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## **APPENDIX O – ProUCL DATA OUTPUTS**

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General Background Statistics for Data Sets with Non-Detects

User Selected Options	
From File	ProUCL-Bkgd.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	90%
Different or Future K Values	1
Number of Bootstrap Operations	2000

Aluminum, Total

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
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Raw Statistics

Minimum	940	Log-Transformed Statistics	
Maximum	14000	Minimum	6.846
Second Largest	6400	Maximum	9.547
First Quartile	1950	Second Largest	8.764
Median	3000	First Quartile	7.576
Third Quartile	4400	Median	8.006
Mean	3884	Third Quartile	8.389
SD	3399	Mean	8.016
Coefficient of Variation	0.875	SD	0.7
Skewness	2.471		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.723	Shapiro Wilk Test Statistic	0.977
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution

95% UTL with 90% Coverage	11210	Assuming Lognormal Distribution	
95% UPL (t)	10171	95% UTL with 90% Coverage	13696
90% Percentile (z)	8240	95% UPL (t)	11058
95% Percentile (z)	9475	90% Percentile (z)	7429
99% Percentile (z)	11792	95% Percentile (z)	9581
		99% Percentile (z)	15442

Gamma Distribution Test

k star	1.713	Data Distribution Test	
Theta Star	2267	Data appear Gamma Distributed at 5% Significance Level	
MLE of Mean	3884		
MLE of Standard Deviation	2967		
nu star	44.54		

A-D Test Statistic

5% A-D Critical Value	0.398	Nonparametric Statistics	
K-S Test Statistic	0.742	90% Percentile	6060
5% K-S Critical Value	0.15	95% Percentile	9440
Data appear Gamma Distributed at 5% Significance Level	0.239	99% Percentile	13088

Assuming Gamma Distribution

90% Percentile	7837	95% UTL with 90% Coverage	14000
95% Percentile	9682	95% Percentile Bootstrap UTL with 90% Coverage	14000
99% Percentile	13815	95% BCA Bootstrap UTL with 90% Coverage	12480
		95% UPL	14000
		95% Chebyshev UPL	19261
95% WH Approx. Gamma UPL	10189	Upper Threshold Limit Based upon IQR	8075

95% HW Approx. Gamma UPL	10315
95% WH Approx. Gamma UTL with 90% Coverage	11863
95% HW Approx. Gamma UTL with 90% Coverage	12152

Antimony, Total

General Statistics

Number of Valid Data	13	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	12

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 Antimony, Total was not processed!

Arsenic, Total

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
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Raw Statistics

Raw Statistics	Log-Transformed Statistics		
Minimum	2.4	Minimum	0.875
Maximum	13	Maximum	2.565
Second Largest	7.2	Second Largest	1.974
First Quartile	3.4	First Quartile	1.224
Median	4.7	Median	1.548
Third Quartile	6.5	Third Quartile	1.872
Mean	5.308	Mean	1.564
SD	2.801	SD	0.461
Coefficient of Variation	0.528		
Skewness	1.823		

Background Statistics

Normal Distribution Test	Lognormal Distribution Test		
Shapiro Wilk Test Statistic	0.83	Shapiro Wilk Test Statistic	0.965
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution

Assuming Normal Distribution	Assuming Lognormal Distribution		
95% UTL with 90% Coverage	11.34	95% UTL with 90% Coverage	12.91
95% UPL (t)	10.49	95% UPL (t)	11.22
90% Percentile (z)	8.898	90% Percentile (z)	8.631
95% Percentile (z)	9.915	95% Percentile (z)	10.21
99% Percentile (z)	11.82	99% Percentile (z)	13.98

Gamma Distribution Test

Gamma Distribution Test	Data Distribution Test		
k star	3.835	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	1.384		
MLE of Mean	5.308		
MLE of Standard Deviation	2.71		
nu star	99.72		

A-D Test Statistic

A-D Test Statistic	Nonparametric Statistics		
5% A-D Critical Value	0.736	90% Percentile	7.16
K-S Test Statistic	0.145	95% Percentile	9.52

5% K-S Critical Value	0.237	99% Percentile	12.3
Data appear Gamma Distributed at 5% Significance Level			
Assuming Gamma Distribution		95% UTL with 90% Coverage	13
90% Percentile	8.941	95% Percentile Bootstrap UTL with 90% Coverage	13
95% Percentile	10.4	95% BCA Bootstrap UTL with 90% Coverage	13
99% Percentile	13.54	95% UPL	13
		95% Chebyshev UPL	17.98
95% WH Approx. Gamma UPL	10.76	Upper Threshold Limit Based upon IQR	11.15
95% HW Approx. Gamma UPL	10.85		
95% WH Approx. Gamma UTL with 90% Coverage	12.02		
95% HW Approx. Gamma UTL with 90% Coverage	12.2		

## Barium, Total

### General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
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### Raw Statistics

Minimum	6.8	Log-Transformed Statistics	
Maximum	73	Minimum	1.917
Second Largest	43	Maximum	4.29
First Quartile	14	Second Largest	3.761
Median	24	First Quartile	2.639
Third Quartile	28.5	Median	3.178
Mean	25.41	Third Quartile	3.35
SD	17.45	Mean	3.052
Coefficient of Variation	0.687	SD	0.622
Skewness	1.845		

### Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.825	Shapiro Wilk Test Statistic	0.979
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

### Assuming Normal Distribution

95% UTL with 90% Coverage	63.01	Assuming Lognormal Distribution	
95% UPL (t)	57.68	95% UTL with 90% Coverage	80.82
90% Percentile (z)	47.77	95% UPL (t)	66.84
95% Percentile (z)	54.11	90% Percentile (z)	46.95
99% Percentile (z)	66	95% Percentile (z)	58.85
		99% Percentile (z)	89.9

### Gamma Distribution Test

k star	2.273	Data Distribution Test	
Theta Star	11.18	Data appear Gamma Distributed at 5% Significance Level	
MLE of Mean	25.41		
MLE of Standard Deviation	16.85		
nu star	59.11		

### A-D Test Statistic

5% A-D Critical Value	0.314	Nonparametric Statistics	
K-S Test Statistic	0.162	90% Percentile	41
5% K-S Critical Value	0.238	95% Percentile	55
Data appear Gamma Distributed at 5% Significance Level		99% Percentile	69.4

