 (t) UCL	1.067	95% H-Stat (DL/2) UCL	29.34
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.487	Mean in Log Scale	-1.376
SD	0.86	SD in Log Scale	1.346
95% MLE (t) UCL	1.02	Mean in Original Scale	0.549
95% MLE (Tiku) UCL	0.993	SD in Original Scale	0.838
		95% t UCL	1.068
		95% Percentile Bootstrap UCL	1.037
		95% BCA Bootstrap UCL	1.304
		95% H UCL	4.301
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.691	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	0.889	Data Follow Appr. Gamma Distribution at 5% Significance Level	
nu star	11.06	Data Follow Appr. Gamma Distribution at 5% Significance Level	
A-D Test Statistic	0.648	Nonparametric Statistics	
5% A-D Critical Value	0.737	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.737	Mean	0.554
5% K-S Critical Value	0.302	SD	0.786
Data follow Appr. Gamma Distribution at 5% Significance Level		SE of Mean	0.28
Assuming Gamma Distribution		95% KM (t) UCL	1.075
		95% KM (z) UCL	1.015

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Gamma ROS Statistics using Extrapolated Data			95% KM (jackknife) UCL	1.068
Minimum	0.000001		95% KM (bootstrap t) UCL	3.188
Maximum	2.7		95% KM (BCA) UCL	1.092
Mean	0.546		95% KM (Percentile Bootstrap) UCL	1.064
Median	0.29		95% KM (Chebyshev) UCL	1.775
SD	0.84		97.5% KM (Chebyshev) UCL	2.304
k star	0.31		99% KM (Chebyshev) UCL	3.342
Theta star	1.758			
Nu star	5.588		Potential UCLs to Use	
AppChi2	1.433		95% KM (Chebyshev) UCL	1.775
95% Gamma Approximate UCL	2.128			
95% Adjusted Gamma UCL	2.938			

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Vanadium

General Statistics	
Number of Valid Observations 20	Number of Distinct Observations 19

Raw Statistics	Log-transformed Statistics
Minimum 17.5	Minimum of Log Data 2.862
Maximum 36.7	Maximum of Log Data 3.603
Mean 26.33	Mean of log Data 3.249
Median 25.45	SD of log Data 0.211
SD 5.589	
Std. Error of Mean 1.25	
Coefficient of Variation 0.212	
Skewness 0.444	

Relevant UCL Statistics

Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.957	Shapiro Wilk Test Statistic 0.975
Shapiro Wilk Critical Value 0.905	Shapiro Wilk Critical Value 0.905
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 28.49

Assuming Lognormal Distribution

95% H-UCL 28.74

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95% UCLs (Adjusted for Skewness)		
95% Adjusted-CLT UCL (Chen-1995)	28.51	95% Chebyshev (MVUE) UCL 31.77
95% Modified-t UCL (Johnson-1978)	28.51	97.5% Chebyshev (MVUE) UCL 34.12
		99% Chebyshev (MVUE) UCL 38.75
Gamma Distribution Test		Data Distribution
k star (bias corrected)		95% Chebyshev (MVUE) UCL 31.77
Theta Star		97.5% Chebyshev (MVUE) UCL 34.12
MLE of Mean		99% Chebyshev (MVUE) UCL 38.75
MLE of Standard Deviation		Data appear Normal at 5% Significance Level
nu star		
Approximate Chi Square Value (.05)		
Adjusted Level of Significance		
Adjusted Chi Square Value		
Anderson-Darling Test Statistic		Nonparametric Statistics
Anderson-Darling 5% Critical Value		95% CLT UCL 28.38
Kolmogorov-Smirnov Test Statistic		95% Jackknife UCL 28.49
Kolmogorov-Smirnov 5% Critical Value		95% Standard Bootstrap UCL 28.3
Data appear Gamma Distributed at 5% Significance Level		95% Bootstrap-t UCL 28.66
Assuming Gamma Distribution		95% Hall's Bootstrap UCL 28.66
95% Approximate Gamma UCL		95% Percentile Bootstrap UCL 28.33
95% Adjusted Gamma UCL		95% BCA Bootstrap UCL 28.29
		95% Chebyshev(Mean, Sd) UCL 31.77
		97.5% Chebyshev(Mean, Sd) UCL 34.13
		99% Chebyshev(Mean, Sd) UCL 38.76
Potential UCL to Use		Use 95% Student's-t UCL 28.49

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). For additional insight, the user may want to consult a statistician.

Table F-10
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General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Area4.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Number of Valid Observations	19	Number of Distinct Observations	18
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Raw Statistics

Minimum	0.028
Maximum	4.7
Mean	0.469
Median	0.12
SD	1.068
Std. Error of Mean	0.245
Coefficient of Variation	2.277
Skewness	3.855

Log-transformed Statistics

Minimum of Log Data	-3.576
Maximum of Log Data	1.548
Mean of log Data	-1.857
SD of log Data	1.34

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.432
Shapiro Wilk Critical Value	0.901

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.933
Shapiro Wilk Critical Value	0.901

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	0.894
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95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995)	1.103
95% Modified-t UCL (Johnson-1978)	0.93

Assuming Lognormal Distribution

95% H-UCL	1.03
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95% Chebyshev (MVUE) UCL	0.907
97.5% Chebyshev (MVUE) UCL	1.147
99% Chebyshev (MVUE) UCL	1.617

Gamma Distribution Test

k star (bias corrected)	0.512
Theta Star	0.915
MLE of Mean	0.469
MLE of Standard Deviation	0.655
nu star	19.47
Approximate Chi Square Value (.05)	10.46

Data Distribution

Data Follow Appr. Gamma Distribution at 5% Significance Level

Nonparametric Statistics

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Adjusted Level of Significance	0.0369	95% CLT UCL	0.872
Adjusted Chi Square Value	9.887	95% Jackknife UCL	0.894
Anderson-Darling Test Statistic	1.468	95% Standard Bootstrap UCL	0.863
Anderson-Darling 5% Critical Value	0.796	95% Bootstrap-t UCL	2.74
Kolmogorov-Smirnov Test Statistic	0.207	95% Hall's Bootstrap UCL	2.432
Kolmogorov-Smirnov 5% Critical Value	0.209	95% Percentile Bootstrap UCL	0.925
Data follow Appr. Gamma Distribution at 5% Significance Level		95% BCA Bootstrap UCL	1.195
Assuming Gamma Distribution		95% Chebyshev(Mean, Sd) UCL	1.537
95% Approximate Gamma UCL	0.873	97.5% Chebyshev(Mean, Sd) UCL	1.999
95% Adjusted Gamma UCL	0.923	99% Chebyshev(Mean, Sd) UCL	2.906
Potential UCL to Use		Use 95% Approximate Gamma UCL	0.873

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). For additional insight, the user may want to consult a statistician.

Benzo(a)pyrene

General Statistics	
Number of Valid Observations	19
Number of Distinct Observations	18
Raw Statistics	
Minimum	0.041
Maximum	6.4
Mean	0.559
Median	0.15
SD	1.434
Std. Error of Mean	0.329
Coefficient of Variation	2.565
Skewness	4.173
Log-transformed Statistics	
Minimum of Log Data	-3.194
Maximum of Log Data	1.856
Mean of log Data	-1.67
SD of log Data	1.241
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic	0.365
Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level	
Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.906
Shapiro Wilk Critical Value	0.901
Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution	
Assuming Lognormal Distribution	

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95% Student's-t UCL 1.129	95% H-UCL 0.97
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 1.437	95% Chebyshev (MVUE) UCL 0.927
95% Modified-t UCL (Johnson-1978) 1.182	97.5% Chebyshev (MVUE) UCL 1.163
	99% Chebyshev (MVUE) UCL 1.626
Gamma Distribution Test	Data Distribution
k star (bias corrected) 0.517	Data appear Lognormal at 5% Significance Level
Theta Star 1.082	
MLE of Mean 0.559	
MLE of Standard Deviation 0.778	
nu star 19.63	
Approximate Chi Square Value (.05) 10.58	Nonparametric Statistics
Adjusted Level of Significance 0.0369	95% CLT UCL 1.1
Adjusted Chi Square Value 10	95% Jackknife UCL 1.129
Anderson-Darling Test Statistic 1.912	95% Standard Bootstrap UCL 1.095
Anderson-Darling 5% Critical Value 0.796	95% Bootstrap-t UCL 4.322
Kolmogorov-Smirnov Test Statistic 0.284	95% Hall's Bootstrap UCL 3.148
Kolmogorov-Smirnov 5% Critical Value 0.209	95% Percentile Bootstrap UCL 1.199
Data not Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 1.568
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 1.993
95% Approximate Gamma UCL 1.037	97.5% Chebyshev(Mean, Sd) UCL 2.613
95% Adjusted Gamma UCL 1.097	99% Chebyshev(Mean, Sd) UCL 3.832
Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL 1.993

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). For additional insight, the user may want to consult a statistician.

Benzo(b)fluoranthene

General Statistics	
Number of Valid Observations 19	Number of Distinct Observations 18
Raw Statistics	
Minimum 0.036	Minimum of Log Data -3.324
Maximum 8.8	Maximum of Log Data 2.175
Mean 0.841	Mean of log Data -1.402
Median 0.19	SD of log Data 1.327

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SD 2.054

Std. Error of Mean 0.471

Coefficient of Variation 2.443

Skewness 3.672

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.416

Shapiro Wilk Critical Value 0.901

Data not Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 1.658

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 2.04

95% Modified-t UCL (Johnson-1978) 1.724

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.882

Shapiro Wilk Critical Value 0.901

Data not Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL 1.566

95% Chebyshev (MVUE) UCL 1.397

97.5% Chebyshev (MVUE) UCL 1.763

99% Chebyshev (MVUE) UCL 2.484

Gamma Distribution Test

k star (bias corrected) 0.468

Theta Star 1.795

MLE of Mean 0.841

MLE of Standard Deviation 1.228

nu star 17.8

Approximate Chi Square Value (.05) 9.249

Adjusted Level of Significance 0.0369

Adjusted Chi Square Value 8.712

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL 1.616

95% Jackknife UCL 1.658

95% Standard Bootstrap UCL 1.607

95% Bootstrap-t UCL 7.188

95% Hall's Bootstrap UCL 5.116

95% Percentile Bootstrap UCL 1.668

95% BCA Bootstrap UCL 2.196

95% Chebyshev(Mean, Sd) UCL 2.895

97.5% Chebyshev(Mean, Sd) UCL 3.784

99% Chebyshev(Mean, Sd) UCL 5.529

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 1.618

95% Adjusted Gamma UCL 1.718

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL 2.895

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). For additional insight, the user may want to consult a statistician.

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Carbazole

General Statistics

Number of Valid Data	4	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	2
		Percent Non-Detects	50.00%

Warning: This data set only has 4 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Carbazole was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Dibenz(a,h)anthracene

General Statistics

Number of Valid Data	19	Number of Detected Data	18
Number of Distinct Detected Data	18	Number of Non-Detect Data	1
		Percent Non-Detects	5.26%

Raw Statistics

Minimum Detected	0.01	Minimum Detected	-4.605
Maximum Detected	1.2	Maximum Detected	0.182
Mean of Detected	0.121	Mean of Detected	-3.118
SD of Detected	0.274	SD of Detected	1.292
Minimum Non-Detect	0.66	Minimum Non-Detect	-0.416
Maximum Non-Detect	0.66	Maximum Non-Detect	-0.416

Log-transformed Statistics

UCL Statistics

Normal Distribution Test with Detected Values Only

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.406	Shapiro Wilk Test Statistic	0.895
5% Shapiro Wilk Critical Value	0.897	5% Shapiro Wilk Critical Value	0.897

Data not Normal at 5% Significance Level

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Assuming Lognormal Distribution

DL/2 Substitution Method

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Mean	0.132	Mean	-3.012
SD	0.271	SD	1.338
95% DL/2 (t) UCL	0.24	95% H-Stat (DL/2) UCL	0.322
Maximum Likelihood Estimate(MLE) Method MLE method failed to converge properly	N/A	Log ROS Method	
		Mean in Log Scale	-3.124
		SD in Log Scale	1.256
		Mean in Original Scale	0.117
		SD in Original Scale	0.267
		95% t UCL	0.223
		95% Percentile Bootstrap UCL	0.234
		95% BCA Bootstrap UCL	0.314
		95% H-UCL	0.235
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.547	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	0.221		
nu star	19.69		
A-D Test Statistic	1.399	Nonparametric Statistics	
5% A-D Critical Value	0.79	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.79	Mean	0.118
5% K-S Critical Value	0.213	SD	0.26
Data follow Appr. Gamma Distribution at 5% Significance Level		SE of Mean	0.0614
Assuming Gamma Distribution		95% KM (t) UCL	0.224
Gamma ROS Statistics using Extrapolated Data		95% KM (z) UCL	0.219
Minimum	0.01	95% KM (jackknife) UCL	0.224
Maximum	1.2	95% KM (bootstrap t) UCL	0.554
Mean	0.118	95% KM (BCA) UCL	0.244
Median	0.058	95% KM (Percentile Bootstrap) UCL	0.23
SD	0.267	95% KM (Chebyshev) UCL	0.385
k star	0.571	97.5% KM (Chebyshev) UCL	0.501
Theta star	0.207	99% KM (Chebyshev) UCL	0.729
Nu star	21.71	Potential UCLs to Use	
AppChi2	12.12	95% KM (Chebyshev) UCL	0.385
95% Gamma Approximate UCL	0.212		
95% Adjusted Gamma UCL	0.223		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

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For additional insight, the user may want to consult a statistician.

Indeno(1,2,3-cd)pyrene

General Statistics	
Number of Valid Observations 19	Number of Distinct Observations 17
Raw Statistics	
Minimum 0.024	Minimum of Log Data -3.73
Maximum 4.4	Maximum of Log Data 1.482
Mean 0.402	Mean of log Data -1.958
Median 0.11	SD of log Data 1.26
SD 0.983	
Std. Error of Mean 0.225	
Coefficient of Variation 2.447	
Skewness 4.152	
Log-transformed Statistics	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.378	Shapiro Wilk Test Statistic 0.923
Shapiro Wilk Critical Value 0.901	Shapiro Wilk Critical Value 0.901
Data not Normal at 5% Significance Level	
Lognormal Distribution Test	
Assuming Normal Distribution	
95% Student's-t UCL 0.793	95% H-UCL 0.76
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 1.002	95% Chebyshev (MVUE) UCL 0.716
95% Modified-t UCL (Johnson-1978) 0.829	97.5% Chebyshev (MVUE) UCL 0.9
	99% Chebyshev (MVUE) UCL 1.261
Assuming Lognormal Distribution	
Gamma Distribution Test	
k star (bias corrected) 0.534	Data Distribution
Theta Star 0.753	
MLE of Mean 0.402	
MLE of Standard Deviation 0.55	
nu star 20.28	
Approximate Chi Square Value (.05) 11.06	
Adjusted Level of Significance 0.0369	
Adjusted Chi Square Value 10.46	
Data appear Lognormal at 5% Significance Level	
Nonparametric Statistics	
Anderson-Darling Test Statistic 1.658	95% CLT UCL 0.773
Anderson-Darling 5% Critical Value 0.794	95% Jackknife UCL 0.793
	95% Standard Bootstrap UCL 0.758
	95% Bootstrap-t UCL 2.501
	95% Hall's Bootstrap UCL 2.195

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Kolmogorov-Smirnov Test Statistic	0.26	95% Percentile Bootstrap UCL	0.834
Kolmogorov-Smirnov 5% Critical Value	0.209	95% BCA Bootstrap UCL	1.081
Data not Gamma Distributed at 5% Significance Level			95% Chebyshev(Mean, Sd) UCL 1.385
			97.5% Chebyshev(Mean, Sd) UCL 1.81
Assuming Gamma Distribution			99% Chebyshev(Mean, Sd) UCL 2.645
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL 1.385	

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). For additional insight, the user may want to consult a statistician.

