From File: PHCs Input.wst

### Summary Statistics for Raw Full Data Sets

| Variable | NumObs | Minimum | Maximum | Mean | Median | Variance | SD | MAD/0.675 | Skewness | Kurtosis | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_LEPHw | 145 | 50.43 | 490 | 156.1 | N/A | N/A | 67.62 | 46.33 | 1.828 | 5.447 | 0.433 |
| LnROS_HEPHw | 149 | 46.1 | 2580 | 575.5 | 410 | 277060 | 526.4 | 324.5 | 1.917 | 3.809 | 0.915 |
| LnROS_EPHw(C10-<C19) 1 | 145 | 50.43 | 490 | 156.1 | N/A | N/A | 67.62 | 46.33 | 1.828 | 5.447 | 0.433 |
| LnROS_EPHw(C10-<C19) 1(Silica gel) | 145 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_EPHw(C19-C32) | 149 | 46.08 | 2580 | 575.5 | 410 | 277132 | 526.4 | 324.6 | 1.916 | 3.805 | 0.915 |
| LnROS_EPHw(C19-C32)(Silica gel) | 149 | 42.31 | 1350 | 316.9 | 246.4 | 56509 | 237.7 | 164.3 | 1.794 | 3.751 | 0.75 |
| LnROS_VPHw | 149 | 0.592 | 570 | 50.75 | 20.06 | 7363 | 85.81 | 22.52 | 3.367 | 13 | 1.691 |
| LnROS_VHw (C6-C10) | 149 | 1.094 | 850 | 69.81 | 30.38 | 12285 | 110.8 | 33.19 | 3.616 | 17.88 | 1.588 |
| LnROS_Benzene | 149 | 0.0003009 | 280 | 13.94 | 0.548 | 1828 | 42.75 | 0.786 | 4.682 | 23.37 | 3.067 |
| LnROS_Ethylbenzene | 149 | 1.713E-06 | 3.55 | 0.0705 | 0.00223 | 0.114 | 0.338 | 0.00323 | 8.36 | 79.55 | 4.793 |
| LnROS_Styrene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Toluene | 149 | 1.554E-08 | 8.63 | 0.118 | 0.0002775 | 0.616 | 0.785 | 0.00041 | 9.456 | 97.34 | 6.677 |
| LnROS_ortho-Xylene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_meta- & para-Xylene | 145 | 0.0005829 | 2.71 | 0.109 | 0.0319 | 0.0715 | 0.267 | 0.0388 | 7.025 | 63.17 | 2.456 |
| LnROS_Xylenes | 149 | 2.041E-11 | 3.24 | 0.0315 | 5.711E-06 | 0.0761 | 0.276 | 8.464E-06 | 11.01 | 126.4 | 8.767 |
| LnROS_MTBE | 3 | 2.098 | 5.14 | 3.653 | 3.72 | 2.317 | 1.522 | 2.105 | -0.199 | N/A | 0.417 |

### Percentiles for Raw Full Data Sets

| Variable | NumObs | 5%ile | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | 99%ile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_LEPHw | 145 | N/A | 90.61 | 105.7 | 114.6 | 143 | 180.8 | 193.3 | 233.9 | 288 | 400.4 |
| LnROS_HEPHw | 149 | 100.7 | 135.7 | 190.3 | 220.2 | 410 | 720 | 848 | 1196 | 1732 | 2526 |
| LnROS_EPHw(C10-<C19) 1 | 145 | N/A | 90.61 | 105.7 | 114.6 | 143 | 180.8 | 193.3 | 233.9 | 288 | 400.4 |
| LnROS_EPHw(C10-<C19) 1(Silica gel) | 145 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_EPHw(C19-C32) | 149 | 100.7 | 135.7 | 190.3 | 220.1 | 410 | 720 | 848 | 1196 | 1732 | 2526 |
| LnROS_EPHw(C19-C32)(Silica gel) | 149 | 80.19 | 102.4 | 139.4 | 157 | 246.4 | 400 | 448 | 614 | 808 | 1141 |
| LnROS_VPHw | 149 | 2.09 | 3.379 | 6.181 | 7.799 | 20.06 | 51.56 | 65.04 | 110 | 266 | 386 |
| LnROS_VHw (C6-C10) | 149 | 3.594 | 5.657 | 10 | 12.46 | 30.38 | 74 | 92.11 | 164 | 306 | 432.4 |
| LnROS_Benzene | 149 | 0.00444 | 0.0123 | 0.0447 | 0.0733 | 0.548 | 4.96 | 9.292 | 30.08 | 67.78 | 236.2 |
| LnROS_Ethylbenzene | 149 | 2.232E-05 | 5.927E-05 | 0.0002026 | 0.0003251 | 0.00223 | 0.0152 | 0.0245 | 0.0836 | 0.223 | 1.373 |
| LnROS_Styrene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Toluene | 149 | 5.494E-07 | 2.134E-06 | 1.183E-05 | 2.288E-05 | 0.0002775 | 0.00413 | 0.00801 | 0.0446 | 0.175 | 2.908 |
| LnROS_ortho-Xylene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_meta- & para-Xylene | 145 | 0.00242 | 0.00419 | 0.00834 | 0.0109 | 0.0319 | 0.0938 | 0.122 | 0.243 | 0.502 | 0.838 |
| LnROS_Xylenes | 149 | 1.828E-09 | 1.006E-08 | 8.634E-08 | 1.973E-07 | 5.711E-06 | 0.0001652 | 0.0003788 | 0.00326 | 0.0182 | 0.574 |
| LnROS_MTBE | 3 | 2.26 | 2.422 | 2.747 | 2.909 | 3.72 | 4.43 | 4.572 | 4.856 | 4.998 | 5.112 |