### Assuming Gamma Distribution

95% UTL with 90% Coverage

73

90% Percentile	47.96	95% Percentile Bootstrap UTL with 90% Coverage	73
95% Percentile	57.9	95% BCA Bootstrap UTL with 90% Coverage	67
99% Percentile	79.79	95% UPL	73
		95% Chebyshev UPL	104.3
95% WH Approx. Gamma UPL	60.7	Upper Threshold Limit Based upon IQR	50.25
95% HW Approx. Gamma UPL	61.76		
95% WH Approx. Gamma UTL with 90% Coverage	69.59		
95% HW Approx. Gamma UTL with 90% Coverage	71.52		

## Beryllium, Total

### General Statistics

Number of Valid Data	13	Number of Detected Data	8
Number of Distinct Detected Data	8	Number of Non-Detect Data	5
		Percent Non-Detects	38.46%

### Raw Statistics

		Log-transformed Statistics	
Minimum Detected	0.059	Minimum Detected	-2.83
Maximum Detected	0.67	Maximum Detected	-0.4
Mean of Detected	0.198	Mean of Detected	-1.948
SD of Detected	0.204	SD of Detected	0.809
Minimum Non-Detect	0.04	Minimum Non-Detect	-3.219
Maximum Non-Detect	0.097	Maximum Non-Detect	-2.333

### Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended		Single Detection Limit Scenario	
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Non-Detect with Single DL	9
Observations < Largest ND are treated as NDs		Number treated as Detected with Single DL	4
		Single DL Non-Detect Percentage	69.23%

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.

### Background 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	0.911
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

DL/2 Substitution Method		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.135	Mean (Log Scale)	-2.537
SD	0.177	SD (Log Scale)	1.014
95% UTL 90% Coverage	0.516	95% UTL 90% Coverage	0.704
95% UPL (t)	0.462	95% UPL (t)	0.516
90% Percentile (z)	0.362	90% Percentile (z)	0.29
95% Percentile (z)	0.426	95% Percentile (z)	0.419
99% Percentile (z)	0.547	99% Percentile (z)	0.837

### Maximum Likelihood Estimate(MLE) Method

		Log ROS Method	
Mean	-0.0936	Mean in Original Scale	0.134
SD	0.368	SD in Original Scale	0.178
95% UTL with 90% Coverage	0.699	95% UTL with 90% Coverage	0.75
		95% BCA UTL with 90% Coverage	0.67

	95% Bootstrap (%) UTL with 90% Coverage	0.67
95% UPL (t)	0.587 95% UPL (t)	0.543
90% Percentile (z)	0.378 90% Percentile (z)	0.297
95% Percentile (z)	0.511 95% Percentile (z)	0.437
99% Percentile (z)	0.762 99% Percentile (z)	0.9
Gamma Distribution Test with Detected Values Only	Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.119 Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.177	
nu star	17.91	
A-D Test Statistic	0.56 Nonparametric Statistics	
5% A-D Critical Value	0.727 Kaplan-Meier (KM) Method	
K-S Test Statistic	0.231 Mean	0.146
5% K-S Critical Value	0.298 SD	0.164
Data appear Gamma Distributed at 5% Significance Level	SE of Mean	0.0485
	95% KM UTL with 90% Coverage	0.499
Assuming Gamma Distribution	95% KM Chebyshev UPL	0.886
Gamma ROS Statistics with Extrapolated Data	95% KM UPL (t)	0.449
Mean	0.162 90% Percentile (z)	0.356
Median	0.091 95% Percentile (z)	0.415
SD	0.17 99% Percentile (z)	0.527
k star	1.028	
Theta star	0.157 Gamma ROS Limits with Extrapolated Data	
Nu star	26.73 95% Wilson Hilferty (WH) Approx. Gamma UPL	0.513
95% Percentile of Chisquare (2k)	6.1 95% Hawkins Wixley (HW) Approx. Gamma UPL	0.542
	95% WH Approx. Gamma UTL with 90% Coverage	0.615
90% Percentile	0.37 95% HW Approx. Gamma UTL with 90% Coverage	0.665
95% Percentile	0.479	
99% Percentile	0.734	

Note: DL/2 is not a recommended method.

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#### Cadmium, Total

##### General Statistics

Number of Valid Data	13	Number of Detected Data	9
Number of Distinct Detected Data	8	Number of Non-Detect Data	4
		Percent Non-Detects	30.77%

##### Raw Statistics

		Log-transformed Statistics	
Minimum Detected	0.079	Minimum Detected	-2.538
Maximum Detected	0.92	Maximum Detected	-0.0834
Mean of Detected	0.228	Mean of Detected	-1.869
SD of Detected	0.271	SD of Detected	0.831
Minimum Non-Detect	0.05	Minimum Non-Detect	-2.996
Maximum Non-Detect	0.063	Maximum Non-Detect	-2.765

##### Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect with Single DL	4
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected with Single DL	9
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	30.77%

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.

Background Statistics

Normal Distribution Test with Detected Values Only	Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.612 Shapiro Wilk Test Statistic	0.814
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

DL/2 Substitution Method	Assuming Lognormal Distribution	
Mean	DL/2 Substitution Method	
SD	0.166 Mean (Log Scale)	-2.398
95% UTL 90% Coverage	0.242 SD (Log Scale)	1.07
95% UPL (t)	0.687 95% UTL 90% Coverage	0.912
90% Percentile (z)	0.613 95% UPL (t)	0.658
95% Percentile (z)	0.476 90% Percentile (z)	0.358
99% Percentile (z)	0.563 95% Percentile (z)	0.528
	0.728 99% Percentile (z)	1.095

Maximum Likelihood Estimate(MLE) Method

Mean	Log ROS Method	
SD	0.111 Mean in Original Scale	0.164
95% UTL with 90% Coverage	0.291 SD in Original Scale	0.243
	0.738 95% UTL with 90% Coverage	1.038
	95% BCA UTL with 90% Coverage	0.792
	95% Bootstrap (%) UTL with 90% Coverage	0.92
95% UPL (t)	0.649 95% UPL (t)	0.727
90% Percentile (z)	0.484 90% Percentile (z)	0.375
95% Percentile (z)	0.589 95% Percentile (z)	0.572
99% Percentile (z)	0.788 99% Percentile (z)	1.267

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	Data Distribution Test with Detected Values Only	
Theta Star	1.028 Data do not follow a Discernable Distribution (0.05)	
nu star	0.221	
	18.5	