Antimony

General Statistics			
Number of Valid Data	6	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	1
		Percent Non-Detects	16.67%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.15	Minimum Detected	-1.897
Maximum Detected	1.2	Maximum Detected	0.182
Mean of Detected	0.562	Mean of Detected	-0.834
SD of Detected	0.419	SD of Detected	0.84
Minimum Non-Detect	0.37	Minimum Non-Detect	-0.994
Maximum Non-Detect	0.37	Maximum Non-Detect	-0.994

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set
 the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.928	Shapiro Wilk Test Statistic	0.957
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762

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Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level		
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.499	Mean	-0.976
SD	0.405	SD	0.828
95% DL/2 (t) UCL	0.832	95% H-Stat (DL/2) UCL	1.987
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.388	Mean in Log Scale	-0.969
SD	0.514	SD in Log Scale	0.821
95% MLE (t) UCL	0.811	Mean in Original Scale	0.5
95% MLE (Tiku) UCL	0.909	SD in Original Scale	0.404
		95% t UCL	0.833
		95% Percentile Bootstrap UCL	0.77
		95% BCA Bootstrap UCL	0.837
		95% H UCL	1.952
Gamma Distribution Test with Detected Values Only			
k star (bias corrected)	0.971	Data Distribution Test with Detected Values Only	
Theta Star	0.579	Data appear Normal at 5% Significance Level	
nu star	9.711		
A-D Test Statistic	0.239	Nonparametric Statistics	
5% A-D Critical Value	0.684	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.684	Mean	0.5
5% K-S Critical Value	0.36	SD	0.369
Data appear Gamma Distributed at 5% Significance Level			
Assuming Gamma Distribution		SE of Mean	0.169
Gamma ROS Statistics using Extrapolated Data		95% KM (t) UCL	0.84
Minimum	0.15	95% KM (z) UCL	0.778
Maximum	1.2	95% KM (jackknife) UCL	0.834
Mean	0.495	95% KM (bootstrap t) UCL	0.951
Median	0.39	95% KM (BCA) UCL	0.778
SD	0.409	95% KM (Percentile Bootstrap) UCL	0.788
k star	1.027	95% KM (Chebyshev) UCL	1.236
Theta star	0.482	97.5% KM (Chebyshev) UCL	1.554
Nu star	12.32	99% KM (Chebyshev) UCL	2.179
AppChi2	5.438	Potential UCLs to Use	
95% Gamma Approximate UCL	1.121	95% KM (t) UCL	0.84
95% Adjusted Gamma UCL	1.559	95% KM (Percentile Bootstrap) UCL	0.788

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Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006). For additional insight, the user may want to consult a statistician.

Arsenic

General Statistics	
Number of Valid Observations 6	Number of Distinct Observations 4
Raw Statistics	
Minimum 2.4	Minimum of Log Data 0.875
Maximum 4.9	Maximum of Log Data 1.589
Mean 3.55	Mean of log Data 1.23
Median 3.05	SD of log Data 0.293
SD 1.075	
Std. Error of Mean 0.439	
Coefficient of Variation 0.303	
Skewness 0.719	

Warning: There are only 4 Distinct Values in this data

There are insufficient Distinct Values to perform some GOF tests and bootstrap methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values to compute bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10-15 or more observations for accurate and meaningful bootstrap results.

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!

If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.8	Shapiro Wilk Test Statistic 0.84
Shapiro Wilk Critical Value 0.788	Shapiro Wilk Critical Value 0.788
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level

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Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 4.434	95% H-UCL 4.772
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 5.392
95% Adjusted-CLT UCL (Chen-1995) 4.409	97.5% Chebyshev (MVUE) UCL 6.191
95% Modified-t UCL (Johnson-1978) 4.456	99% Chebyshev (MVUE) UCL 7.76
Gamma Distribution Test	Data Distribution
k star (bias corrected) 7.039	Data appear Normal at 5% Significance Level
Theta Star 0.504	
MLE of Mean 3.55	
MLE of Standard Deviation 1.338	
nu star 84.47	
Approximate Chi Square Value (.05) 64.28	Nonparametric Statistics
Adjusted Level of Significance 0.0122	95% CLT UCL 4.272
Adjusted Chi Square Value 57.96	95% Jackknife UCL 4.434
Anderson-Darling Test Statistic 0.658	95% Standard Bootstrap UCL 4.192
Anderson-Darling 5% Critical Value 0.698	95% Bootstrap-t UCL 6.043
Kolmogorov-Smirnov Test Statistic 0.323	95% Hall's Bootstrap UCL 14.11
Kolmogorov-Smirnov 5% Critical Value 0.332	95% Percentile Bootstrap UCL 4.267
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 4.283
 	95% Chebyshev(Mean, Sd) UCL 5.462
Assuming Gamma Distribution	97.5% Chebyshev(Mean, Sd) UCL 6.29
95% Approximate Gamma UCL 4.665	99% Chebyshev(Mean, Sd) UCL 7.915
95% Adjusted Gamma UCL 5.173	
Potential UCL to Use	Use 95% Student's-t UCL 4.434

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). For additional insight, the user may want to consult a statistician.

Cobalt

General Statistics	
Number of Valid Observations 6	Number of Distinct Observations 6
Raw Statistics	
Minimum 6.2	Minimum of Log Data 1.825
Maximum 12	Maximum of Log Data 2.485

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Mean 8.567	Mean of log Data 2.115
Median 7.95	SD of log Data 0.281
SD 2.452	
Std. Error of Mean 1.001	
Coefficient of Variation 0.286	
Skewness 0.569	

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data

**Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions**

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.887	Shapiro Wilk Test Statistic 0.9
Shapiro Wilk Critical Value 0.788	Shapiro Wilk Critical Value 0.788
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 10.58	95% H-UCL 11.35
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 12.84
95% Adjusted-CLT UCL (Chen-1995) 10.46	97.5% Chebyshev (MVUE) UCL 14.69
95% Modified-t UCL (Johnson-1978) 10.62	99% Chebyshev (MVUE) UCL 18.32
Gamma Distribution Test	Data Distribution
k star (bias corrected) 7.703	Data appear Normal at 5% Significance Level
Theta Star 1.112	
MLE of Mean 8.567	
MLE of Standard Deviation 3.087	
nu star 92.44	
Approximate Chi Square Value (.05) 71.27	Nonparametric Statistics
Adjusted Level of Significance 0.0122	95% CLT UCL 10.21
Adjusted Chi Square Value 64.58	95% Jackknife UCL 10.58
	95% Standard Bootstrap UCL 10.04

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Anderson-Darling Test Statistic	0.374	95% Bootstrap-t UCL	11.46
Anderson-Darling 5% Critical Value	0.698	95% Hall's Bootstrap UCL	11.33
Kolmogorov-Smirnov Test Statistic	0.199	95% Percentile Bootstrap UCL	10.08
Kolmogorov-Smirnov 5% Critical Value	0.332	95% BCA Bootstrap UCL	10.15
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	12.93
		97.5% Chebyshev(Mean, Sd) UCL	14.82
		99% Chebyshev(Mean, Sd) UCL	18.53
Assuming Gamma Distribution			
95% Approximate Gamma UCL	11.11		
95% Adjusted Gamma UCL	12.26		
Potential UCL to Use		Use 95% Student's-t UCL	10.58

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). For additional insight, the user may want to consult a statistician.

Thallium

General Statistics			
Number of Valid Data	5	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	1
		Percent Non-Detects	20.00%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.15	Minimum Detected	-1.897
Maximum Detected	0.25	Maximum Detected	-1.386
Mean of Detected	0.19	Mean of Detected	-1.679
SD of Detected	0.0432	SD of Detected	0.218
Minimum Non-Detect	0.93	Minimum Non-Detect	-0.0726
Maximum Non-Detect	0.93	Maximum Non-Detect	-0.0726

Warning: There are only 4 Distinct Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set
 the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only

Lognormal Distribution Test with Detected Values Only

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Shapiro Wilk Test Statistic	0.928	Shapiro Wilk Test Statistic	0.961
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.245	Mean	-1.496
SD	0.129	SD	0.45
95% DL/2 (t) UCL	0.368	95% H-Stat (DL/2) UCL	0.464
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-1.679
		SD in Log Scale	0.189
		Mean in Original Scale	0.189
		SD in Original Scale	0.0374
		95% t UCL	0.225
		95% Percentile Bootstrap UCL	0.214
		95% BCA Bootstrap UCL	0.221
		95% H-UCL	0.233
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)		Data appear Normal at 5% Significance Level	
Theta Star	0.027		
nu star	56.33		
A-D Test Statistic	0.278	Nonparametric Statistics	
5% A-D Critical Value	0.657	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.657	Mean	0.19
5% K-S Critical Value	0.394	SD	0.0374
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0216
Assuming Gamma Distribution		95% KM (t) UCL	0.236
Gamma ROS Statistics using Extrapolated Data		95% KM (z) UCL	0.226
Minimum	0.15	95% KM (jackknife) UCL	0.238
Maximum	0.25	95% KM (bootstrap t) UCL	0.276
Mean	0.191	95% KM (BCA) UCL	0.223
Median	0.19	95% KM (Percentile Bootstrap) UCL	0.223
SD	0.0375	95% KM (Chebyshev) UCL	0.284
k star	13.82	97.5% KM (Chebyshev) UCL	0.325
Theta star	0.0138	99% KM (Chebyshev) UCL	0.405
Nu star	138.2	Potential UCLs to Use	
AppChi2	112.1	95% KM (t) UCL	0.236

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95% Gamma Approximate UCL	0.236	95% KM (Percentile Bootstrap) UCL	0.223
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Chrysene

General Statistics

Number of Valid Observations 19	Number of Distinct Observations 17
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Raw Statistics

Minimum 0.033
Maximum 4.3
Mean 0.564
Median 0.12
SD 1.152
Std. Error of Mean 0.264
Coefficient of Variation 2.041
Skewness 2.808

Log-transformed Statistics

Minimum of Log Data -3.411
Maximum of Log Data 1.459
Mean of log Data -1.714
SD of log Data 1.369

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.495
Shapiro Wilk Critical Value 0.901

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.893
Shapiro Wilk Critical Value 0.901

Data not Normal at 5% Significance Level

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 1.022
95% UCLs (Adjusted for Skewness)
95% Adjusted-CLT UCL (Chen-1995) 1.181
95% Modified-t UCL (Johnson-1978) 1.051

Assuming Lognormal Distribution

95% H-UCL 1.281
95% Chebyshev (MVUE) UCL 1.1
97.5% Chebyshev (MVUE) UCL 1.392
99% Chebyshev (MVUE) UCL 1.968

Gamma Distribution Test

k star (bias corrected) 0.497
Theta Star 1.136
MLE of Mean 0.564
MLE of Standard Deviation 0.8
nu star 18.88

Data Distribution

Data do not follow a Discernable Distribution (0.05)

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Approximate Chi Square Value (.05) 10.03	Nonparametric Statistics
Adjusted Level of Significance 0.0369	95% CLT UCL 0.999
Adjusted Chi Square Value 9.471	95% Jackknife UCL 1.022
	95% Standard Bootstrap UCL 0.987
Anderson-Darling Test Statistic 1.876	95% Bootstrap-t UCL 3.282
Anderson-Darling 5% Critical Value 0.798	95% Hall's Bootstrap UCL 3.125
Kolmogorov-Smirnov Test Statistic 0.227	95% Percentile Bootstrap UCL 1.032
Kolmogorov-Smirnov 5% Critical Value 0.209	95% BCA Bootstrap UCL 1.196
Data not Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 1.716
Assuming Gamma Distribution	97.5% Chebyshev(Mean, Sd) UCL 2.214
	99% Chebyshev(Mean, Sd) UCL 3.193
Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL 1.716

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). For additional insight, the user may want to consult a statistician.

Aluminum

General Statistics	
Number of Valid Observations 6	Number of Distinct Observations 6
Raw Statistics	Log-transformed Statistics
Minimum 8470	Minimum of Log Data 9.044
Maximum 21300	Maximum of Log Data 9.966
Mean 13662	Mean of log Data 9.469
Median 11750	SD of log Data 0.353
SD 5027	
Std. Error of Mean 2052	
Coefficient of Variation 0.368	
Skewness 0.85	

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

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Warning: There are only 6 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.878	Shapiro Wilk Test Statistic 0.919
Shapiro Wilk Critical Value 0.788	Shapiro Wilk Critical Value 0.788
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 17797	95% H-UCL 19884
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 22196
95% Adjusted-CLT UCL (Chen-1995) 17799	97.5% Chebyshev (MVUE) UCL 25900
95% Modified-t UCL (Johnson-1978) 17916	99% Chebyshev (MVUE) UCL 33176
Gamma Distribution Test	Data Distribution
k star (bias corrected) 4.878	Data appear Normal at 5% Significance Level
Theta Star 2800	
MLE of Mean 13662	
MLE of Standard Deviation 6185	
nu star 58.54	
Approximate Chi Square Value (.05) 41.95	Nonparametric Statistics
Adjusted Level of Significance 0.0122	95% CLT UCL 17037
Adjusted Chi Square Value 36.94	95% Jackknife UCL 17797
Anderson-Darling Test Statistic 0.413	95% Standard Bootstrap UCL 16755
Anderson-Darling 5% Critical Value 0.698	95% Bootstrap-t UCL 25242
Kolmogorov-Smirnov Test Statistic 0.297	95% Hall's Bootstrap UCL 51643
Kolmogorov-Smirnov 5% Critical Value 0.333	95% Percentile Bootstrap UCL 16900
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 16917
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 22608
95% Approximate Gamma UCL 19065	97.5% Chebyshev(Mean, Sd) UCL 26479
95% Adjusted Gamma UCL 21652	99% Chebyshev(Mean, Sd) UCL 34082
Potential UCL to Use	Use 95% Student's-t UCL 17797

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

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These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Barium

General Statistics	
Number of Valid Observations 6	Number of Distinct Observations 6
Raw Statistics	
Minimum 61	Minimum of Log Data 4.111
Maximum 120	Maximum of Log Data 4.787
Mean 83.57	Mean of log Data 4.401
Median 80.5	SD of log Data 0.24
SD 21.02	
Std. Error of Mean 8.583	
Coefficient of Variation 0.252	
Skewness 1.072	
Log-transformed Statistics	

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.918	Shapiro Wilk Test Statistic 0.957
Shapiro Wilk Critical Value 0.788	Shapiro Wilk Critical Value 0.788
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 100.9	95% H-UCL 105.4
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 119.1
95% Adjusted-CLT UCL (Chen-1995) 101.7	97.5% Chebyshev (MVUE) UCL 134.5

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95% Modified-t UCL (Johnson-1978) 101.5	99% Chebyshev (MVUE) UCL 164.8
Gamma Distribution Test	
k star (bias corrected) 10.33	Data Distribution
Theta Star 8.091	Data appear Normal at 5% Significance Level
MLE of Mean 83.57	
MLE of Standard Deviation 26	
nu star 123.9	
Approximate Chi Square Value (.05) 99.23	Nonparametric Statistics
Adjusted Level of Significance 0.0122	95% CLT UCL 97.68
Adjusted Chi Square Value 91.25	95% Jackknife UCL 100.9
Anderson-Darling Test Statistic 0.274	95% Standard Bootstrap UCL 96.15
Anderson-Darling 5% Critical Value 0.697	95% Bootstrap-t UCL 110.3
Kolmogorov-Smirnov Test Statistic 0.2	95% Hall's Bootstrap UCL 107.8
Kolmogorov-Smirnov 5% Critical Value 0.332	95% Percentile Bootstrap UCL 96.57
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 99.33
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 121
95% Approximate Gamma UCL 104.4	97.5% Chebyshev(Mean, Sd) UCL 137.2
95% Adjusted Gamma UCL 113.5	99% Chebyshev(Mean, Sd) UCL 169
Potential UCL to Use	Use 95% Student's-t UCL 100.9

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). For additional insight, the user may want to consult a statistician.