## General UCL Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| From File | PHCs Input.wst |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**LEPHw**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 145 | Number of Distinct Observations | 28 |
| Number of Detects | 12 | Number of Non-Detects | 133 |
| Number of Distinct Detects | 8 | Number of Distinct Non-Detects | 25 |
| Minimum Detect | 270 | Minimum Non-Detect | 250 |
| Maximum Detect | 490 | Maximum Non-Detect | 670 |
| Variance Detects | 5057 | Percent Non-Detects | 91.72% |
| Mean Detects | 322.5 | SD Detects | 71.11 |
| Median Detects | 295 | CV Detects | 0.221 |
| Skewness Detects | 1.744 | Kurtosis Detects | 2.172 |
| Mean of Logged Detects | 5.757 | SD of Logged Detects | 0.195 |

Normal GOF Test on Detects Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.738 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.859 | Detected Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.32 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.256 | Detected Data Not Normal at 5% Significance Level |

Detected Data Not Normal at 5% Significance Level

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

| | | | |
|---|---|---|---|
| Mean | 257 | Standard Error of Mean | 2.668 |
| SD | 29.22 | 95% KM (BCA) UCL | 261.7 |
| 95% KM (t) UCL | 261.4 | 95% KM (Percentile Bootstrap) UCL | 261.3 |
| 95% KM (z) UCL | 261.4 | 95% KM Bootstrap t UCL | 264.6 |
| 90% KM Chebyshev UCL | 265 | 95% KM Chebyshev UCL | 268.6 |
| 97.5% KM Chebyshev UCL | 273.7 | 99% KM Chebyshev UCL | 283.6 |

Gamma GOF Tests on Detected Observations Only

| | | |
|---|---|---|
| A-D Test Statistic | 1.202 | Anderson-Darling GOF Test |
| 5% A-D Critical Value | 0.731 | Detected Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.305 | Kolmogrov-Smirnoff GOF |
| 5% K-S Critical Value | 0.245 | Detected Data Not Gamma Distributed at 5% Significance Level |

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

| | | | |
|---|---|---|---|
| k hat (MLE) | 26.55 | k star (bias corrected MLE) | 19.97 |
| Theta hat (MLE) | 12.15 | Theta star (bias corrected MLE) | 16.15 |
| nu hat (MLE) | 637.3 | nu star (bias corrected) | 479.3 |
| MLE Mean (bias corrected) | 322.5 | MLE Sd (bias corrected) | 72.17 |

Gamma Kaplan-Meier (KM) Statistics

| | | | |
|---|---|---|---|
| k hat (KM) | 77.37 | nu hat (KM) | 22437 |
| Approximate Chi Square Value (N/A, α) | 22090 | Adjusted Chi Square Value (N/A, β) | 22086 |
| 95% Gamma Approximate KM-UCL (use when n>=50) | 261.1 | 95% Gamma Adjusted KM-UCL (use when n<50) | 261.1 |

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 0.01 | Mean | 90.94 |
| Maximum | 490 | Median | 67.75 |
| SD | 96.06 | CV | 1.056 |
| k hat (MLE) | 0.31 | k star (bias corrected MLE) | 0.308 |
| Theta hat (MLE) | 293.1 | Theta star (bias corrected MLE) | 294.8 |
| nu hat (MLE) | 89.98 | nu star (bias corrected) | 89.45 |
| MLE Mean (bias corrected) | 90.94 | MLE Sd (bias corrected) | 163.7 |
| | | Adjusted Level of Significance (β) | 0.0483 |
| Approximate Chi Square Value (89.45, α) | 68.64 | Adjusted Chi Square Value (89.45, β) | 68.46 |
| 95% Gamma Approximate UCL (use when n>=50) | 118.5 | 95% Gamma Adjusted UCL (use when n<50) | 118.8 |

Lognormal GOF Test on Detected Observations Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.782 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.859 | Detected Data Not Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.292 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.256 | Detected Data Not Lognormal at 5% Significance Level |