A-D Test Statistic

5% A-D Critical Value	0.973 Nonparametric Statistics	
K-S Test Statistic	0.736 Kaplan-Meier (KM) Method	
5% K-S Critical Value	0.305 Mean	0.182
Data not Gamma Distributed at 5% Significance Level	0.284 SD	0.224
	SE of Mean	0.0658

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data	95% KM UTL with 90% Coverage	0.664
Mean	95% KM Chebyshev UPL	1.194
Median	95% KM UPL (t)	0.596
SD	0.167 90% Percentile (z)	0.469
k star	0.0822 95% Percentile (z)	0.55
Theta star	0.241 99% Percentile (z)	0.702
Nu star	0.828	
95% Percentile of Chisquare (2k)	0.202 Gamma ROS Limits with Extrapolated Data	
	21.54 95% Wilson Hilferty (WH) Approx. Gamma UPL	0.567
90% Percentile	5.308 95% Hawkins Wixley (HW) Approx. Gamma UPL	0.572
95% Percentile	95% WH Approx. Gamma UTL with 90% Coverage	0.692
99% Percentile	0.403 95% HW Approx. Gamma UTL with 90% Coverage	0.712
	0.536	
	0.848	

Note: DL/2 is not a recommended method.

General Statistics

Total Number of Observations 13 Number of Distinct Observations 11

Raw Statistics

	Log-Transformed Statistics	
Minimum	110 Minimum	4.7
Maximum	2300 Maximum	7.741
Second Largest	840 Second Largest	6.733
First Quartile	150 First Quartile	5.011
Median	200 Median	5.298
Third Quartile	355 Third Quartile	5.872
Mean	423.1 Mean	5.596
SD	595.2 SD	0.836
Coefficient of Variation	1.407	
Skewness	3.055	

Background Statistics

Normal Distribution Test	Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.533 Shapiro Wilk Test Statistic	0.831
Shapiro Wilk Critical Value	0.866 Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level	Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution

	Assuming Lognormal Distribution	
95% UTL with 90% Coverage	1706 95% UTL with 90% Coverage	1634
95% UPL (t)	1524 95% UPL (t)	1265
90% Percentile (z)	1186 90% Percentile (z)	786.8
95% Percentile (z)	1402 95% Percentile (z)	1066
99% Percentile (z)	1808 99% Percentile (z)	1885

Gamma Distribution Test

	Data Distribution Test	
k star	1.011 Data do not follow a Discernable Distribution (0.05)	
Theta Star	418.5	
MLE of Mean	423.1	
MLE of Standard Deviation	420.8	
nu star	26.28	

A-D Test Statistic

	1.462 Nonparametric Statistics	
5% A-D Critical Value	0.754 90% Percentile	744
K-S Test Statistic	0.295 95% Percentile	1424
5% K-S Critical Value	0.242 99% Percentile	2125
Data not Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution

	95% UTL with 90% Coverage	2300
90% Percentile	971.6 95% Percentile Bootstrap UTL with 90% Coverage	2300
95% Percentile	1263 95% BCA Bootstrap UTL with 90% Coverage	2008
99% Percentile	1938 95% UPL	2300
	95% Chebyshev UPL	3115
95% WH Approx. Gamma UPL	1318 Upper Threshold Limit Based upon IQR	662.5
95% HW Approx. Gamma UPL	1299	
95% WH Approx. Gamma UTL with 90% Coverage	1587	
95% HW Approx. Gamma UTL with 90% Coverage	1586	

Chromium, Total

General Statistics

Total Number of Observations 13 Number of Distinct Observations 13

Raw Statistics

Log-Transformed Statistics



Minimum	2.4	Minimum	0.875
Maximum	11	Maximum	2.398
Second Largest	9.6	Second Largest	2.262
First Quartile	4	First Quartile	1.386
Median	4.8	Median	1.569
Third Quartile	6.4	Third Quartile	1.856
Mean	5.685	Mean	1.65
SD	2.557	SD	0.435
Coefficient of Variation	0.45		
Skewness	0.957		

#### Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.911	Shapiro Wilk Test Statistic	0.975
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

95% UTL with 90% Coverage	11.2	95% UTL with 90% Coverage	13.29
95% UPL (t)	10.41	95% UPL (t)	11.63
90% Percentile (z)	8.962	90% Percentile (z)	9.088
95% Percentile (z)	9.891	95% Percentile (z)	10.64
99% Percentile (z)	11.63	99% Percentile (z)	14.32

#### Gamma Distribution Test

k star	4.533	Data appear Normal at 5% Significance Level	
Theta Star	1.254		
MLE of Mean	5.685		
MLE of Standard Deviation	2.67		
nu star	117.9		

#### A-D Test Statistic

5% A-D Critical Value	0.736	90% Percentile	9.34
K-S Test Statistic	0.14	95% Percentile	10.16
5% K-S Critical Value	0.237	99% Percentile	10.83
Data appear Gamma Distributed at 5% Significance Level			

#### Assuming Gamma Distribution

		95% UTL with 90% Coverage	11
90% Percentile	9.261	95% Percentile Bootstrap UTL with 90% Coverage	11
95% Percentile	10.67	95% BCA Bootstrap UTL with 90% Coverage	10.72
99% Percentile	13.65	95% UPL	11
		95% Chebyshev UPL	17.25
95% WH Approx. Gamma UPL	11.01	Upper Threshold Limit Based upon IQR	10
95% HW Approx. Gamma UPL	11.14		
95% WH Approx. Gamma UTL with 90% Coverage	12.22		
95% HW Approx. Gamma UTL with 90% Coverage	12.43		

#### Cobalt, Total

##### General Statistics

Total Number of Observations	13	Number of Distinct Observations	12
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##### Raw Statistics

Minimum	0.32	Minimum	-1.139
Maximum	8.5	Maximum	2.14
Second Largest	2.1	Second Largest	0.742
First Quartile	0.49	First Quartile	-0.713

##### Log-Transformed Statistics

Median	1 Median	0
Third Quartile	1.4 Third Quartile	0.336
Mean	1.563 Mean	0.00113
SD	2.157 SD	0.865
Coefficient of Variation	1.38	
Skewness	3.207	

#### Background Statistics

Normal Distribution Test	Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.543 Shapiro Wilk Test Statistic	0.92
Shapiro Wilk Critical Value	0.866 Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level	