Chromium

General Statistics	
Number of Valid Observations 6	Number of Distinct Observations 6
Raw Statistics	
Minimum 17.8	Minimum of Log Data 2.879
Maximum 33	Maximum of Log Data 3.497
Mean 23.92	Mean of log Data 3.147
Median 20.85	SD of log Data 0.254
SD 6.392	
Std. Error of Mean 2.61	
Coefficient of Variation 0.267	
Log-transformed Statistics	

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Skewness 0.871

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.813
Shapiro Wilk Critical Value 0.788

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.84
Shapiro Wilk Critical Value 0.788

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 29.17

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 29.2
95% Modified-t UCL (Johnson-1978) 29.33

Assuming Lognormal Distribution

95% H-UCL 30.68
95% Chebyshev (MVUE) UCL 34.7
97.5% Chebyshev (MVUE) UCL 39.38
99% Chebyshev (MVUE) UCL 48.57

Gamma Distribution Test

k star (bias corrected) 9.156
Theta Star 2.612
MLE of Mean 23.92
MLE of Standard Deviation 7.904
nu star 109.9
Approximate Chi Square Value (.05) 86.68
Adjusted Level of Significance 0.0122
Adjusted Chi Square Value 79.25

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 28.21
95% Jackknife UCL 29.17
95% Standard Bootstrap UCL 27.9
95% Bootstrap-t UCL 44.02
95% Hall's Bootstrap UCL 80.62
95% Percentile Bootstrap UCL 28.13
95% BCA Bootstrap UCL 28.28
95% Chebyshev(Mean, Sd) UCL 35.29

Data follow Appr. Gamma Distribution at 5% Significance Level

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Assuming Gamma Distribution	97.5% Chebyshev(Mean, Sd) UCL 40.21 99% Chebyshev(Mean, Sd) UCL 49.88
95% Approximate Gamma UCL 30.32 95% Adjusted Gamma UCL 33.16	
Potential UCL to Use	Use 95% Student's-t UCL 29.17

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). For additional insight, the user may want to consult a statistician.

Copper

General Statistics	
Number of Valid Observations 6	Number of Distinct Observations 6
Raw Statistics	Log-transformed Statistics
Minimum 19.6	Minimum of Log Data 2.976
Maximum 35.4	Maximum of Log Data 3.567
Mean 26.33	Mean of log Data 3.248
Median 26	SD of log Data 0.231
SD 6.126	
Std. Error of Mean 2.501	
Coefficient of Variation 0.233	
Skewness 0.417	

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test

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Shapiro Wilk Test Statistic 0.93	Shapiro Wilk Test Statistic 0.936
Shapiro Wilk Critical Value 0.788	Shapiro Wilk Critical Value 0.788
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 31.37	95% H-UCL 32.92
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 37.17
95% Adjusted-CLT UCL (Chen-1995) 30.9	97.5% Chebyshev (MVUE) UCL 41.86
95% Modified-t UCL (Johnson-1978) 31.44	99% Chebyshev (MVUE) UCL 51.07
Gamma Distribution Test	Data Distribution
k star (bias corrected) 11.37	Data appear Normal at 5% Significance Level
Theta Star 2.317	
MLE of Mean 26.33	
MLE of Standard Deviation 7.811	
nu star 136.4	
Approximate Chi Square Value (.05) 110.4	Nonparametric Statistics
Adjusted Level of Significance 0.0122	95% CLT UCL 30.45
Adjusted Chi Square Value 102	95% Jackknife UCL 31.37
Anderson-Darling Test Statistic 0.309	95% Standard Bootstrap UCL 30.06
Anderson-Darling 5% Critical Value 0.697	95% Bootstrap-t UCL 32.64
Kolmogorov-Smirnov Test Statistic 0.211	95% Hall's Bootstrap UCL 29.65
Kolmogorov-Smirnov 5% Critical Value 0.332	95% Percentile Bootstrap UCL 30.13
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 30.3
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 37.24
95% Approximate Gamma UCL 32.53	97.5% Chebyshev(Mean, Sd) UCL 41.95
95% Adjusted Gamma UCL 35.23	99% Chebyshev(Mean, Sd) UCL 51.22
Potential UCL to Use	Use 95% Student's-t UCL 31.37

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). For additional insight, the user may want to consult a statistician.

Lead

General Statistics	
Number of Valid Observations 6	Number of Distinct Observations 6

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Raw Statistics	Log-transformed Statistics
Minimum 14	Minimum of Log Data 2.639
Maximum 298	Maximum of Log Data 5.697
Mean 118.3	Mean of log Data 4.235
Median 95.5	SD of log Data 1.241
SD 112.8	
Std. Error of Mean 46.07	
Coefficient of Variation 0.954	
Skewness 0.759	

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data

**Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions**

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.883	Shapiro Wilk Test Statistic 0.916
Shapiro Wilk Critical Value 0.788	Shapiro Wilk Critical Value 0.788
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 211.2	95% H-UCL 2340
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 391.4
95% Adjusted-CLT UCL (Chen-1995) 209.4	97.5% Chebyshev (MVUE) UCL 506.7
95% Modified-t UCL (Johnson-1978) 213.5	99% Chebyshev (MVUE) UCL 733.2
Gamma Distribution Test	Data Distribution
k star (bias corrected) 0.643	Data appear Normal at 5% Significance Level
Theta Star 183.9	
MLE of Mean 118.3	
MLE of Standard Deviation 147.5	
nu star 7.721	
Approximate Chi Square Value (.05) 2.574	Nonparametric Statistics

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Adjusted Level of Significance 0.0122	95% CLT UCL 194.1
Adjusted Chi Square Value 1.632	95% Jackknife UCL 211.2
	95% Standard Bootstrap UCL 188.3
Anderson-Darling Test Statistic 0.359	95% Bootstrap-t UCL 237
Anderson-Darling 5% Critical Value 0.714	95% Hall's Bootstrap UCL 185
Kolmogorov-Smirnov Test Statistic 0.233	95% Percentile Bootstrap UCL 188.3
Kolmogorov-Smirnov 5% Critical Value 0.34	95% BCA Bootstrap UCL 205
Data appear Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 319.1
	97.5% Chebyshev(Mean, Sd) UCL 406
Assuming Gamma Distribution	99% Chebyshev(Mean, Sd) UCL 576.7
95% Approximate Gamma UCL 354.9	
95% Adjusted Gamma UCL 559.7	
Potential UCL to Use	Use 95% Student's-t UCL 211.2

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). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics	
Number of Valid Observations 6	Number of Distinct Observations 6
Raw Statistics	
Minimum 380	Minimum of Log Data 5.94
Maximum 485	Maximum of Log Data 6.184
Mean 439.5	Mean of log Data 6.082
Median 446	SD of log Data 0.0949
SD 40.89	
Std. Error of Mean 16.69	
Coefficient of Variation 0.093	
Skewness -0.485	

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Table F-10
ProUCL Output - Area 4 Subsurface Soil
Second Supplemental Remedial Investigation
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Warning: There are only 6 Values in this data

**Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions**

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.943	Shapiro Wilk Test Statistic 0.936
Shapiro Wilk Critical Value 0.788	Shapiro Wilk Critical Value 0.788
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 473.1	95% H-UCL N/A
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 513.7
95% Adjusted-CLT UCL (Chen-1995) 463.4	97.5% Chebyshev (MVUE) UCL 545.9
95% Modified-t UCL (Johnson-1978) 472.6	99% Chebyshev (MVUE) UCL 608.9
Gamma Distribution Test	Data Distribution
k star (bias corrected) 67.71	Data appear Normal at 5% Significance Level
Theta Star 6.491	
MLE of Mean 439.5	
MLE of Standard Deviation 53.41	
nu star 812.5	
Approximate Chi Square Value (.05) 747.4	Nonparametric Statistics
Adjusted Level of Significance 0.0122	95% CLT UCL 467
Adjusted Chi Square Value 724.6	95% Jackknife UCL 473.1
Anderson-Darling Test Statistic 0.276	95% Standard Bootstrap UCL 464.8
Anderson-Darling 5% Critical Value 0.696	95% Bootstrap-t UCL 467.9
Kolmogorov-Smirnov Test Statistic 0.183	95% Hall's Bootstrap UCL 463.3
Kolmogorov-Smirnov 5% Critical Value 0.332	95% Percentile Bootstrap UCL 463.5
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 463
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 512.3
95% Approximate Gamma UCL 477.8	97.5% Chebyshev(Mean, Sd) UCL 543.7
95% Adjusted Gamma UCL 492.9	99% Chebyshev(Mean, Sd) UCL 605.6
Potential UCL to Use	Use 95% Student's-t UCL 473.1

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)

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and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

**Note: For highly negative-skewed data, confidence limits
(e.g., Chen, Johnson, Lognormal, and Gamma) may not be
reliable. Chen's and Johnson's methods provide
adjustments for positively skewed data sets.**

Mercury

General Statistics	
Number of Valid Observations 9	Number of Distinct Observations 9
Raw Statistics	
Minimum 0.021	Minimum of Log Data -3.863
Maximum 0.86	Maximum of Log Data -0.151
Mean 0.202	Mean of log Data -2.176
Median 0.0775	SD of log Data 1.1
SD 0.265	
Std. Error of Mean 0.0884	
Coefficient of Variation 1.31	
Skewness 2.319	

Warning: There are only 9 Values in this data

**Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions**

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.668	Shapiro Wilk Test Statistic 0.922
Shapiro Wilk Critical Value 0.829	Shapiro Wilk Critical Value 0.829
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 0.367	95% H-UCL 0.801
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 0.504
95% Adjusted-CLT UCL (Chen-1995) 0.421	97.5% Chebyshev (MVUE) UCL 0.64
95% Modified-t UCL (Johnson-1978) 0.378	99% Chebyshev (MVUE) UCL 0.907

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Gamma Distribution Test		Data Distribution
k star (bias corrected) 0.739		Data Follow Appr. Gamma Distribution at 5% Significance Level
Theta Star 0.274		
MLE of Mean 0.202		
MLE of Standard Deviation 0.235		
nu star 13.31		
Approximate Chi Square Value (.05) 6.101		Nonparametric Statistics
Adjusted Level of Significance 0.0231		95% CLT UCL 0.348
Adjusted Chi Square Value 5.109		95% Jackknife UCL 0.367
Anderson-Darling Test Statistic 0.694		95% Standard Bootstrap UCL 0.339
Anderson-Darling 5% Critical Value 0.744		95% Bootstrap-t UCL 0.627
Kolmogorov-Smirnov Test Statistic 0.295		95% Hall's Bootstrap UCL 0.8
Kolmogorov-Smirnov 5% Critical Value 0.287		95% Percentile Bootstrap UCL 0.356
Data follow Appr. Gamma Distribution at 5% Significance Level		95% BCA Bootstrap UCL 0.417
Assuming Gamma Distribution		95% Chebyshev(Mean, Sd) UCL 0.588
95% Approximate Gamma UCL 0.442		97.5% Chebyshev(Mean, Sd) UCL 0.754
95% Adjusted Gamma UCL 0.527		99% Chebyshev(Mean, Sd) UCL 1.082
Potential UCL to Use		Use 95% Approximate Gamma UCL 0.442

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). For additional insight, the user may want to consult a statistician.

Mercury, Inorganic Salts

General Statistics	
Number of Valid Observations 5	Number of Distinct Observations 5
Raw Statistics	
Minimum 0.021	Minimum of Log Data -3.863
Maximum 0.86	Maximum of Log Data -0.151
Mean 0.304	Mean of log Data -1.843
Median 0.27	SD of log Data 1.445
SD 0.334	
Std. Error of Mean 0.149	
Coefficient of Variation 1.099	
Skewness 1.525	
Log-transformed Statistics	

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Warning: A sample size of 'n' = 5 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 5 Values in this data

**Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions**

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.844
Shapiro Wilk Critical Value 0.762

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.956
Shapiro Wilk Critical Value 0.762

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 0.622
95% UCLs (Adjusted for Skewness)
95% Adjusted-CLT UCL (Chen-1995) 0.658
95% Modified-t UCL (Johnson-1978) 0.639

Assuming Lognormal Distribution

95% H-UCL 64.46
95% Chebyshev (MVUE) UCL 1.184
97.5% Chebyshev (MVUE) UCL 1.553
99% Chebyshev (MVUE) UCL 2.277

Gamma Distribution Test

k star (bias corrected) 0.492
Theta Star 0.617
MLE of Mean 0.304
MLE of Standard Deviation 0.433
nu star 4.923
Approximate Chi Square Value (.05) 1.117
Adjusted Level of Significance 0.0086
Adjusted Chi Square Value 0.514

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 0.549
95% Jackknife UCL 0.622
95% Standard Bootstrap UCL 0.525
95% Bootstrap-t UCL 0.902
95% Hall's Bootstrap UCL 1.566
95% Percentile Bootstrap UCL 0.534
95% BCA Bootstrap UCL 0.59
95% Chebyshev(Mean, Sd) UCL 0.955
97.5% Chebyshev(Mean, Sd) UCL 1.236
99% Chebyshev(Mean, Sd) UCL 1.79

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

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95% Approximate Gamma UCL 1.339

95% Adjusted Gamma UCL 2.91

Potential UCL to Use	Use 95% Student's-t UCL 0.622
-----------------------------	-------------------------------

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). For additional insight, the user may want to consult a statistician.