#### Assuming Normal Distribution

95% UTL with 90% Coverage	6.21	95% UTL with 90% Coverage	6.457
95% UPL (t)	5.552	95% UPL (t)	4.958
90% Percentile (z)	4.327	90% Percentile (z)	3.033
95% Percentile (z)	5.11	95% Percentile (z)	4.153
99% Percentile (z)	6.58	99% Percentile (z)	7.488

#### Assuming Lognormal Distribution

#### Gamma Distribution Test

k star	1.023	Data Follow Appr. Gamma Distribution at 5% Significance Level
Theta Star	1.528	
MLE of Mean	1.563	
MLE of Standard Deviation	1.546	
nu star	26.59	

#### Data Distribution Test

A-D Test Statistic	0.891	Nonparametric Statistics	
5% A-D Critical Value	0.754	90% Percentile	2.06
K-S Test Statistic	0.197	95% Percentile	4.66
5% K-S Critical Value	0.242	99% Percentile	7.732
Data follow Appx. Gamma Distribution at 5% Significance Level			

#### Assuming Gamma Distribution

95% UTL with 90% Coverage		8.5	
90% Percentile	3.579	95% Percentile Bootstrap UTL with 90% Coverage	8.5
95% Percentile	4.645	95% BCA Bootstrap UTL with 90% Coverage	7.22
99% Percentile	7.117	95% UPL	8.5
		95% Chebyshev UPL	11.32
95% WH Approx. Gamma UPL	4.863	Upper Threshold Limit Based upon IQR	2.765
95% HW Approx. Gamma UPL	4.837		
95% WH Approx. Gamma UTL with 90% Coverage	5.849		
95% HW Approx. Gamma UTL with 90% Coverage	5.905		

#### Copper, Total

#### General Statistics

Total Number of Observations	13	Number of Distinct Observations	12
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#### Raw Statistics

Minimum	2.9	Minimum	1.065
Maximum	23	Maximum	3.135
Second Largest	19	Second Largest	2.944
First Quartile	4.7	First Quartile	1.548
Median	5.3	Median	1.668
Third Quartile	6.4	Third Quartile	1.856
Mean	7.804	Mean	1.827
SD	6.343	SD	0.655

#### Log-Transformed Statistics

Coefficient of Variation	0.813		
Skewness	1.758		
Background Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.724	Shapiro Wilk Test Statistic	0.881
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	21.47	95% UTL with 90% Coverage	25.51
95% UPL (t)	19.54	95% UPL (t)	20.88
90% Percentile (z)	15.93	90% Percentile (z)	14.39
95% Percentile (z)	18.24	95% Percentile (z)	18.26
99% Percentile (z)	22.56	99% Percentile (z)	28.54
Gamma Distribution Test			
k star	1.861	Data appear Lognormal at 5% Significance Level	
Theta Star	4.193		
MLE of Mean	7.804		
MLE of Standard Deviation	5.721		
nu star	48.39		
A-D Test Statistic			
5% A-D Critical Value	0.983	Nonparametric Statistics	
K-S Test Statistic	0.742	90% Percentile	17.6
5% K-S Critical Value	0.298	95% Percentile	20.6
Data not Gamma Distributed at 5% Significance Level	0.239	99% Percentile	22.52
Assuming Gamma Distribution			
		95% UTL with 90% Coverage	23
90% Percentile	15.44	95% Percentile Bootstrap UTL with 90% Coverage	23
95% Percentile	18.94	95% BCA Bootstrap UTL with 90% Coverage	23
99% Percentile	26.74	95% UPL	23
		95% Chebyshev UPL	36.49
95% WH Approx. Gamma UPL	19.92	Upper Threshold Limit Based upon IQR	8.95
95% HW Approx. Gamma UPL	20.09		
95% WH Approx. Gamma UTL with 90% Coverage	23.1		
95% HW Approx. Gamma UTL with 90% Coverage	23.53		

Iron, Total			
General Statistics			
Total Number of Observations	13	Number of Distinct Observations	12
Raw Statistics		Log-Transformed Statistics	
Minimum	2400	Minimum	7.783
Maximum	26000	Maximum	10.17
Second Largest	12000	Second Largest	9.393
First Quartile	4600	First Quartile	8.434
Median	6100	Median	8.716
Third Quartile	9600	Third Quartile	9.17
Mean	7900	Mean	8.777
SD	6128	SD	0.622
Coefficient of Variation	0.776		
Skewness	2.396		
Background Statistics			

Normal Distribution Test	Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.737 Shapiro Wilk Test Statistic	0.965
Shapiro Wilk Critical Value	0.866 Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level	Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution	Assuming Lognormal Distribution	
95% UTL with 90% Coverage	21106 95% UTL with 90% Coverage	24776
95% UPL (t)	19234 95% UPL (t)	20487
90% Percentile (z)	15753 90% Percentile (z)	14387
95% Percentile (z)	17980 95% Percentile (z)	18037
99% Percentile (z)	22156 99% Percentile (z)	27564

Gamma Distribution Test	Data Distribution Test	
k star	2.113 Data appear Gamma Distributed at 5% Significance Level	
Theta Star	3740	
MLE of Mean	7900	
MLE of Standard Deviation	5435	
nu star	54.93	

A-D Test Statistic	0.449 Nonparametric Statistics	
5% A-D Critical Value	0.74 90% Percentile	11600
K-S Test Statistic	0.193 95% Percentile	17600
5% K-S Critical Value	0.239 99% Percentile	24320
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution	95% UTL with 90% Coverage	26000
90% Percentile	15169 95% Percentile Bootstrap UTL with 90% Coverage	26000
95% Percentile	18418 95% BCA Bootstrap UTL with 90% Coverage	26000
99% Percentile	25603 95% UPL	26000
	95% Chebyshev UPL	35619
95% WH Approx. Gamma UPL	19276 Upper Threshold Limit Based upon IQR	17100
95% HW Approx. Gamma UPL	19459	
95% WH Approx. Gamma UTL with 90% Coverage	22182	
95% HW Approx. Gamma UTL with 90% Coverage	22611	

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Lead, Total

General Statistics		
Total Number of Observations	13 Number of Distinct Observations	12

Raw Statistics	Log-Transformed Statistics	
Minimum	25 Minimum	3.219
Maximum	260 Maximum	5.561
Second Largest	170 Second Largest	5.136
First Quartile	39 First Quartile	3.664
Median	42 Median	3.738
Third Quartile	51 Third Quartile	3.932
Mean	74.46 Mean	4.016
SD	71.07 SD	0.727
Coefficient of Variation	0.954	
Skewness	1.933	