Vanadium

General Statistics

Number of Valid Observations 6	Number of Distinct Observations 6
--------------------------------	-----------------------------------

Raw Statistics

Minimum 22.4
Maximum 40
Mean 29.2
Median 26.4
SD 7.607
Std. Error of Mean 3.106
Coefficient of Variation 0.261
Skewness 0.709

Log-transformed Statistics

Minimum of Log Data 3.109
Maximum of Log Data 3.689
Mean of log Data 3.347
SD of log Data 0.252

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!

If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.848
Shapiro Wilk Critical Value 0.788

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.861
Shapiro Wilk Critical Value 0.788

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Data appear Normal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 35.46

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 35.27

95% Modified-t UCL (Johnson-1978) 35.61

Assuming Lognormal Distribution

95% H-UCL 37.35

95% Chebyshev (MVUE) UCL 42.24

97.5% Chebyshev (MVUE) UCL 47.9

99% Chebyshev (MVUE) UCL 59

Gamma Distribution Test

k star (bias corrected) 9.44

Theta Star 3.093

MLE of Mean 29.2

MLE of Standard Deviation 9.504

nu star 113.3

Approximate Chi Square Value (.05) 89.71

Adjusted Level of Significance 0.0122

Adjusted Chi Square Value 82.15

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 34.31

95% Jackknife UCL 35.46

95% Standard Bootstrap UCL 33.99

95% Bootstrap-t UCL 39.95

95% Hall's Bootstrap UCL 38.41

95% Percentile Bootstrap UCL 33.97

95% BCA Bootstrap UCL 34.8

95% Chebyshev(Mean, Sd) UCL 42.74

97.5% Chebyshev(Mean, Sd) UCL 48.6

99% Chebyshev(Mean, Sd) UCL 60.1

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 36.87

95% Adjusted Gamma UCL 40.27

Potential UCL to Use

Use 95% Student's-t UCL 35.46

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). For additional insight, the user may want to consult a statistician.

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General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Area5.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Number of Valid Observations 2	Number of Distinct Observations 2
--------------------------------	-----------------------------------

Warning: This data set only has 2 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Benzo(a)anthracene was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Benzo(a)pyrene

General Statistics

Number of Valid Observations 2	Number of Distinct Observations 2
--------------------------------	-----------------------------------

Warning: This data set only has 2 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Benzo(a)pyrene was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Benzo(b)fluoranthene

General Statistics

Number of Valid Observations 2	Number of Distinct Observations 2
--------------------------------	-----------------------------------

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Warning: This data set only has 2 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Benzo(b)fluoranthene was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Antimony

General Statistics			
Number of Valid Data	22	Number of Detected Data	7
Number of Distinct Detected Data	6	Number of Non-Detect Data	15
		Percent Non-Detects	68.18%
Raw Statistics			
Minimum Detected	0.2	Minimum Detected	-1.609
Maximum Detected	1.9	Maximum Detected	0.642
Mean of Detected	0.66	Mean of Detected	-0.759
SD of Detected	0.633	SD of Detected	0.86
Minimum Non-Detect	0.365	Minimum Non-Detect	-1.008
Maximum Non-Detect	0.47	Maximum Non-Detect	-0.755
Note: Data have multiple DLs - Use of KM Method is recommended			
For all methods (except KM, DL/2, and ROS Methods),			
Observations < Largest ND are treated as NDs			
Number treated as Non-Detect			
Number treated as Detected			
Single DL Non-Detect Percentage			

Warning: There are only 7 Detected Values in this data

**Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions**

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics	
Normal Distribution Test with Detected Values Only	Lognormal Distribution Test with Detected Values Only
Shapiro Wilk Test Statistic	0.778
5% Shapiro Wilk Critical Value	0.803
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level

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Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.358	Mean	-1.286
SD	0.399	SD	0.591
95% DL/2 (t) UCL	0.504	95% H-Stat (DL/2) UCL	0.431
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1.341	Mean in Log Scale	-1.144
SD	0.532	SD in Log Scale	0.594
95% MLE (t) UCL	1.536	Mean in Original Scale	0.4
95% MLE (Tiku) UCL	1.857	SD in Original Scale	0.391
		95% t UCL	0.543
		95% Percentile Bootstrap UCL	0.551
		95% BCA Bootstrap UCL	0.614
		95% H UCL	0.498
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)		Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.652	Data appear Gamma Distributed at 5% Significance Level	
nu star	14.16	Data appear Gamma Distributed at 5% Significance Level	
A-D Test Statistic	0.562	Nonparametric Statistics	
5% A-D Critical Value	0.72	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.72	Mean	0.382
5% K-S Critical Value	0.317	SD	0.383
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0896
		95% KM (t) UCL	0.536
		95% KM (z) UCL	0.529
Assuming Gamma Distribution		95% KM (jackknife) UCL	0.53
Gamma ROS Statistics using Extrapolated Data		95% KM (bootstrap t) UCL	0.795
Minimum	0.000001	95% KM (BCA) UCL	0.533
Maximum	1.9	95% KM (Percentile Bootstrap) UCL	0.545
Mean	0.439	95% KM (Chebyshev) UCL	0.773
Median	0.331	97.5% KM (Chebyshev) UCL	0.941
SD	0.415	99% KM (Chebyshev) UCL	1.273
k star	0.572	Potential UCLs to Use	
Theta star	0.766	95% KM (t) UCL	0.536
Nu star	25.19		
AppChi2	14.76		
95% Gamma Approximate UCL	0.749		
95% Adjusted Gamma UCL	0.78		

Note: DL/2 is not a recommended method.

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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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Arsenic

General Statistics

Number of Valid Observations 22	Number of Distinct Observations 16
---------------------------------	------------------------------------

Raw Statistics

Minimum 1.4
Maximum 3.9
Mean 2.525
Median 2.4
SD 0.652
Std. Error of Mean 0.139
Coefficient of Variation 0.258
Skewness 0.391

Log-transformed Statistics

Minimum of Log Data 0.336
Maximum of Log Data 1.361
Mean of log Data 0.894
SD of log Data 0.262

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.968
Shapiro Wilk Critical Value 0.911

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.978
Shapiro Wilk Critical Value 0.911

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 2.765

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 2.767
95% Modified-t UCL (Johnson-1978) 2.767

Assuming Lognormal Distribution

95% H-UCL 2.807

95% Chebyshev (MVUE) UCL 3.148
97.5% Chebyshev (MVUE) UCL 3.417
99% Chebyshev (MVUE) UCL 3.946

Gamma Distribution Test

k star (bias corrected) 13.57
Theta Star 0.186
MLE of Mean 2.525
MLE of Standard Deviation 0.686
nu star 597.1
Approximate Chi Square Value (.05) 541.4
Adjusted Level of Significance 0.0386
Adjusted Chi Square Value 537.5

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 2.754
95% Jackknife UCL 2.765

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Anderson-Darling Test Statistic	0.238	95% Standard Bootstrap UCL	2.748
Anderson-Darling 5% Critical Value	0.742	95% Bootstrap-t UCL	2.78
Kolmogorov-Smirnov Test Statistic	0.107	95% Hall's Bootstrap UCL	2.8
Kolmogorov-Smirnov 5% Critical Value	0.185	95% Percentile Bootstrap UCL	2.748
Data appear Gamma Distributed at 5% Significance Level		95% BCA Bootstrap UCL	2.749
Assuming Gamma Distribution		95% Chebyshev(Mean, Sd) UCL	3.132
95% Approximate Gamma UCL	2.785	97.5% Chebyshev(Mean, Sd) UCL	3.394
95% Adjusted Gamma UCL	2.806	99% Chebyshev(Mean, Sd) UCL	3.909
Potential UCL to Use		Use 95% Student's-t UCL	2.765

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). For additional insight, the user may want to consult a statistician.

Cobalt

General Statistics			
Number of Valid Observations		22	Number of Distinct Observations
			21
Raw Statistics	Log-transformed Statistics		
Minimum 3.1	Minimum of Log Data	1.131	
Maximum 15.8	Maximum of Log Data	2.76	
Mean 6.909	Mean of log Data	1.852	
Median 6.1	SD of log Data	0.397	
SD 3.128			
Std. Error of Mean 0.667			
Coefficient of Variation 0.453			
Skewness 1.6			
Relevant UCL Statistics			
Normal Distribution Test	Lognormal Distribution Test		
Shapiro Wilk Test Statistic 0.838	Shapiro Wilk Test Statistic	0.958	
Shapiro Wilk Critical Value 0.911	Shapiro Wilk Critical Value	0.911	
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level		
Assuming Normal Distribution	Assuming Lognormal Distribution		
95% Student's-t UCL 8.057	95% H-UCL 8.136		
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 9.466		

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95% Adjusted-CLT UCL (Chen-1995) 8.249	97.5% Chebyshev (MVUE) UCL 10.59
95% Modified-t UCL (Johnson-1978) 8.095	99% Chebyshev (MVUE) UCL 12.8
Gamma Distribution Test	Data Distribution
k star (bias corrected) 5.521	Data Follow Appr. Gamma Distribution at 5% Significance Level
Theta Star 1.252	
MLE of Mean 6.909	
MLE of Standard Deviation 2.941	
nu star 242.9	
Approximate Chi Square Value (.05) 207.8	Nonparametric Statistics
Adjusted Level of Significance 0.0386	95% CLT UCL 8.006
Adjusted Chi Square Value 205.4	95% Jackknife UCL 8.057
Anderson-Darling Test Statistic 0.672	95% Standard Bootstrap UCL 7.997
Anderson-Darling 5% Critical Value 0.746	95% Bootstrap-t UCL 8.587
Kolmogorov-Smirnov Test Statistic 0.19	95% Hall's Bootstrap UCL 8.565
Kolmogorov-Smirnov 5% Critical Value 0.186	95% Percentile Bootstrap UCL 8.023
Data follow Appr. Gamma Distribution at 5% Significance Level	95% BCA Bootstrap UCL 8.223
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 9.816
95% Approximate Gamma UCL 8.075	97.5% Chebyshev(Mean, Sd) UCL 11.07
95% Adjusted Gamma UCL 8.171	99% Chebyshev(Mean, Sd) UCL 13.55
Potential UCL to Use	Use 95% Approximate Gamma UCL 8.075

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). For additional insight, the user may want to consult a statistician.

Thallium

General Statistics			
Number of Valid Data	21	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	21
		Percent Non-Detects	100.00%

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs! Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit! The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Thallium was not processed!

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Chrysene

General Statistics	
Number of Valid Observations 2	Number of Distinct Observations 1

Warning: This data set only has 2 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Chrysene was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Indeno(1,2,3-cd)pyrene

General Statistics	
Number of Valid Observations 1	Number of Distinct Observations 1

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Indeno(1,2,3-cd)pyrene was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Aluminum

General Statistics	
Number of Valid Observations 22	Number of Distinct Observations 22

Raw Statistics	Log-transformed Statistics
Minimum 3660	Minimum of Log Data 8.205
Maximum 15200	Maximum of Log Data 9.629
Mean 7966	Mean of log Data 8.947

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Median 7855	SD of log Data 0.278
SD 2246	
Std. Error of Mean 478.9	
Coefficient of Variation 0.282	
Skewness 1.288	
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.893	Shapiro Wilk Test Statistic 0.943
Shapiro Wilk Critical Value 0.911	Shapiro Wilk Critical Value 0.911
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 8790	95% H-UCL 8917
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 10051
95% Adjusted-CLT UCL (Chen-1995) 8895	97.5% Chebyshev (MVUE) UCL 10952
95% Modified-t UCL (Johnson-1978) 8812	99% Chebyshev (MVUE) UCL 12721
Gamma Distribution Test	Data Distribution
k star (bias corrected) 12.09	Data appear Gamma Distributed at 5% Significance Level
Theta Star 658.9	
MLE of Mean 7966	
MLE of Standard Deviation 2291	
nu star 532	
Approximate Chi Square Value (.05) 479.5	Nonparametric Statistics
Adjusted Level of Significance 0.0386	95% CLT UCL 8754
Adjusted Chi Square Value 475.8	95% Jackknife UCL 8790
Anderson-Darling Test Statistic 0.428	95% Standard Bootstrap UCL 8730
Anderson-Darling 5% Critical Value 0.742	95% Bootstrap-t UCL 9002
Kolmogorov-Smirnov Test Statistic 0.145	95% Hall's Bootstrap UCL 9385
Kolmogorov-Smirnov 5% Critical Value 0.185	95% Percentile Bootstrap UCL 8811
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 8875
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 10054
95% Approximate Gamma UCL 8838	97.5% Chebyshev(Mean, Sd) UCL 10957
95% Adjusted Gamma UCL 8907	99% Chebyshev(Mean, Sd) UCL 12731
Potential UCL to Use	Use 95% Approximate Gamma UCL 8838

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)

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and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Barium

General Statistics	
Number of Valid Observations 22	Number of Distinct Observations 22
Raw Statistics	Log-transformed Statistics
Minimum 15.8	Minimum of Log Data 2.76
Maximum 156	Maximum of Log Data 5.05
Mean 50.62	Mean of log Data 3.794
Median 41.95	SD of log Data 0.499
SD 30.88	
Std. Error of Mean 6.583	
Coefficient of Variation 0.61	
Skewness 2.232	
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.764	Shapiro Wilk Test Statistic 0.952
Shapiro Wilk Critical Value 0.911	Shapiro Wilk Critical Value 0.911
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 61.95	95% H-UCL 62.5
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 74.05
95% Adjusted-CLT UCL (Chen-1995) 64.79	97.5% Chebyshev (MVUE) UCL 84.46
95% Modified-t UCL (Johnson-1978) 62.47	99% Chebyshev (MVUE) UCL 104.9
Gamma Distribution Test	Data Distribution
k star (bias corrected) 3.472	
Theta Star 14.58	
MLE of Mean 50.62	
MLE of Standard Deviation 27.17	
nu star 152.8	
Approximate Chi Square Value (.05) 125.2	Data appear Lognormal at 5% Significance Level
Adjusted Level of Significance 0.0386	
Adjusted Chi Square Value 123.3	
Anderson-Darling Test Statistic 0.861	Nonparametric Statistics
Anderson-Darling 5% Critical Value 0.747	95% CLT UCL 61.45
	95% Jackknife UCL 61.95
	95% Standard Bootstrap UCL 61.12
	95% Bootstrap-t UCL 69.86
	95% Hall's Bootstrap UCL 83.88

Table F-11
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Kolmogorov-Smirnov Test Statistic 0.205	95% Percentile Bootstrap UCL 61.8
Kolmogorov-Smirnov 5% Critical Value 0.186	95% BCA Bootstrap UCL 64.48
Data not Gamma Distributed at 5% Significance Level	95% Chebyshev(Mean, Sd) UCL 79.31
	97.5% Chebyshev(Mean, Sd) UCL 91.73
	99% Chebyshev(Mean, Sd) UCL 116.1
Assuming Gamma Distribution	
95% Approximate Gamma UCL 61.76	
95% Adjusted Gamma UCL 62.7	
Potential UCL to Use	Use 95% Student's-t UCL 61.95 or 95% Modified-t UCL 62.47 or 95% H-UCL 62.5

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.

H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.

It is therefore recommended to avoid the use of H-statistic based 95% UCLs.

Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

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). For additional insight, the user may want to consult a statistician.

Chromium

General Statistics	
Number of Valid Observations 22	Number of Distinct Observations 20
Raw Statistics	Log-transformed Statistics
Minimum 10.3	Minimum of Log Data 2.332
Maximum 45.2	Maximum of Log Data 3.811
Mean 19.26	Mean of log Data 2.901
Median 18.85	SD of log Data 0.334
SD 7.359	
Std. Error of Mean 1.569	
Coefficient of Variation 0.382	
Skewness 2.124	
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.802	Shapiro Wilk Test Statistic 0.933
Shapiro Wilk Critical Value 0.911	Shapiro Wilk Critical Value 0.911
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level

Table F-11
ProUCL Output - Area 5 Subsurface Soil
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Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 21.96	95% H-UCL 22.04
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 25.26
95% Adjusted-CLT UCL (Chen-1995) 22.6	97.5% Chebyshev (MVUE) UCL 27.89
95% Modified-t UCL (Johnson-1978) 22.08	99% Chebyshev (MVUE) UCL 33.05
Gamma Distribution Test	Data Distribution
k star (bias corrected) 7.789	Data appear Gamma Distributed at 5% Significance Level
Theta Star 2.473	
MLE of Mean 19.26	
MLE of Standard Deviation 6.901	
nu star 342.7	
Approximate Chi Square Value (.05) 300.8	Nonparametric Statistics
Adjusted Level of Significance 0.0386	95% CLT UCL 21.84
Adjusted Chi Square Value 297.9	95% Jackknife UCL 21.96
Anderson-Darling Test Statistic 0.68	95% Standard Bootstrap UCL 21.83
Anderson-Darling 5% Critical Value 0.744	95% Bootstrap-t UCL 23.15
Kolmogorov-Smirnov Test Statistic 0.184	95% Hall's Bootstrap UCL 35.75
Kolmogorov-Smirnov 5% Critical Value 0.185	95% Percentile Bootstrap UCL 21.92
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 22.5
 	95% Chebyshev(Mean, Sd) UCL 26.1
Assuming Gamma Distribution	97.5% Chebyshev(Mean, Sd) UCL 29.06
95% Approximate Gamma UCL 21.94	99% Chebyshev(Mean, Sd) UCL 34.87
95% Adjusted Gamma UCL 22.16	
Potential UCL to Use	Use 95% Approximate Gamma UCL 21.94

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). For additional insight, the user may want to consult a statistician.

Copper

General Statistics	
Number of Valid Observations 22	Number of Distinct Observations 22
Raw Statistics	
Minimum 7.4	Minimum of Log Data 2.001
Maximum 66.9	Maximum of Log Data 4.203

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Mean 21.45	Mean of log Data 2.947
Median 17.9	SD of log Data 0.476
SD 12.52	
Std. Error of Mean 2.67	
Coefficient of Variation 0.584	
Skewness 2.451	

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.765
 Shapiro Wilk Critical Value 0.911

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.969
 Shapiro Wilk Critical Value 0.911

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 26.04

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 27.33
 95% Modified-t UCL (Johnson-1978) 26.27

Assuming Lognormal Distribution

95% H-UCL 26.18
 95% Chebyshev (MVUE) UCL 30.91
 97.5% Chebyshev (MVUE) UCL 35.11
 99% Chebyshev (MVUE) UCL 43.35

Gamma Distribution Test

k star (bias corrected) 3.807
 Theta Star 5.632
 MLE of Mean 21.45
 MLE of Standard Deviation 10.99
 nu star 167.5
 Approximate Chi Square Value (.05) 138.6
 Adjusted Level of Significance 0.0386
 Adjusted Chi Square Value 136.6

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 25.84
 95% Jackknife UCL 26.04
 95% Standard Bootstrap UCL 25.7
 95% Bootstrap-t UCL 29.08
 95% Hall's Bootstrap UCL 45.97
 95% Percentile Bootstrap UCL 26.03
 95% BCA Bootstrap UCL 27.73
 95% Chebyshev(Mean, Sd) UCL 33.08
 97.5% Chebyshev(Mean, Sd) UCL 38.12
 99% Chebyshev(Mean, Sd) UCL 48.01

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 25.92
 95% Adjusted Gamma UCL 26.29

Potential UCL to Use

Use 95% Approximate Gamma UCL 25.92

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

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These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Lead

General Statistics	
Number of Valid Observations 22	Number of Distinct Observations 21
Raw Statistics	
Minimum 4.1	Minimum of Log Data 1.411
Maximum 106	Maximum of Log Data 4.663
Mean 43.25	Mean of log Data 3.34
Median 37.55	SD of log Data 1.069
SD 33.62	
Std. Error of Mean 7.167	
Coefficient of Variation 0.777	
Skewness 0.508	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.91	Lognormal Distribution Test
Shapiro Wilk Critical Value 0.911	Shapiro Wilk Test Statistic 0.904
Data not Normal at 5% Significance Level	Shapiro Wilk Critical Value 0.911
Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution	
95% Student's-t UCL 55.59	95% H-UCL 93.38
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 55.87	95% Chebyshev (MVUE) UCL 102.6
95% Modified-t UCL (Johnson-1978) 55.72	97.5% Chebyshev (MVUE) UCL 126.1
	99% Chebyshev (MVUE) UCL 172.4
Gamma Distribution Test	
k star (bias corrected) 1.164	Data Distribution
Theta Star 37.15	Data appear Gamma Distributed at 5% Significance Level
MLE of Mean 43.25	
MLE of Standard Deviation 40.08	
nu star 51.24	
Approximate Chi Square Value (.05) 35.8	Nonparametric Statistics
Adjusted Level of Significance 0.0386	95% CLT UCL 55.04
Adjusted Chi Square Value 34.83	95% Jackknife UCL 55.59
Anderson-Darling Test Statistic 0.533	95% Standard Bootstrap UCL 54.64
	95% Bootstrap-t UCL 56.89

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Anderson-Darling 5% Critical Value 0.763	95% Hall's Bootstrap UCL 55.47
Kolmogorov-Smirnov Test Statistic 0.148	95% Percentile Bootstrap UCL 54.25
Kolmogorov-Smirnov 5% Critical Value 0.189	95% BCA Bootstrap UCL 55.06
Data appear Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
95% Approximate Gamma UCL 61.91	95% Chebyshev(Mean, Sd) UCL 74.49
95% Adjusted Gamma UCL 63.62	97.5% Chebyshev(Mean, Sd) UCL 88.01
Potential UCL to Use	
Use 95% Approximate Gamma UCL 61.91	

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). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics	
Number of Valid Observations 22	Number of Distinct Observations 20
Raw Statistics	
Minimum 103	Minimum of Log Data 4.635
Maximum 510	Maximum of Log Data 6.234
Mean 255.4	Mean of log Data 5.463
Median 221	SD of log Data 0.408
SD 108.2	
Std. Error of Mean 23.06	
Coefficient of Variation 0.424	
Skewness 1.017	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.909	Shapiro Wilk Test Statistic 0.977
Shapiro Wilk Critical Value 0.911	Shapiro Wilk Critical Value 0.911
Data not Normal at 5% Significance Level	
Assuming Normal Distribution	
95% Student's-t UCL 295	95% H-UCL 303.8
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 298.6	95% Chebyshev (MVUE) UCL 354.3
95% Modified-t UCL (Johnson-1978) 295.9	97.5% Chebyshev (MVUE) UCL 397.2
Assuming Lognormal Distribution	
99% Chebyshev (MVUE) UCL 481.5	

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ProUCL Output - Area 5 Subsurface Soil
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Gamma Distribution Test		Data Distribution
k star (bias corrected) 5.561		Data appear Gamma Distributed at 5% Significance Level
Theta Star 45.92		
MLE of Mean 255.4		
MLE of Standard Deviation 108.3		
nu star 244.7		
Approximate Chi Square Value (.05) 209.5		Nonparametric Statistics
Adjusted Level of Significance 0.0386		95% CLT UCL 293.3
Adjusted Chi Square Value 207		95% Jackknife UCL 295
Anderson-Darling Test Statistic 0.374		95% Standard Bootstrap UCL 292.3
Anderson-Darling 5% Critical Value 0.746		95% Bootstrap-t UCL 303.9
Kolmogorov-Smirnov Test Statistic 0.139		95% Hall's Bootstrap UCL 301
Kolmogorov-Smirnov 5% Critical Value 0.186		95% Percentile Bootstrap UCL 292.1
Data appear Gamma Distributed at 5% Significance Level		95% BCA Bootstrap UCL 296.5
Assuming Gamma Distribution		95% Chebyshev(Mean, Sd) UCL 355.9
95% Approximate Gamma UCL 298.3		97.5% Chebyshev(Mean, Sd) UCL 399.4
95% Adjusted Gamma UCL 301.8		99% Chebyshev(Mean, Sd) UCL 484.8
Potential UCL to Use		Use 95% Approximate Gamma UCL 298.3

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). For additional insight, the user may want to consult a statistician.

Mercury

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 14
Raw Statistics	Log-transformed Statistics
Minimum 0.088	Minimum of Log Data -2.43
Maximum 12.2	Maximum of Log Data 2.501
Mean 2.916	Mean of log Data 0.347
Median 1.72	SD of log Data 1.381
SD 3.648	
Std. Error of Mean 0.942	
Coefficient of Variation 1.251	
Skewness 1.848	

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ProUCL Output - Area 5 Subsurface Soil
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Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.704	Shapiro Wilk Test Statistic 0.931
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 4.575	95% H-UCL 12.84
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 9.099
95% Adjusted-CLT UCL (Chen-1995) 4.946	97.5% Chebyshev (MVUE) UCL 11.61
95% Modified-t UCL (Johnson-1978) 4.65	99% Chebyshev (MVUE) UCL 16.54
Gamma Distribution Test	Data Distribution
k star (bias corrected) 0.699	Data Follow Appr. Gamma Distribution at 5% Significance Level
Theta Star 4.172	
MLE of Mean 2.916	
MLE of Standard Deviation 3.488	
nu star 20.97	
Approximate Chi Square Value (.05) 11.57	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 4.466
Adjusted Chi Square Value 10.71	95% Jackknife UCL 4.575
Anderson-Darling Test Statistic 0.567	95% Standard Bootstrap UCL 4.405
Anderson-Darling 5% Critical Value 0.772	95% Bootstrap-t UCL 6.09
Kolmogorov-Smirnov Test Statistic 0.232	95% Hall's Bootstrap UCL 4.883
Kolmogorov-Smirnov 5% Critical Value 0.23	95% Percentile Bootstrap UCL 4.585
Data follow Appr. Gamma Distribution at 5% Significance Level	95% BCA Bootstrap UCL 5.053
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 7.022
95% Approximate Gamma UCL 5.286	97.5% Chebyshev(Mean, Sd) UCL 8.799
95% Adjusted Gamma UCL 5.706	99% Chebyshev(Mean, Sd) UCL 12.29
Potential UCL to Use	Use 95% Approximate Gamma UCL 5.286

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). For additional insight, the user may want to consult a statistician.

Vanadium

Table F-11
ProUCL Output - Area 5 Subsurface Soil
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General Statistics

Number of Valid Observations 22	Number of Distinct Observations 19
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Raw Statistics

Minimum 11.5	Maximum 44.9
Mean 22.43	Median 22
SD 6.858	Std. Error of Mean 1.462
Coefficient of Variation 0.306	Skewness 1.631

Log-transformed Statistics

Minimum of Log Data 2.442	Maximum of Log Data 3.804
Mean of log Data 3.071	SD of log Data 0.281

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.872	Shapiro Wilk Critical Value 0.911
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Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.959	Shapiro Wilk Critical Value 0.911
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Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 24.95	95% H-UCL 25.1
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95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 25.38	95% Chebyshev (MVUE) UCL 28.33
95% Modified-t UCL (Johnson-1978) 25.03	97.5% Chebyshev (MVUE) UCL 30.9
	99% Chebyshev (MVUE) UCL 35.94

Assuming Lognormal Distribution

95% H-UCL 25.1	95% Chebyshev (MVUE) UCL 28.33
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Gamma Distribution Test

k star (bias corrected) 11.19	Theta Star 2.005
MLE of Mean 22.43	MLE of Standard Deviation 6.706
nu star 492.4	Approximate Chi Square Value (.05) 441.9
Adjusted Level of Significance 0.0386	Adjusted Chi Square Value 438.3

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 24.84	95% Jackknife UCL 24.95
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Anderson-Darling Test Statistic 0.449	Anderson-Darling 5% Critical Value 0.743
Kolmogorov-Smirnov Test Statistic 0.123	Kolmogorov-Smirnov 5% Critical Value 0.185

95% Standard Bootstrap UCL 24.74	95% Bootstrap-t UCL 25.75
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Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Hall's Bootstrap UCL 27.22	95% Percentile Bootstrap UCL 24.98
95% BCA Bootstrap UCL 25.39	95% Chebyshev(Mean, Sd) UCL 28.81
97.5% Chebyshev(Mean, Sd) UCL 31.56	99% Chebyshev(Mean, Sd) UCL 36.98

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95% Approximate Gamma UCL 24.99

95% Adjusted Gamma UCL 25.2

Potential UCL to Use	Use 95% Approximate Gamma UCL 24.99
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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). For additional insight, the user may want to consult a statistician.

Table F-12
ProUCL Output - Background Subsurface Soil
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General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Background.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Benzo(a)anthracene

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	14
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Raw Statistics

Minimum	0.0022
Maximum	0.59
Mean	0.11
Median	0.023
SD	0.186
Std. Error of Mean	0.0481
Coefficient of Variation	1.686
Skewness	2.054

Log-transformed Statistics

Minimum of Log Data	-6.119
Maximum of Log Data	-0.528
Mean of log Data	-3.51
SD of log Data	1.741

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.621
Shapiro Wilk Critical Value	0.881

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.948
Shapiro Wilk Critical Value	0.881

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	0.195
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95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995)	0.217
95% Modified-t UCL (Johnson-1978)	0.199

Assuming Lognormal Distribution

95% H-UCL	0.902
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95% Chebyshev (MVUE) UCL	0.361
97.5% Chebyshev (MVUE) UCL	0.469
99% Chebyshev (MVUE) UCL	0.681

Gamma Distribution Test

k star (bias corrected)	0.435
Theta Star	0.254
MLE of Mean	0.11
MLE of Standard Deviation	0.168
nu star	13.04
Approximate Chi Square Value (.05)	5.922

Data Distribution

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

Table F-12
ProUCL Output - Background Subsurface Soil
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Adjusted Level of Significance	0.0324	95% CLT UCL	0.19
Adjusted Chi Square Value	5.341	95% Jackknife UCL	0.195
		95% Standard Bootstrap UCL	0.186
Anderson-Darling Test Statistic	0.842	95% Bootstrap-t UCL	0.335
Anderson-Darling 5% Critical Value	0.796	95% Hall's Bootstrap UCL	0.514
Kolmogorov-Smirnov Test Statistic	0.261	95% Percentile Bootstrap UCL	0.188
Kolmogorov-Smirnov 5% Critical Value	0.234	95% BCA Bootstrap UCL	0.215
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.32
		97.5% Chebyshev(Mean, Sd) UCL	0.411
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.589
95% Approximate Gamma UCL	0.243		
95% Adjusted Gamma UCL	0.27		
Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL	0.589

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). For additional insight, the user may want to consult a statistician.