Background Statistics		
Normal Distribution Test	Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.678 Shapiro Wilk Test Statistic	0.828
Shapiro Wilk Critical Value	0.866 Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level	Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution	Assuming Lognormal Distribution	
95% UTL with 90% Coverage	227.6	95% UTL with 90% Coverage 266.1
95% UPL (t)	205.9	95% UPL (t) 213.1
90% Percentile (z)	165.5	90% Percentile (z) 141
95% Percentile (z)	191.4	95% Percentile (z) 183.6
99% Percentile (z)	239.8	99% Percentile (z) 301.4

Gamma Distribution Test	Data Distribution Test	
k star	1.474	Data do not follow a Discernable Distribution (0.05)
Theta Star	50.51	
MLE of Mean	74.46	
MLE of Standard Deviation	61.33	
nu star	38.33	

A-D Test Statistic	1.42 Nonparametric Statistics	
5% A-D Critical Value	0.745	90% Percentile 164
K-S Test Statistic	0.36	95% Percentile 206
5% K-S Critical Value	0.24	99% Percentile 249.2

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution	95% UTL with 90% Coverage	260
90% Percentile	155.8	95% Percentile Bootstrap UTL with 90% Coverage 260
95% Percentile	195.1	95% BCA Bootstrap UTL with 90% Coverage 242
99% Percentile	283.9	95% UPL 260
		95% Chebyshev UPL 395.9
95% WH Approx. Gamma UPL	206.2	Upper Threshold Limit Based upon IQR 69
95% HW Approx. Gamma UPL	207.2	
95% WH Approx. Gamma UTL with 90% Coverage	242.3	
95% HW Approx. Gamma UTL with 90% Coverage	246.5	

## Magnesium, Total

General Statistics		
Total Number of Observations	13	Number of Distinct Observations 12

Raw Statistics	Log-Transformed Statistics	
Minimum	59	Minimum 4.078
Maximum	590	Maximum 6.38
Second Largest	350	Second Largest 5.858
First Quartile	120	First Quartile 4.787
Median	150	Median 5.011
Third Quartile	230	Third Quartile 5.438
Mean	199.7	Mean 5.117
SD	140.8	SD 0.604
Coefficient of Variation	0.705	
Skewness	2.013	

Background Statistics	Lognormal Distribution Test	
Normal Distribution Test	0.795	Shapiro Wilk Test Statistic 0.976
Shapiro Wilk Test Statistic	0.866	Shapiro Wilk Critical Value 0.866
Shapiro Wilk Critical Value		Data appear Lognormal at 5% Significance Level
Data not Normal at 5% Significance Level		

Assuming Normal Distribution	Assuming Lognormal Distribution	
95% UTL with 90% Coverage	503	95% UTL with 90% Coverage 613
95% UPL (t)	460	95% UPL (t) 509.8

90% Percentile (z)	380.1	90% Percentile (z)	361.8
95% Percentile (z)	431.2	95% Percentile (z)	450.5
99% Percentile (z)	527.1	99% Percentile (z)	679.8

Gamma Distribution Test

k star	2.314	Data appear Gamma Distributed at 5% Significance Level
Theta Star	86.3	
MLE of Mean	199.7	
MLE of Standard Deviation	131.3	
nu star	60.16	

Data Distribution Test

A-D Test Statistic	0.384	Nonparametric Statistics	
5% A-D Critical Value	0.739	90% Percentile	332
K-S Test Statistic	0.182	95% Percentile	446
5% K-S Critical Value	0.238	99% Percentile	561.2

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

		95% UTL with 90% Coverage	590
90% Percentile	375.4	95% Percentile Bootstrap UTL with 90% Coverage	590
95% Percentile	452.6	95% BCA Bootstrap UTL with 90% Coverage	590
99% Percentile	622.4	95% UPL	590
		95% Chebyshev UPL	836.4
95% WH Approx. Gamma UPL	473.6	Upper Threshold Limit Based upon IQR	395
95% HW Approx. Gamma UPL	479.6		
95% WH Approx. Gamma UTL with 90% Coverage	542.4		
95% HW Approx. Gamma UTL with 90% Coverage	554.5		

Mercury, Total

General Statistics

Total Number of Observations	13	Number of Distinct Observations	12
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Raw Statistics

Minimum	0.022	Minimum	-3.817
Maximum	0.51	Maximum	-0.673
Second Largest	0.38	Second Largest	-0.968
First Quartile	0.057	First Quartile	-2.865
Median	0.0842	Median	-2.475
Third Quartile	0.1	Third Quartile	-2.303
Mean	0.14	Mean	-2.421
SD	0.154	SD	0.953
Coefficient of Variation	1.1		
Skewness	1.671		

Log-Transformed Statistics

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.718	Shapiro Wilk Test Statistic	0.923
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution

95% UTL with 90% Coverage	0.473	95% UTL with 90% Coverage	0.693
95% UPL (t)	0.426	95% UPL (t)	0.518
90% Percentile (z)	0.338	90% Percentile (z)	0.302
95% Percentile (z)	0.394	95% Percentile (z)	0.426
99% Percentile (z)	0.499	99% Percentile (z)	0.816

Assuming Lognormal Distribution

Gamma Distribution Test	Data Distribution Test	
k star	1.002 Data appear Lognormal at 5% Significance Level	
Theta Star	0.14	
MLE of Mean	0.14	
MLE of Standard Deviation	0.14	
nu star	26.05	
A-D Test Statistic	0.886 Nonparametric Statistics	
5% A-D Critical Value	0.754 90% Percentile	0.364
K-S Test Statistic	0.287 95% Percentile	0.432
5% K-S Critical Value	0.242 99% Percentile	0.494
Data not Gamma Distributed at 5% Significance Level		
Assuming Gamma Distribution	95% UTL with 90% Coverage	0.51
90% Percentile	0.323 95% Percentile Bootstrap UTL with 90% Coverage	0.51
95% Percentile	0.42 95% BCA Bootstrap UTL with 90% Coverage	0.484
99% Percentile	0.645 95% UPL	0.51
	95% Chebyshev UPL	0.838
95% WH Approx. Gamma UPL	0.451 Upper Threshold Limit Based upon IQR	0.165
95% HW Approx. Gamma UPL	0.461	
95% WH Approx. Gamma UTL with 90% Coverage	0.543	
95% HW Approx. Gamma UTL with 90% Coverage	0.566	