Benzo(a)pyrene

General Statistics	
Number of Valid Observations	15
Number of Distinct Observations	14
Raw Statistics	
Minimum	0.0022
Maximum	0.51
Mean	0.0903
Median	0.021
SD	0.148
Std. Error of Mean	0.0381
Coefficient of Variation	1.637
Skewness	2.232
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic	0.643
Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	
Assuming Lognormal Distribution	

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ProUCL Output - Background Subsurface Soil
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95% Student's-t UCL 0.157	95% H-UCL 0.591
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 0.176	95% Chebyshev (MVUE) UCL 0.284
95% Modified-t UCL (Johnson-1978) 0.161	97.5% Chebyshev (MVUE) UCL 0.368
	99% Chebyshev (MVUE) UCL 0.532
Gamma Distribution Test	Data Distribution
k star (bias corrected) 0.477	Data appear Gamma Distributed at 5% Significance Level
Theta Star 0.189	
MLE of Mean 0.0903	
MLE of Standard Deviation 0.131	
nu star 14.31	
Approximate Chi Square Value (.05) 6.781	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 0.153
Adjusted Chi Square Value 6.153	95% Jackknife UCL 0.157
Anderson-Darling Test Statistic 0.606	95% Standard Bootstrap UCL 0.15
Anderson-Darling 5% Critical Value 0.79	95% Bootstrap-t UCL 0.281
Kolmogorov-Smirnov Test Statistic 0.193	95% Hall's Bootstrap UCL 0.42
Kolmogorov-Smirnov 5% Critical Value 0.233	95% Percentile Bootstrap UCL 0.158
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 0.179
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 0.256
95% Approximate Gamma UCL 0.19	97.5% Chebyshev(Mean, Sd) UCL 0.328
95% Adjusted Gamma UCL 0.21	99% Chebyshev(Mean, Sd) UCL 0.47
Potential UCL to Use	Use 95% Approximate Gamma UCL 0.19

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). For additional insight, the user may want to consult a statistician.

Benzo(b)fluoranthene

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 15
Raw Statistics	
Minimum 0.004	Minimum of Log Data -5.521
Maximum 0.74	Maximum of Log Data -0.301
Mean 0.133	Mean of log Data -3.154
Median 0.033	SD of log Data 1.569

Table F-12
ProUCL Output - Background Subsurface Soil
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SD 0.224

Std. Error of Mean 0.0579

Coefficient of Variation 1.68

Skewness 2.18

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.613

Shapiro Wilk Critical Value 0.881

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.95

Shapiro Wilk Critical Value 0.881

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 0.235

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 0.264

95% Modified-t UCL (Johnson-1978) 0.241

Assuming Lognormal Distribution

95% H-UCL 0.701

95% Chebyshev (MVUE) UCL 0.379

97.5% Chebyshev (MVUE) UCL 0.488

99% Chebyshev (MVUE) UCL 0.704

Gamma Distribution Test

k star (bias corrected) 0.484

Theta Star 0.276

MLE of Mean 0.133

MLE of Standard Deviation 0.192

nu star 14.51

Approximate Chi Square Value (.05) 6.921

Adjusted Level of Significance 0.0324

Adjusted Chi Square Value 6.286

Data Distribution

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 0.229

95% Jackknife UCL 0.235

95% Standard Bootstrap UCL 0.227

95% Bootstrap-t UCL 0.447

95% Hall's Bootstrap UCL 0.655

95% Percentile Bootstrap UCL 0.236

95% BCA Bootstrap UCL 0.268

95% Chebyshev(Mean, Sd) UCL 0.386

97.5% Chebyshev(Mean, Sd) UCL 0.495

99% Chebyshev(Mean, Sd) UCL 0.71

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 0.28

95% Adjusted Gamma UCL 0.308

Potential UCL to Use

Use 99% Chebyshev (Mean, Sd) UCL 0.71

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). For additional insight, the user may want to consult a statistician.

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ProUCL Output - Background Subsurface Soil
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Carbazole

General Statistics			
Number of Valid Data	15	Number of Detected Data	5
Number of Distinct Detected Data	4	Number of Non-Detect Data	10
		Percent Non-Detects	66.67%

Raw Statistics	Log-transformed Statistics
Minimum Detected	0.0066
Maximum Detected	0.1
Mean of Detected	0.0395
SD of Detected	0.0395
Minimum Non-Detect	0.0043
Maximum Non-Detect	0.0051

Note: Data have multiple DLs - Use of KM Method is recommended For all methods (except KM, DL/2, and ROS Methods), Observations < Largest ND are treated as NDs	Number treated as Non-Detect	10
	Number treated as Detected	5
	Single DL Non-Detect Percentage	66.67%

Warning: There are only 4 Distinct Detected Values in this data

**Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions**

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only	Lognormal Distribution Test with Detected Values Only
Shapiro Wilk Test Statistic	0.843
5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution

DL/2 Substitution Method
Mean
SD
95% DL/2 (t) UCL

Assuming Lognormal Distribution

DL/2 Substitution Method
Mean
SD
95% H-Stat (DL/2) UCL

Maximum Likelihood Estimate(MLE) Method	N/A
MLE yields a negative mean	

Log ROS Method
Mean in Log Scale

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		SD in Log Scale	2.067	
		Mean in Original Scale	0.0135	
		SD in Original Scale	0.0284	
		95% t UCL	0.0265	
		95% Percentile Bootstrap UCL	0.0266	
		95% BCA Bootstrap UCL	0.0317	
		95% H-UCL	0.204	
Gamma Distribution Test with Detected Values Only				
k star (bias corrected)	0.63	Data Distribution Test with Detected Values Only		
Theta Star	0.0627	Data appear Normal at 5% Significance Level		
nu star	6.301			
A-D Test Statistic	0.379	Nonparametric Statistics		
5% A-D Critical Value	0.689	Kaplan-Meier (KM) Method		
K-S Test Statistic	0.689	Mean	0.0176	
5% K-S Critical Value	0.363	SD	0.0256	
Data appear Gamma Distributed at 5% Significance Level				
Assuming Gamma Distribution				
Gamma ROS Statistics using Extrapolated Data		SE of Mean	0.00739	
Minimum	0.000001	95% KM (t) UCL	0.0306	
Maximum	0.1	95% KM (z) UCL	0.0297	
Mean	0.0132	95% KM (jackknife) UCL	0.0286	
Median	0.000001	95% KM (bootstrap t) UCL	0.0775	
SD	0.0286	95% KM (BCA) UCL	0.0617	
k star	0.147	95% KM (Percentile Bootstrap) UCL	0.0357	
Theta star	0.0894	95% KM (Chebyshev) UCL	0.0498	
Nu star	4.419	97.5% KM (Chebyshev) UCL	0.0637	
AppChi2	0.894	99% KM (Chebyshev) UCL	0.0911	
95% Gamma Approximate UCL	0.0651	Potential UCLs to Use		
95% Adjusted Gamma UCL	0.0809	95% KM (t) UCL	0.0306	
		95% KM (Percentile Bootstrap) UCL	0.0357	

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Dibenz(a,h)anthracene

General Statistics

Table F-12
ProUCL Output - Background Subsurface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Number of Valid Data	15	Number of Detected Data	7
Number of Distinct Detected Data	7	Number of Non-Detect Data	8
		Percent Non-Detects	53.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0041	Minimum Detected	-5.497
Maximum Detected	0.052	Maximum Detected	-2.957
Mean of Detected	0.0216	Mean of Detected	-4.261
SD of Detected	0.0194	SD of Detected	1.046
Minimum Non-Detect	0.0036	Minimum Non-Detect	-5.627
Maximum Non-Detect	0.004	Maximum Non-Detect	-5.521

Note: Data have multiple DLs - Use of KM Method is recommended

For all methods (except KM, DL/2, and ROS Methods),

Observations < Largest ND are treated as NDs

Number treated as Non-Detect	8
Number treated as Detected	7
Single DL Non-Detect Percentage	53.33%

Warning: There are only 7 Detected Values in this data

**Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions**

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics		Lognormal Distribution Test with Detected Values Only	
Normal Distribution Test with Detected Values Only		Shapiro Wilk Test Statistic	0.907
		5% Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0111	Mean	-5.326
SD	0.0162	SD	1.238
95% DL/2 (t) UCL	0.0185	95% H-Stat (DL/2) UCL	0.0296
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.0001946	Mean in Log Scale	-5.919
SD	0.0264	SD in Log Scale	1.794
95% MLE (t) UCL	0.0122	Mean in Original Scale	0.0105
95% MLE (Tiku) UCL	0.0157	SD in Original Scale	0.0166
		95% t UCL	0.018
		95% Percentile Bootstrap UCL	0.0176

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		95% BCA Bootstrap UCL	0.0196
		95% H UCL	0.0991
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
			Data appear Normal at 5% Significance Level
k star (bias corrected)	0.847		
Theta Star	0.0255		
nu star	11.86		
A-D Test Statistic	0.375	Nonparametric Statistics	
5% A-D Critical Value	0.724	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.724	Mean	0.0123
5% K-S Critical Value	0.318	SD	0.015
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.00419
		95% KM (t) UCL	0.0196
		95% KM (z) UCL	0.0192
Assuming Gamma Distribution		95% KM (jackknife) UCL	0.0192
Gamma ROS Statistics using Extrapolated Data		95% KM (bootstrap t) UCL	0.0244
Minimum	0.000001	95% KM (BCA) UCL	0.0211
Maximum	0.052	95% KM (Percentile Bootstrap) UCL	0.0205
Mean	0.0101	95% KM (Chebyshev) UCL	0.0305
Median	0.000001	97.5% KM (Chebyshev) UCL	0.0385
SD	0.0169	99% KM (Chebyshev) UCL	0.054
k star	0.172		
Theta star	0.0584	Potential UCLs to Use	
Nu star	5.173	95% KM (t) UCL	0.0196
AppChi2	1.233	95% KM (Percentile Bootstrap) UCL	0.0205
95% Gamma Approximate UCL	0.0423		
95% Adjusted Gamma UCL	0.0513		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Indeno(1,2,3-cd)pyrene

General Statistics			
Number of Valid Data	15	Number of Detected Data	14
Number of Distinct Detected Data	12	Number of Non-Detect Data	1
		Percent Non-Detects	6.67%

Raw Statistics

Log-transformed Statistics

Table F-12
ProUCL Output - Background Subsurface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Minimum Detected	0.002	Minimum Detected	-6.215
Maximum Detected	0.17	Maximum Detected	-1.772
Mean of Detected	0.0426	Mean of Detected	-4.065
SD of Detected	0.0597	SD of Detected	1.42
Minimum Non-Detect	0.0011	Minimum Non-Detect	-6.812
Maximum Non-Detect	0.0011	Maximum Non-Detect	-6.812

UCL Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.682
5% Shapiro Wilk Critical Value	0.874

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.941
5% Shapiro Wilk Critical Value	0.874

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.0398
SD	0.0585
95% DL/2 (t) UCL	0.0664

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean	-4.294
SD	1.631
95% H-Stat (DL/2) UCL	0.277

Maximum Likelihood Estimate(MLE) Method

Mean	0.0374
SD	0.0594
95% MLE (t) UCL	0.0644
95% MLE (Tiku) UCL	0.0626

Log ROS Method

Mean in Log Scale	-4.297
SD in Log Scale	1.637
Mean in Original Scale	0.0398
SD in Original Scale	0.0585
95% t UCL	0.0664
95% Percentile Bootstrap UCL	0.0649
95% BCA Bootstrap UCL	0.0708
95% H UCL	0.282

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.573
Theta Star	0.0743
nu star	16.05

Data Distribution Test with Detected Values Only

Data appear Gamma Distributed at 5% Significance Level

A-D Test Statistic	0.77
5% A-D Critical Value	0.778
K-S Test Statistic	0.778
5% K-S Critical Value	0.239

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	0.0399
SD	0.0565
SE of Mean	0.0151

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% KM (t) UCL	0.0665
95% KM (z) UCL	0.0648

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ProUCL Output - Background Subsurface Soil
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Gamma ROS Statistics using Extrapolated Data				
Minimum	0.000001		95% KM (jackknife) UCL	0.0664
Maximum	0.17		95% KM (bootstrap t) UCL	0.0968
Mean	0.0398		95% KM (BCA) UCL	0.0679
Median	0.012		95% KM (Percentile Bootstrap) UCL	0.0673
SD	0.0586		95% KM (Chebyshev) UCL	0.106
k star	0.393		97.5% KM (Chebyshev) UCL	0.134
Theta star	0.101		99% KM (Chebyshev) UCL	0.19
Nu star	11.79		Potential UCLs to Use	
AppChi2	5.088		95% KM (Chebyshev) UCL	0.106
95% Gamma Approximate UCL	0.0921			
95% Adjusted Gamma UCL	0.103			

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Antimony

General Statistics				
Number of Valid Data	15		Number of Detected Data	7
Number of Distinct Detected Data	6		Number of Non-Detect Data	8
			Percent Non-Detects	53.33%
Raw Statistics				
Minimum Detected	0.2		Minimum Detected	-1.609
Maximum Detected	1.2		Maximum Detected	0.182
Mean of Detected	0.393		Mean of Detected	-1.157
SD of Detected	0.361		SD of Detected	0.632
Minimum Non-Detect	0.2		Minimum Non-Detect	-1.609
Maximum Non-Detect	0.25		Maximum Non-Detect	-1.386
Log-transformed Statistics				

Note: Data have multiple DLs - Use of KM Method is recommended

Number treated as Non-Detect 11

For all methods (except KM, DL/2, and ROS Methods),

Number treated as Detected 4

Observations < Largest ND are treated as NDs

Single DL Non-Detect Percentage 73.33%

Warning: There are only 7 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

Table F-12
ProUCL Output - Background Subsurface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.599	Shapiro Wilk Test Statistic	0.754
5% Shapiro Wilk Critical Value	0.803	5% Shapiro Wilk Critical Value	0.803
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.241	Mean	-1.727
SD	0.278	SD	0.692
95% DL/2 (t) UCL	0.368	95% H-Stat (DL/2) UCL	0.346
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-1.717
		SD in Log Scale	0.731
		Mean in Original Scale	0.246
		SD in Original Scale	0.278
		95% t UCL	0.372
		95% Percentile Bootstrap UCL	0.378
		95% BCA Bootstrap UCL	0.451
		95% H-UCL	0.371
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.469	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.268		
nu star	20.56		
A-D Test Statistic	1.014	Nonparametric Statistics	
5% A-D Critical Value	0.714	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.714	Mean	0.29
5% K-S Critical Value	0.315	SD	0.248
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0691
Assuming Gamma Distribution		95% KM (t) UCL	0.412
Gamma ROS Statistics using Extrapolated Data		95% KM (z) UCL	0.404
Minimum	0.000001	95% KM (jackknife) UCL	0.407
Maximum	1.2	95% KM (bootstrap t) UCL	0.88
Mean	0.2	95% KM (BCA) UCL	0.425
Median	0.2	95% KM (Percentile Bootstrap) UCL	0.414
		95% KM (Chebyshev) UCL	0.591