Molybdenum, Total

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

	Log-transformed Statistics	
Minimum Detected	0.445 Minimum Detected	-0.81
Maximum Detected	3 Maximum Detected	1.099
Mean of Detected	0.949 Mean of Detected	-0.237
SD of Detected	0.74 SD of Detected	0.577
Minimum Non-Detect	0.32 Minimum Non-Detect	-1.139
Maximum Non-Detect	0.32 Maximum Non-Detect	-1.139

Background Statistics

Normal Distribution Test with Detected Values Only	Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.674 Shapiro Wilk Test Statistic	0.832
5% Shapiro Wilk Critical Value	0.859 5% Shapiro Wilk Critical Value	0.859
Data not Normal at 5% Significance Level	Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution

DL/2 Substitution Method	Assuming Lognormal Distribution	
Mean	DL/2 Substitution Method	
SD	0.888 Mean (Log Scale)	-0.36
	0.741 SD (Log Scale)	0.708
95% UTL 90% Coverage	2.485 95% UTL 90% Coverage	3.209
95% UPL (t)	2.259 95% UPL (t)	2.585
90% Percentile (z)	1.838 90% Percentile (z)	1.729
95% Percentile (z)	2.107 95% Percentile (z)	2.236
99% Percentile (z)	2.612 99% Percentile (z)	3.623

Maximum Likelihood Estimate(MLE) Method

Log ROS Method

Mean	0.867	Mean in Original Scale	0.892
SD	0.743	SD in Original Scale	0.737
95% UTL with 90% Coverage	2.47	95% UTL with 90% Coverage	2.983
		95% BCA UTL with 90% Coverage	2.7
		95% Bootstrap (%) UTL with 90% Coverage	3
95% UPL (t)	2.242	95% UPL (t)	2.435
90% Percentile (z)	1.82	90% Percentile (z)	1.669
95% Percentile (z)	2.09	95% Percentile (z)	2.125
99% Percentile (z)	2.597	99% Percentile (z)	3.343
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	2.197	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.432		
nu star	52.73		
A-D Test Statistic	1.143	Nonparametric Statistics	
5% A-D Critical Value	0.739	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.334	Mean	0.91
5% K-S Critical Value	0.248	SD	0.693
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.201
		95% KM UTL with 90% Coverage	2.405
Assuming Gamma Distribution		95% KM Chebyshev UPL	4.047
Gamma ROS Statistics with Extrapolated Data		95% KM UPL (t)	2.193
Mean	0.876	90% Percentile (z)	1.799
Median	0.65	95% Percentile (z)	2.051
SD	0.755	99% Percentile (z)	2.523
k star	0.29		
Theta star	3.024	Gamma ROS Limits with Extrapolated Data	
Nu star	7.534	95% Wilson Hilferty (WH) Approx. Gamma UPL	3.172
95% Percentile of Chisquare (2k)	2.681	95% Hawkins Wixley (HW) Approx. Gamma UPL	4.223
		95% WH Approx. Gamma UTL with 90% Coverage	3.858
90% Percentile	2.594	95% HW Approx. Gamma UTL with 90% Coverage	5.41
95% Percentile	4.052		
99% Percentile	7.858		

Note: DL/2 is not a recommended method.

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## Nickel, Total

### General Statistics

Total Number of Observations	13	Number of Distinct Observations	12
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### Raw Statistics

Minimum	1.3	Minimum	0.262
Maximum	9.6	Maximum	2.262
Second Largest	8.4	Second Largest	2.128
First Quartile	2.1	First Quartile	0.742
Median	2.3	Median	0.833
Third Quartile	3.2	Third Quartile	1.163
Mean	3.404	Mean	1.028
SD	2.619	SD	0.603
Coefficient of Variation	0.769		
Skewness	1.84		

### Background Statistics

#### Normal Distribution Test

Shapiro Wilk Test Statistic	0.706	Shapiro Wilk Test Statistic	0.874
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866

#### Lognormal Distribution Test



Data not Normal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

Assuming Lognormal Distribution

95% UTL with 90% Coverage	9.048	95% UTL with 90% Coverage	10.26
95% UPL (t)	8.248	95% UPL (t)	8.533
90% Percentile (z)	6.76	90% Percentile (z)	6.057
95% Percentile (z)	7.712	95% Percentile (z)	7.542
99% Percentile (z)	9.497	99% Percentile (z)	11.38

Gamma Distribution Test

Data Distribution Test

k star	2.126	Data appear Lognormal at 5% Significance Level	
Theta Star	1.601		
MLE of Mean	3.404		
MLE of Standard Deviation	2.335		
nu star	55.27		

A-D Test Statistic

1.085 Nonparametric Statistics

5% A-D Critical Value	0.74	90% Percentile	7.62
K-S Test Statistic	0.277	95% Percentile	8.88
5% K-S Critical Value	0.239	99% Percentile	9.456

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% UTL with 90% Coverage 9.6

90% Percentile	6.526	95% Percentile Bootstrap UTL with 90% Coverage	9.6
95% Percentile	7.921	95% BCA Bootstrap UTL with 90% Coverage	9.6
99% Percentile	11	95% UPL	9.6
		95% Chebyshev UPL	15.25
95% WH Approx. Gamma UPL	8.292	Upper Threshold Limit Based upon IQR	4.85
95% HW Approx. Gamma UPL	8.331		
95% WH Approx. Gamma UTL with 90% Coverage	9.542		
95% HW Approx. Gamma UTL with 90% Coverage	9.673		

Potassium, Total

General Statistics

Total Number of Observations	13	Number of Distinct Observations	11
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Raw Statistics

Log-Transformed Statistics

Minimum	130	Minimum	4.868
Maximum	430	Maximum	6.064
Second Largest	370	Second Largest	5.914
First Quartile	190	First Quartile	5.247
Median	270	Median	5.598
Third Quartile	340	Third Quartile	5.829
Mean	270	Mean	5.545
SD	88.41	SD	0.351
Coefficient of Variation	0.327		
Skewness	0.119		

Background Statistics

Lognormal Distribution Test

Normal Distribution Test			
Shapiro Wilk Test Statistic	0.975	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% UTL with 90% Coverage	460.5	95% UTL with 90% Coverage	545.1
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95% UPL (t)	433.5	95% UPL (t)	489.6
90% Percentile (z)	383.3	90% Percentile (z)	401.1
95% Percentile (z)	415.4	95% Percentile (z)	455.7
99% Percentile (z)	475.7	99% Percentile (z)	578.8