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ProUCL Output - Background Subsurface Soil
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SD	0.306	97.5% KM (Chebyshev) UCL	0.722
k star	0.172	99% KM (Chebyshev) UCL	0.977
Theta star	1.159		
Nu star	5.165	Potential UCLs to Use	
AppChi2	1.229	95% KM (t) UCL	0.412
95% Gamma Approximate UCL	0.839	95% KM (% Bootstrap) UCL	0.414
95% Adjusted Gamma UCL	1.019		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Arsenic

General Statistics	
Number of Valid Observations	15
Number of Distinct Observations	13
Raw Statistics	
Minimum	2.3
Maximum	6.7
Mean	4.233
Median	3.9
SD	1.253
Std. Error of Mean	0.324
Coefficient of Variation	0.296
Skewness	0.58
Log-transformed Statistics	
Minimum of Log Data	0.833
Maximum of Log Data	1.902
Mean of log Data	1.402
SD of log Data	0.297
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic	0.942
Shapiro Wilk Critical Value	0.881
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	
95% Student's-t UCL	4.803
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995)	4.817
95% Modified-t UCL (Johnson-1978)	4.811
Assuming Lognormal Distribution	
95% H-UCL	4.931
95% Chebyshev (MVUE) UCL	5.667
97.5% Chebyshev (MVUE) UCL	6.286
99% Chebyshev (MVUE) UCL	7.503
Gamma Distribution Test	
Data Distribution	

Table F-12
ProUCL Output - Background Subsurface Soil
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k star (bias corrected) 9.993	Data appear Normal at 5% Significance Level
Theta Star 0.424	
MLE of Mean 4.233	
MLE of Standard Deviation 1.339	
nu star 299.8	
Approximate Chi Square Value (.05) 260.7	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 4.766
Adjusted Chi Square Value 256.2	95% Jackknife UCL 4.803
Anderson-Darling Test Statistic 0.322	95% Standard Bootstrap UCL 4.752
Anderson-Darling 5% Critical Value 0.737	95% Bootstrap-t UCL 4.912
Kolmogorov-Smirnov Test Statistic 0.14	95% Hall's Bootstrap UCL 4.877
Kolmogorov-Smirnov 5% Critical Value 0.221	95% Percentile Bootstrap UCL 4.753
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 4.807
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 5.644
95% Approximate Gamma UCL 4.868	97.5% Chebyshev(Mean, Sd) UCL 6.254
95% Adjusted Gamma UCL 4.954	99% Chebyshev(Mean, Sd) UCL 7.453
Potential UCL to Use	Use 95% Student's-t UCL 4.803

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). For additional insight, the user may want to consult a statistician.

Cobalt

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 14
Raw Statistics	
Minimum 5.2	Minimum of Log Data 1.649
Maximum 12.2	Maximum of Log Data 2.501
Mean 7.107	Mean of log Data 1.93
Median 6.6	SD of log Data 0.245
SD 2.037	
Std. Error of Mean 0.526	
Coefficient of Variation 0.287	
Skewness 1.866	
Log-transformed Statistics	

Relevant UCL Statistics

Table F-12
ProUCL Output - Background Subsurface Soil
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Queens, New York

Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.75	Shapiro Wilk Test Statistic 0.838
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data not Normal at 5% Significance Level	Data not Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 8.033	95% H-UCL 8.011
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 9.057
95% Adjusted-CLT UCL (Chen-1995) 8.242	97.5% Chebyshev (MVUE) UCL 9.91
95% Modified-t UCL (Johnson-1978) 8.075	99% Chebyshev (MVUE) UCL 11.59
Gamma Distribution Test	Data Distribution
k star (bias corrected) 13.05	Data do not follow a Discernable Distribution (0.05)
Theta Star 0.544	
MLE of Mean 7.107	
MLE of Standard Deviation 1.967	
nu star 391.6	
Approximate Chi Square Value (.05) 346.7	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 7.972
Adjusted Chi Square Value 341.5	95% Jackknife UCL 8.033
Anderson-Darling Test Statistic 1.12	95% Standard Bootstrap UCL 7.923
Anderson-Darling 5% Critical Value 0.736	95% Bootstrap-t UCL 9.275
Kolmogorov-Smirnov Test Statistic 0.248	95% Hall's Bootstrap UCL 13.51
Kolmogorov-Smirnov 5% Critical Value 0.221	95% Percentile Bootstrap UCL 8.1
Data not Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 8.233
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 9.399
95% Approximate Gamma UCL 8.026	97.5% Chebyshev(Mean, Sd) UCL 10.39
95% Adjusted Gamma UCL 8.148	99% Chebyshev(Mean, Sd) UCL 12.34
Potential UCL to Use	Use 95% Student's-t UCL 8.033 or 95% Modified-t UCL 8.075

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). For additional insight, the user may want to consult a statistician.

Thallium

General Statistics

Table F-12
ProUCL Output - Background Subsurface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Number of Valid Data	15	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	11
		Percent Non-Detects	73.33%

Raw Statistics	Log-transformed Statistics
Minimum Detected	0.6
Maximum Detected	0.83
Mean of Detected	0.72
SD of Detected	0.108
Minimum Non-Detect	0.44
Maximum Non-Detect	0.53

Note: Data have multiple DLs - Use of KM Method is recommended

Number treated as Non-Detect 11

For all methods (except KM, DL/2, and ROS Methods),

Number treated as Detected 4

Observations < Largest ND are treated as NDs

Single DL Non-Detect Percentage 73.33%

Warning: There are only 4 Distinct Detected Values in this data

**Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions**

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics		Lognormal Distribution Test with Detected Values Only	
Normal Distribution Test with Detected Values Only		Shapiro Wilk Test Statistic	0.924
		5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.368	Mean	-1.138
SD	0.226	SD	0.507
95% DL/2 (t) UCL	0.471	95% H-Stat (DL/2) UCL	0.483
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.727	Mean in Log Scale	-0.792
SD	0.0935	SD in Log Scale	0.301
95% MLE (t) UCL	0.77	Mean in Original Scale	0.475
95% MLE (Tiku) UCL	0.809	SD in Original Scale	0.164
		95% t UCL	0.549
		95% Percentile Bootstrap UCL	0.546

Table F-12
ProUCL Output - Background Subsurface Soil
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		95% BCA Bootstrap UCL	0.558
		95% H UCL	0.552
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
			Data appear Normal at 5% Significance Level
k star (bias corrected)	14.75		
Theta Star	0.0488		
nu star	118		
A-D Test Statistic	0.333	Nonparametric Statistics	
5% A-D Critical Value	0.656	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.656	Mean	0.632
5% K-S Critical Value	0.394	SD	0.0718
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0214
		95% KM (t) UCL	0.67
Assuming Gamma Distribution		95% KM (z) UCL	0.667
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.676
Minimum	0.000001	95% KM (bootstrap t) UCL	0.655
Maximum	0.83	95% KM (BCA) UCL	N/A
Mean	0.195	95% KM (Percentile Bootstrap) UCL	0.801
Median	0.000001	95% KM (Chebyshev) UCL	0.725
SD	0.332	97.5% KM (Chebyshev) UCL	0.766
k star	0.133	99% KM (Chebyshev) UCL	0.845
Theta star	1.467	Potential UCLs to Use	
Nu star	3.987	95% KM (t) UCL	0.67
AppChi2	0.716	95% KM (Percentile Bootstrap) UCL	0.801
95% Gamma Approximate UCL	1.085		
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

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, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Chrysene

General Statistics		
Number of Valid Observations	15	Number of Distinct Observations
Raw Statistics		
Minimum	0.0019	Minimum of Log Data
Maximum	0.64	-6.266
Log-transformed Statistics		
		Maximum of Log Data
		-0.446

Table F-12
ProUCL Output - Background Subsurface Soil
Second Supplemental Remedial Investigation
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Mean 0.0986	Mean of log Data -3.657
Median 0.02	SD of log Data 1.727
SD 0.182	
Std. Error of Mean 0.047	
Coefficient of Variation 1.847	
Skewness 2.493	

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.583
 Shapiro Wilk Critical Value 0.881

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.97
 Shapiro Wilk Critical Value 0.881

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 0.181

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 0.208
 95% Modified-t UCL (Johnson-1978) 0.186

Assuming Lognormal Distribution

95% H-UCL 0.739
 95% Chebyshev (MVUE) UCL 0.304
 97.5% Chebyshev (MVUE) UCL 0.395
 99% Chebyshev (MVUE) UCL 0.573

Gamma Distribution Test

k star (bias corrected) 0.426
 Theta Star 0.231
 MLE of Mean 0.0986
 MLE of Standard Deviation 0.151
 nu star 12.79
 Approximate Chi Square Value (.05) 5.754
 Adjusted Level of Significance 0.0324
 Adjusted Chi Square Value 5.184

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 0.176
 95% Jackknife UCL 0.181
 95% Standard Bootstrap UCL 0.173
 95% Bootstrap-t UCL 0.468
 95% Hall's Bootstrap UCL 0.536
 95% Percentile Bootstrap UCL 0.184
 95% BCA Bootstrap UCL 0.197
 95% Chebyshev(Mean, Sd) UCL 0.304
 97.5% Chebyshev(Mean, Sd) UCL 0.392
 99% Chebyshev(Mean, Sd) UCL 0.566

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 0.219
 95% Adjusted Gamma UCL 0.243

Potential UCL to Use

Use 95% Adjusted Gamma UCL 0.243

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

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These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Aluminum

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 14
Raw Statistics	
Minimum 6300	Minimum of Log Data 8.748
Maximum 15700	Maximum of Log Data 9.661
Mean 10697	Mean of log Data 9.252
Median 11100	SD of log Data 0.24
SD 2445	
Std. Error of Mean 631.4	
Coefficient of Variation 0.229	
Skewness 0.0698	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.982	Lognormal Distribution Test
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Test Statistic 0.967
Data appear Normal at 5% Significance Level	Shapiro Wilk Critical Value 0.881
Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution	
95% Student's-t UCL 11809	95% H-UCL 12070
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 11748	95% Chebyshev (MVUE) UCL 13621
95% Modified-t UCL (Johnson-1978) 11811	97.5% Chebyshev (MVUE) UCL 14881
	99% Chebyshev (MVUE) UCL 17357
Gamma Distribution Test	
k star (bias corrected) 15.65	Data Distribution
Theta Star 683.4	Data appear Normal at 5% Significance Level
MLE of Mean 10697	
MLE of Standard Deviation 2704	
nu star 469.6	
Approximate Chi Square Value (.05) 420.3	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 11736
Adjusted Chi Square Value 414.6	95% Jackknife UCL 11809
Anderson-Darling Test Statistic 0.247	95% Standard Bootstrap UCL 11700
	95% Bootstrap-t UCL 11745

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Anderson-Darling 5% Critical Value 0.735	95% Hall's Bootstrap UCL 11840
Kolmogorov-Smirnov Test Statistic 0.136	95% Percentile Bootstrap UCL 11718
Kolmogorov-Smirnov 5% Critical Value 0.221	95% BCA Bootstrap UCL 11759
Data appear Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
95% Approximate Gamma UCL 11951	95% Chebyshev(Mean, Sd) UCL 13450
95% Adjusted Gamma UCL 12116	97.5% Chebyshev(Mean, Sd) UCL 14641
Potential UCL to Use	
Use 95% Student's-t UCL 11809	

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). For additional insight, the user may want to consult a statistician.

Barium

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 15
Raw Statistics	
Minimum 33.5	Minimum of Log Data 3.512
Maximum 203	Maximum of Log Data 5.313
Mean 75.62	Mean of log Data 4.23
Median 71	SD of log Data 0.431
SD 39.92	
Std. Error of Mean 10.31	
Coefficient of Variation 0.528	
Skewness 2.481	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.74	Shapiro Wilk Test Statistic 0.934
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data not Normal at 5% Significance Level	
Log-transformed Statistics	
Shapiro Wilk Test Statistic 0.934	Shapiro Wilk Test Statistic 0.934
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution	
95% Student's-t UCL 93.77	95% H-UCL 94.9
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 99.63	95% Chebyshev (MVUE) UCL 112
95% Modified-t UCL (Johnson-1978) 94.87	97.5% Chebyshev (MVUE) UCL 128.1
Assuming Lognormal Distribution	
99% Chebyshev (MVUE) UCL 159.7	

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Gamma Distribution Test	Data Distribution
k star (bias corrected) 4.362	Data appear Gamma Distributed at 5% Significance Level
Theta Star 17.34	
MLE of Mean 75.62	
MLE of Standard Deviation 36.21	
nu star 130.9	
Approximate Chi Square Value (.05) 105.4	
Adjusted Level of Significance 0.0324	
Adjusted Chi Square Value 102.6	
Anderson-Darling Test Statistic 0.59	95% CLT UCL 92.57
Anderson-Darling 5% Critical Value 0.738	95% Jackknife UCL 93.77
Kolmogorov-Smirnov Test Statistic 0.18	95% Standard Bootstrap UCL 92.14
Kolmogorov-Smirnov 5% Critical Value 0.222	95% Bootstrap-t UCL 108.5
Data appear Gamma Distributed at 5% Significance Level	95% Hall's Bootstrap UCL 174.9
Assuming Gamma Distribution	95% Percentile Bootstrap UCL 93.39
95% Approximate Gamma UCL 93.86	95% BCA Bootstrap UCL 98.59
95% Adjusted Gamma UCL 96.42	95% Chebyshev(Mean, Sd) UCL 120.5
Potential UCL to Use	97.5% Chebyshev(Mean, Sd) UCL 140
	99% Chebyshev(Mean, Sd) UCL 178.2
	Use 95% Approximate Gamma UCL 93.86

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). For additional insight, the user may want to consult a statistician.

Chromium

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 15
Raw Statistics	Log-transformed Statistics
Minimum 14.9	Minimum of Log Data 2.701
Maximum 28.6	Maximum of Log Data 3.353
Mean 20.82	Mean of log Data 3.019
Median 19.2	SD of log Data 0.189
SD 4.052	
Std. Error of Mean 1.046	
Coefficient of Variation 0.195	
Skewness 0.674	

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Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.908	Shapiro Wilk Test Statistic 0.934
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data appear Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 22.66	95% H-UCL 22.82
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 25.25
95% Adjusted-CLT UCL (Chen-1995) 22.74	97.5% Chebyshev (MVUE) UCL 27.18
95% Modified-t UCL (Johnson-1978) 22.69	99% Chebyshev (MVUE) UCL 30.95
Gamma Distribution Test	Data Distribution
k star (bias corrected) 23.78	Data appear Normal at 5% Significance Level
Theta Star 0.875	
MLE of Mean 20.82	
MLE of Standard Deviation 4.269	
nu star 713.5	
Approximate Chi Square Value (.05) 652.5	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 22.54
Adjusted Chi Square Value 645.3	95% Jackknife UCL 22.66
Anderson-Darling Test Statistic 0.58	95% Standard Bootstrap UCL 22.5
Anderson-Darling 5% Critical Value 0.735	95% Bootstrap-t UCL 22.86
Kolmogorov-Smirnov Test Statistic 0.179	95% Hall's Bootstrap UCL 22.73
Kolmogorov-Smirnov 5% Critical Value 0.221	95% Percentile Bootstrap UCL 22.53
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 22.63
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 25.38
95% Approximate Gamma UCL 22.77	97.5% Chebyshev(Mean, Sd) UCL 27.35
95% Adjusted Gamma UCL 23.02	99% Chebyshev(Mean, Sd) UCL 31.23
Potential UCL to Use	Use 95% Student's-t UCL 22.66

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). For additional insight, the user may want to consult a statistician.