Gamma Distribution Test

k star	7.31
Theta Star	36.93
MLE of Mean	270
MLE of Standard Deviation	99.86
nu star	190.1

Data Distribution Test

7.31 Data appear Normal at 5% Significance Level

A-D Test Statistic

5% A-D Critical Value

K-S Test Statistic

5% K-S Critical Value

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

0.734 90% Percentile

0.131 95% Percentile

0.237 99% Percentile

364

394

422.8

Assuming Gamma Distribution

		<b>95% UTL with 90% Coverage</b>	<b>430</b>
90% Percentile	403.3	95% Percentile Bootstrap UTL with 90% Coverage	430
95% Percentile	452.4	95% BCA Bootstrap UTL with 90% Coverage	418
99% Percentile	554.6	95% UPL	430
		95% Chebyshev UPL	669.9
95% WH Approx. Gamma UPL	463.4	Upper Threshold Limit Based upon IQR	565
95% HW Approx. Gamma UPL	469		
95% WH Approx. Gamma UTL with 90% Coverage	504.7		
95% HW Approx. Gamma UTL with 90% Coverage	513.1		

Selenium, Total

General Statistics

Number of Valid Data	13	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	10
		Percent Non-Detects	76.92%

Raw Statistics

Minimum Detected	1.5	Minimum Detected	0.405
Maximum Detected	5.4	Maximum Detected	1.686
Mean of Detected	3.133	Mean of Detected	1.003
SD of Detected	2.026	SD of Detected	0.645
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	1.5	Maximum Non-Detect	0.405

Log-transformed Statistics

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended		Single Detection Limit Scenario	
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Non-Detect with Single DL	10
Observations < Largest ND are treated as NDs		Number treated as Detected with Single DL	3
		Single DL Non-Detect Percentage	76.92%

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.

Background Statistics

Normal Distribution Test with Detected Values Only  
 Shapiro Wilk Test Statistic  
 5% Shapiro Wilk Critical Value  
 Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only  
 0.927 Shapiro Wilk Test Statistic  
 0.767 5% Shapiro Wilk Critical Value  
 Data appear Lognormal at 5% Significance Level

0.987  
 0.767

Assuming Normal Distribution

DL/2 Substitution Method

Mean  
 SD  
 95% UTL 90% Coverage  
 95% UPL (t)  
 90% Percentile (z)  
 95% Percentile (z)  
 99% Percentile (z)

Assuming Lognormal Distribution

DL/2 Substitution Method

1.187 Mean (Log Scale)  
 1.386 SD (Log Scale)  
 4.173 95% UTL 90% Coverage  
 3.75 95% UPL (t)  
 2.962 90% Percentile (z)  
 3.466 95% Percentile (z)  
 4.41 99% Percentile (z)

-0.164  
 0.724  
 4.038  
 3.237  
 2.146  
 2.791  
 4.571

Maximum Likelihood Estimate(MLE) Method

Mean  
 SD  
 95% UTL with 90% Coverage  
  
 95% UPL (t)  
 90% Percentile (z)  
 95% Percentile (z)  
 99% Percentile (z)

Log ROS Method

-0.773 Mean in Original Scale  
 3.019 SD in Original Scale  
 5.734 95% UTL with 90% Coverage  
 95% BCA UTL with 90% Coverage  
 95% Bootstrap (%) UTL with 90% Coverage  
 4.811 95% UPL (t)  
 3.096 90% Percentile (z)  
 4.193 95% Percentile (z)  
 6.251 99% Percentile (z)

0.83  
 1.553  
 6.124  
 5.4  
 5.4  
 3.882  
 1.662  
 2.859  
 7.91

Gamma Distribution Test with Detected Values Only

k star (bias corrected)  
 Theta Star  
 nu star

N/A  
 N/A  
 N/A

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

A-D Test Statistic

5% A-D Critical Value  
 K-S Test Statistic  
 5% K-S Critical Value

N/A  
 N/A  
 N/A

Nonparametric Statistics  
 Kaplan-Meier (KM) Method

Mean  
 SD  
 SE of Mean

1.877  
 1.051  
 0.357

Data not Gamma Distributed at 5% Significance Level

95% KM UTL with 90% Coverage

4.142

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean  
 Median  
 SD  
 k star  
 Theta star  
 Nu star  
 95% Percentile of Chisquare (2k)

N/A  
 N/A  
 N/A  
 N/A  
 N/A  
 N/A  
 N/A

95% KM Chebyshev UPL  
 95% KM UPL (t)  
 90% Percentile (z)  
 95% Percentile (z)  
 99% Percentile (z)

6.632  
 3.821  
 3.224  
 3.606  
 4.322

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL  
 95% Hawkins Wixley (HW) Approx. Gamma UPL  
 95% WH Approx. Gamma UTL with 90% Coverage  
 95% HW Approx. Gamma UTL with 90% Coverage

N/A  
 N/A  
 N/A  
 N/A

90% Percentile  
 95% Percentile  
 99% Percentile

N/A  
 N/A  
 N/A

Note: DL/2 is not a recommended method.