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General Statistics

Number of Valid Observations 15	Number of Distinct Observations 15
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Raw Statistics

Minimum 7.8
Maximum 70.3
Mean 25.4
Median 23.3
SD 15.5
Std. Error of Mean 4.002
Coefficient of Variation 0.61
Skewness 1.75

Log-transformed Statistics

Minimum of Log Data 2.054
Maximum of Log Data 4.253
Mean of log Data 3.082
SD of log Data 0.569

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.838
Shapiro Wilk Critical Value 0.881

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.969
Shapiro Wilk Critical Value 0.881

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 32.45

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 33.91
95% Modified-t UCL (Johnson-1978) 32.75

Assuming Lognormal Distribution

95% H-UCL 35.54

95% Chebyshev (MVUE) UCL 42.18
97.5% Chebyshev (MVUE) UCL 49.47
99% Chebyshev (MVUE) UCL 63.79

Gamma Distribution Test

k star (bias corrected) 2.796
Theta Star 9.084
MLE of Mean 25.4
MLE of Standard Deviation 15.19
nu star 83.88

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Approximate Chi Square Value (.05) 63.77
Adjusted Level of Significance 0.0324
Adjusted Chi Square Value 61.62
Anderson-Darling Test Statistic 0.319
Anderson-Darling 5% Critical Value 0.743
Kolmogorov-Smirnov Test Statistic 0.131
Kolmogorov-Smirnov 5% Critical Value 0.223

Nonparametric Statistics

95% CLT UCL 31.98
95% Jackknife UCL 32.45
95% Standard Bootstrap UCL 31.56
95% Bootstrap-t UCL 35.35
95% Hall's Bootstrap UCL 55.83
95% Percentile Bootstrap UCL 31.79
95% BCA Bootstrap UCL 33.75
95% Chebyshev(Mean, Sd) UCL 42.84
97.5% Chebyshev(Mean, Sd) UCL 50.39
99% Chebyshev(Mean, Sd) UCL 65.21

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

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95% Approximate Gamma UCL 33.41

95% Adjusted Gamma UCL 34.58

Potential UCL to Use

Use 95% Approximate Gamma UCL 33.41

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). For additional insight, the user may want to consult a statistician.

Lead

General Statistics

Number of Valid Observations 15

Number of Distinct Observations 15

Raw Statistics

Minimum 9.3
 Maximum 218
 Mean 78.53
 Median 67.2
 SD 68.07
 Std. Error of Mean 17.58
 Coefficient of Variation 0.867
 Skewness 0.904

Log-transformed Statistics

Minimum of Log Data 2.23
 Maximum of Log Data 5.384
 Mean of log Data 3.891
 SD of log Data 1.116

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.881
 Shapiro Wilk Critical Value 0.881

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.899
 Shapiro Wilk Critical Value 0.881

Data appear Normal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

Assuming Lognormal Distribution

95% Student's-t UCL 109.5

95% H-UCL 218.7

95% UCLs (Adjusted for Skewness)

95% Chebyshev (MVUE) UCL 205.1
 97.5% Chebyshev (MVUE) UCL 256.7
 99% Chebyshev (MVUE) UCL 358

95% Adjusted-CLT UCL (Chen-1995) 111.8
 95% Modified-t UCL (Johnson-1978) 110.2

Gamma Distribution Test

Data Distribution

k star (bias corrected) 1.002
 Theta Star 78.35
 MLE of Mean 78.53
 MLE of Standard Deviation 78.44

Data appear Normal at 5% Significance Level

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nu star	30.07	Nonparametric Statistics
Approximate Chi Square Value (.05)	18.55	
Adjusted Level of Significance	0.0324	
Adjusted Chi Square Value	17.44	95% CLT UCL 107.4
Anderson-Darling Test Statistic	0.441	95% Jackknife UCL 109.5
Anderson-Darling 5% Critical Value	0.759	95% Standard Bootstrap UCL 106.2
Kolmogorov-Smirnov Test Statistic	0.18	95% Bootstrap-t UCL 114.3
Kolmogorov-Smirnov 5% Critical Value	0.227	95% Hall's Bootstrap UCL 115.8
Data appear Gamma Distributed at 5% Significance Level		95% Percentile Bootstrap UCL 107.3
Assuming Gamma Distribution		95% BCA Bootstrap UCL 111.1
95% Approximate Gamma UCL	127.3	95% Chebyshev(Mean, Sd) UCL 155.1
95% Adjusted Gamma UCL	135.4	97.5% Chebyshev(Mean, Sd) UCL 188.3
Potential UCL to Use		99% Chebyshev(Mean, Sd) UCL 253.4
		Use 95% Student's-t UCL 109.5

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). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics	
Number of Valid Observations	15
Number of Distinct Observations	
	15
Raw Statistics	
Minimum	220
Maximum	578
Mean	350.9
Median	318
SD	106.4
Std. Error of Mean	27.48
Coefficient of Variation	0.303
Skewness	1.234
Log-transformed Statistics	
Minimum of Log Data	5.394
Maximum of Log Data	6.36
Mean of log Data	5.822
SD of log Data	0.279
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic	0.865
Shapiro Wilk Critical Value	0.881
Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.937
Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level	

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Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 399.3	95% H-UCL 403.6
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 461.3
95% Adjusted-CLT UCL (Chen-1995) 405.5	97.5% Chebyshev (MVUE) UCL 509.4
95% Modified-t UCL (Johnson-1978) 400.8	99% Chebyshev (MVUE) UCL 603.8
Gamma Distribution Test	Data Distribution
k star (bias corrected) 10.65	Data appear Gamma Distributed at 5% Significance Level
Theta Star 32.94	
MLE of Mean 350.9	
MLE of Standard Deviation 107.5	
nu star 319.6	
Approximate Chi Square Value (.05) 279.2	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 396.1
Adjusted Chi Square Value 274.5	95% Jackknife UCL 399.3
Anderson-Darling Test Statistic 0.509	95% Standard Bootstrap UCL 395
Anderson-Darling 5% Critical Value 0.736	95% Bootstrap-t UCL 420.2
Kolmogorov-Smirnov Test Statistic 0.153	95% Hall's Bootstrap UCL 456.3
Kolmogorov-Smirnov 5% Critical Value 0.221	95% Percentile Bootstrap UCL 396.1
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 403.5
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 470.7
95% Approximate Gamma UCL 401.7	97.5% Chebyshev(Mean, Sd) UCL 522.6
95% Adjusted Gamma UCL 408.5	99% Chebyshev(Mean, Sd) UCL 624.4
Potential UCL to Use	Use 95% Approximate Gamma UCL 401.7

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). For additional insight, the user may want to consult a statistician.

Mercury

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 15
Raw Statistics	
Minimum 0.0064	Minimum of Log Data -5.051
Maximum 0.8	Maximum of Log Data -0.223

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Mean 0.211	Mean of log Data -2.393
Median 0.093	SD of log Data 1.493
SD 0.25	
Std. Error of Mean 0.0645	
Coefficient of Variation 1.182	
Skewness 1.276	
Relevant UCL Statistics	
Normal Distribution Test	Lognormal Distribution Test
Shapiro Wilk Test Statistic 0.785	Shapiro Wilk Test Statistic 0.955
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution	Assuming Lognormal Distribution
95% Student's-t UCL 0.325	95% H-UCL 1.169
95% UCLs (Adjusted for Skewness)	95% Chebyshev (MVUE) UCL 0.71
95% Adjusted-CLT UCL (Chen-1995) 0.34	97.5% Chebyshev (MVUE) UCL 0.912
95% Modified-t UCL (Johnson-1978) 0.328	99% Chebyshev (MVUE) UCL 1.309
Gamma Distribution Test	Data Distribution
k star (bias corrected) 0.619	Data appear Gamma Distributed at 5% Significance Level
Theta Star 0.342	
MLE of Mean 0.211	
MLE of Standard Deviation 0.269	
nu star 18.56	
Approximate Chi Square Value (.05) 9.794	
Adjusted Level of Significance 0.0324	Nonparametric Statistics
Adjusted Chi Square Value 9.018	95% CLT UCL 0.317
Anderson-Darling Test Statistic 0.425	95% Jackknife UCL 0.325
Anderson-Darling 5% Critical Value 0.777	95% Standard Bootstrap UCL 0.31
Kolmogorov-Smirnov Test Statistic 0.178	95% Bootstrap-t UCL 0.36
Kolmogorov-Smirnov 5% Critical Value 0.231	95% Hall's Bootstrap UCL 0.322
Data appear Gamma Distributed at 5% Significance Level	95% Percentile Bootstrap UCL 0.312
Assuming Gamma Distribution	95% BCA Bootstrap UCL 0.352
95% Approximate Gamma UCL 0.4	95% Chebyshev(Mean, Sd) UCL 0.492
95% Adjusted Gamma UCL 0.435	97.5% Chebyshev(Mean, Sd) UCL 0.614
Potential UCL to Use	99% Chebyshev(Mean, Sd) UCL 0.853
	Use 95% Approximate Gamma UCL 0.4

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

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These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Mercury, Inorganic Salts

General Statistics	
Number of Valid Observations 14	Number of Distinct Observations 14
Raw Statistics	
Minimum 0.0064	Minimum of Log Data -5.051
Maximum 0.8	Maximum of Log Data -0.223
Mean 0.22	Mean of log Data -2.395
Median 0.1	SD of log Data 1.549
SD 0.257	
Std. Error of Mean 0.0687	
Coefficient of Variation 1.169	
Skewness 1.169	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.797	Shapiro Wilk Test Statistic 0.949
Shapiro Wilk Critical Value 0.874	Shapiro Wilk Critical Value 0.874
Data not Normal at 5% Significance Level	
Lognormal Distribution Test	
Assuming Normal Distribution	
95% Student's-t UCL 0.341	95% H-UCL 1.539
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995) 0.356	95% Chebyshev (MVUE) UCL 0.786
95% Modified-t UCL (Johnson-1978) 0.345	97.5% Chebyshev (MVUE) UCL 1.014
	99% Chebyshev (MVUE) UCL 1.463
Assuming Lognormal Distribution	
Gamma Distribution Test	
k star (bias corrected) 0.589	
Theta Star 0.373	
MLE of Mean 0.22	
MLE of Standard Deviation 0.287	
nu star 16.48	
Data Distribution	
Approximate Chi Square Value (.05) 8.302	Data appear Gamma Distributed at 5% Significance Level
Adjusted Level of Significance 0.0312	
Adjusted Chi Square Value 7.543	
Nonparametric Statistics	
Anderson-Darling Test Statistic 0.416	95% CLT UCL 0.333
	95% Jackknife UCL 0.341
	95% Standard Bootstrap UCL 0.33
	95% Bootstrap-t UCL 0.372

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Anderson-Darling 5% Critical Value 0.776	95% Hall's Bootstrap UCL 0.334
Kolmogorov-Smirnov Test Statistic 0.157	95% Percentile Bootstrap UCL 0.338
Kolmogorov-Smirnov 5% Critical Value 0.239	95% BCA Bootstrap UCL 0.346
Data appear Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
95% Approximate Gamma UCL 0.436	95% Chebyshev(Mean, Sd) UCL 0.519
95% Adjusted Gamma UCL 0.48	97.5% Chebyshev(Mean, Sd) UCL 0.649
Potential UCL to Use	
Use 95% Approximate Gamma UCL 0.436	

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). For additional insight, the user may want to consult a statistician.

Vanadium

General Statistics	
Number of Valid Observations 15	Number of Distinct Observations 15
Raw Statistics	
Minimum 21.4	Minimum of Log Data 3.063
Maximum 34.9	Maximum of Log Data 3.552
Mean 27.81	Mean of log Data 3.314
Median 28.1	SD of log Data 0.157
SD 4.341	
Std. Error of Mean 1.121	
Coefficient of Variation 0.156	
Skewness 0.118	
Relevant UCL Statistics	
Normal Distribution Test	
Shapiro Wilk Test Statistic 0.949	Shapiro Wilk Test Statistic 0.949
Shapiro Wilk Critical Value 0.881	Shapiro Wilk Critical Value 0.881
Data appear Normal at 5% Significance Level	
Log-transformed Statistics	
Number of Valid Observations 15	Number of Distinct Observations 15
Minimum 21.4	Minimum of Log Data 3.063
Maximum 34.9	Maximum of Log Data 3.552
Mean 27.81	Mean of log Data 3.314
Median 28.1	SD of log Data 0.157
SD 4.341	
Std. Error of Mean 1.121	
Coefficient of Variation 0.156	
Skewness 0.118	
Lognormal Distribution Test	
Data appear Lognormal at 5% Significance Level	
95% Student's-t UCL 29.78	95% H-UCL 30
Assuming Normal Distribution	
95% Chebyshev (MVUE) UCL 32.75	95% Chebyshev (MVUE) UCL 32.75
95% Modified-t UCL (Johnson-1978) 29.79	97.5% Chebyshev (MVUE) UCL 34.88
Assuming Lognormal Distribution	
99% Chebyshev (MVUE) UCL 39.08	99% Chebyshev (MVUE) UCL 39.08

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Gamma Distribution Test	Data Distribution
k star (bias corrected) 35.02	Data appear Normal at 5% Significance Level
Theta Star 0.794	
MLE of Mean 27.81	
MLE of Standard Deviation 4.699	
nu star 1051	
Approximate Chi Square Value (.05) 976.4	Nonparametric Statistics
Adjusted Level of Significance 0.0324	95% CLT UCL 29.65
Adjusted Chi Square Value 967.6	95% Jackknife UCL 29.78
Anderson-Darling Test Statistic 0.334	95% Standard Bootstrap UCL 29.65
Anderson-Darling 5% Critical Value 0.734	95% Bootstrap-t UCL 29.8
Kolmogorov-Smirnov Test Statistic 0.147	95% Hall's Bootstrap UCL 29.6
Kolmogorov-Smirnov 5% Critical Value 0.221	95% Percentile Bootstrap UCL 29.53
Data appear Gamma Distributed at 5% Significance Level	95% BCA Bootstrap UCL 29.51
Assuming Gamma Distribution	95% Chebyshev(Mean, Sd) UCL 32.69
95% Approximate Gamma UCL 29.92	97.5% Chebyshev(Mean, Sd) UCL 34.81
95% Adjusted Gamma UCL 30.19	99% Chebyshev(Mean, Sd) UCL 38.96
Potential UCL to Use	Use 95% Student's-t UCL 29.78

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). For additional insight, the user may want to consult a statistician.