Silver, Total

General Statistics

Number of Valid Data

13 Number of Detected Data

11

Number of Distinct Detected Data	11	Number of Non-Detect Data	2
		Percent Non-Detects	15.38%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.2	Minimum Detected	-1.609
Maximum Detected	0.87	Maximum Detected	-0.139
Mean of Detected	0.382	Mean of Detected	-1.076
SD of Detected	0.21	SD of Detected	0.483
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.21	Maximum Non-Detect	-1.561
Data with Multiple Detection Limits		Single Detection Limit Scenario	
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect with Single DL	3
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected with Single DL	10
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	23.08%
Background Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.823	Shapiro Wilk Test Statistic	0.911
5% Shapiro Wilk Critical Value	0.85	5% 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	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.339	Mean (Log Scale)	-1.265
SD	0.219	SD (Log Scale)	0.638
95% UTL 90% Coverage	0.811	95% UTL 90% Coverage	1.116
95% UPL (t)	0.744	95% UPL (t)	0.918
90% Percentile (z)	0.62	90% Percentile (z)	0.639
95% Percentile (z)	0.699	95% Percentile (z)	0.806
99% Percentile (z)	0.849	99% Percentile (z)	1.244
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.321	Mean in Original Scale	0.342
SD	0.236	SD in Original Scale	0.216
95% UTL with 90% Coverage	0.829	95% UTL with 90% Coverage	1.043
		95% BCA UTL with 90% Coverage	0.87
		95% Bootstrap (%) UTL with 90% Coverage	0.87
95% UPL (t)	0.757	95% UPL (t)	0.87
90% Percentile (z)	0.623	90% Percentile (z)	0.621
95% Percentile (z)	0.709	95% Percentile (z)	0.77
99% Percentile (z)	0.87	99% Percentile (z)	1.154
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	3.345	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.114		
nu star	73.59		
A-D Test Statistic	0.549	Nonparametric Statistics	
5% A-D Critical Value	0.732	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.218	Mean	0.354
5% K-S Critical Value	0.256	SD	0.196
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0569
		95% KM UTL with 90% Coverage	0.776
Assuming Gamma Distribution		95% KM Chebyshev UPL	1.239
Gamma ROS Statistics with Extrapolated Data		95% KM UPL (t)	0.716
Mean	0.342	90% Percentile (z)	0.605
Median	0.27	95% Percentile (z)	0.676
SD	0.217	99% Percentile (z)	0.809

k star	2.341		
Theta star	0.146	Gamma ROS Limits with Extrapolated Data	
Nu star	60.88	95% Wilson Hilferty (WH) Approx. Gamma UPL	0.809
95% Percentile of Chisquare (2k)	10.58	95% Hawkins Wixley (HW) Approx. Gamma UPL	0.829
		95% WH Approx. Gamma UTL with 90% Coverage	0.926
90% Percentile	0.64	95% HW Approx. Gamma UTL with 90% Coverage	0.959
95% Percentile	0.771		
99% Percentile	1.059		

Note: DL/2 is not a recommended method.

#### Sodium, Total

##### General Statistics

Number of Valid Data	13	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	13

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 Sodium, Total was not processed!

#### Thallium, Total

##### General Statistics

Number of Valid Data	13	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	13

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, Total was not processed!

#### Vanadium, Total

##### General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
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##### Raw Statistics

		Log-Transformed Statistics	
Minimum	6.7	Minimum	1.902
Maximum	28	Maximum	3.332
Second Largest	24	Second Largest	3.178
First Quartile	11	First Quartile	2.398
Median	14	Median	2.639
Third Quartile	18	Third Quartile	2.89
Mean	15.35	Mean	2.655
SD	6.192	SD	0.408
Coefficient of Variation	0.403		
Skewness	0.695		

##### Background Statistics

Normal Distribution Test	Lognormal Distribution Test
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Shapiro Wilk Test Statistic	0.957	Shapiro Wilk Test Statistic	0.99
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% UTL with 90% Coverage	28.69	95% UTL with 90% Coverage	34.29
95% UPL (t)	26.8	95% UPL (t)	30.27
90% Percentile (z)	23.28	90% Percentile (z)	24.01
95% Percentile (z)	25.53	95% Percentile (z)	27.85
99% Percentile (z)	29.75	99% Percentile (z)	36.78
Gamma Distribution Test		Data Distribution Test	
k star	5.278	Data appear Normal at 5% Significance Level	
Theta Star	2.908		
MLE of Mean	15.35		
MLE of Standard Deviation	6.68		
nu star	137.2		
A-D Test Statistic	0.124	Nonparametric Statistics	
5% A-D Critical Value	0.735	90% Percentile	23.4
K-S Test Statistic	0.0809	95% Percentile	25.6
5% K-S Critical Value	0.237	99% Percentile	27.52
Data appear Gamma Distributed at 5% Significance Level			
Assuming Gamma Distribution		95% UTL with 90% Coverage	
90% Percentile	24.29	95% Percentile Bootstrap UTL with 90% Coverage	28
95% Percentile	27.72	95% BCA Bootstrap UTL with 90% Coverage	27.2
99% Percentile	34.97	95% UPL	28
		95% Chebyshev UPL	43.35
95% WH Approx. Gamma UPL	28.55	Upper Threshold Limit Based upon IQR	28.5
95% HW Approx. Gamma UPL	28.9		
95% WH Approx. Gamma UTL with 90% Coverage	31.47		
95% HW Approx. Gamma UTL with 90% Coverage	32.04		

Zinc, Total			
General Statistics			
Total Number of Observations	13	Number of Distinct Observations	10
Raw Statistics		Log-Transformed Statistics	
Minimum	11	Minimum	2.398
Maximum	93	Maximum	4.533
Second Largest	67	Second Largest	4.205
First Quartile	14	First Quartile	2.639
Median	21	Median	3.045
Third Quartile	28	Third Quartile	3.332
Mean	28.88	Mean	3.128
SD	24.57	SD	0.657
Coefficient of Variation	0.851		
Skewness	1.976		
Background Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.712	Shapiro Wilk Test Statistic	0.874
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution	Assuming Lognormal Distribution		
95% UTL with 90% Coverage	81.83	95% UTL with 90% Coverage	94.09
95% UPL (t)	74.32	95% UPL (t)	76.98
90% Percentile (z)	60.37	90% Percentile (z)	52.99
95% Percentile (z)	69.29	95% Percentile (z)	67.28
99% Percentile (z)	86.03	99% Percentile (z)	105.3

Gamma Distribution Test	Data Distribution Test		
k star	1.802	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	16.03		
MLE of Mean	28.88		
MLE of Standard Deviation	21.52		
nu star	46.85		

A-D Test Statistic	0.984	Nonparametric Statistics	
5% A-D Critical Value	0.742	90% Percentile	61.6
K-S Test Statistic	0.222	95% Percentile	77.4
5% K-S Critical Value	0.239	99% Percentile	89.88
Data follow Appx. Gamma Distribution at 5% Significance Level			

Assuming Gamma Distribution	95% UTL with 90% Coverage		93
90% Percentile	57.58	95% Percentile Bootstrap UTL with 90% Coverage	93
95% Percentile	70.84	95% BCA Bootstrap UTL with 90% Coverage	87.8
99% Percentile	100.4	95% UPL	93
		95% Chebyshev UPL	140
95% WH Approx. Gamma UPL	74.47	Upper Threshold Limit Based upon IQR	49
95% HW Approx. Gamma UPL	74.86		
95% WH Approx. Gamma UTL with 90% Coverage	86.48		
95% HW Approx. Gamma UTL with 90% Coverage	87.84		