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 156.1 | Mean in Log Scale | 4.972 |
| SD in Original Scale | 67.62 | SD in Log Scale | 0.393 |
| 95% t UCL (assumes normality of ROS data) | 165.4 | 95% Percentile Bootstrap UCL | 165.6 |
| 95% BCA Bootstrap UCL | 166.2 | 95% Bootstrap t UCL | 167 |
| 95% H-UCL (Log ROS) | 165.1 | | |

DL/2 Statistics

| DL/2 Normal | | DL/2 Log-Transformed | |
|---|---|---|---|
| Mean in Original Scale | 161.3 | Mean in Log Scale | 5.024 |
| SD in Original Scale | 66.22 | SD in Log Scale | 0.319 |
| 95% t UCL (Assumes normality) | 170.4 | 95% H-Stat UCL | 167.5 |

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

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

| | | | |
|---|---|---|---|
| 95% KM (t) UCL | 261.4 | 95% KM (% Bootstrap) UCL | 261.3 |

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

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

**HEPHw**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 93 |
| Number of Distinct Detected Data | 66 | Number of Non-Detect Data | 56 |
| | | Percent Non-Detects | 37.58% |

| Raw Statistics | |
|---|---|
| Minimum Detected | 250 |
| Maximum Detected | 2580 |
| Mean of Detected | 811.6 |
| SD of Detected | 541.2 |
| Minimum Non-Detect | 250 |
| Maximum Non-Detect | 270 |

| Log-transformed Statistics | |
|---|---|
| Minimum Detected | 5.521 |
| Maximum Detected | 7.856 |
| Mean of Detected | 6.526 |
| SD of Detected | 0.566 |
| Minimum Non-Detect | 5.521 |
| Maximum Non-Detect | 5.598 |

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 | 58 |
| Number treated as Detected | 91 |
| Single DL Non-Detect Percentage | 38.93% |

## UCL Statistics

| Normal Distribution Test with Detected Values Only | |
|---|---|
| Lilliefors Test Statistic | 0.176 |
| 5% Lilliefors Critical Value | 0.0919 |

Data not Normal at 5% Significance Level

| Lognormal Distribution Test with Detected Values Only | |
|---|---|
| Lilliefors Test Statistic | 0.11 |
| 5% Lilliefors Critical Value | 0.0919 |

Data not Lognormal at 5% Significance Level

| Assuming Normal Distribution | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 553.7 |
| SD | 541.6 |
| 95% DL/2 (t) UCL | 627.1 |
| | |
| Maximum Likelihood Estimate(MLE) Method | |
| Mean | 401.2 |
| SD | 723.4 |
| 95% MLE (t) UCL | 499.2 |
| 95% MLE (Tiku) UCL | 510.5 |

| Assuming Lognormal Distribution | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 5.889 |
| SD | 0.937 |
| 95% H-Stat (DL/2) UCL | 661 |
| | |
| Log ROS Method | |
| Mean in Log Scale | 6 |
| SD in Log Scale | 0.858 |
| Mean in Original Scale | 575.5 |
| SD in Original Scale | 526.4 |
| 95% t UCL | 646.9 |
| 95% Percentile Bootstrap UCL | 650.8 |
| 95% BCA Bootstrap UCL | 657.4 |
| 95% H UCL | 675.2 |

| Gamma Distribution Test with Detected Values Only | |
|---|---|
| k star (bias corrected) | 2.962 |
| Theta Star | 274 |
| nu star | 550.8 |
| | |
| A-D Test Statistic | 2.336 |
| 5% A-D Critical Value | 0.759 |
| K-S Test Statistic | 0.759 |
| 5% K-S Critical Value | 0.0934 |

Data not Gamma Distributed at 5% Significance Level

| Assuming Gamma Distribution | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 2580 |
| Mean | 506.6 |
| Median | 410 |
| SD | 581.1 |
| k star | 0.112 |

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

| Nonparametric Statistics | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 600.5 |
| SD | 504.8 |
| SE of Mean | 41.58 |
| 95% KM (t) UCL | 669.4 |
| 95% KM (z) UCL | 668.9 |
| 95% KM (jackknife) UCL | 666.1 |
| 95% KM (bootstrap t) UCL | 680.3 |
| 95% KM (BCA) UCL | 677 |
| 95% KM (Percentile Bootstrap) UCL | 671.5 |
| 95% KM (Chebyshev) UCL | 781.8 |
| 97.5% KM (Chebyshev) UCL | 860.2 |
| 99% KM (Chebyshev) UCL | 1014 |

| | |
|---|---|
| Theta star | 4541 |
| Nu star | 33.25 |
| AppChi2 | 21.06 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 799.6 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 803.2 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (BCA) UCL | 677 |

**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.**

**EPHw(C10-<C19)**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 145 | Number of Distinct Observations | 28 |
| Number of Detects | 12 | Number of Non-Detects | 133 |
| Number of Distinct Detects | 8 | Number of Distinct Non-Detects | 25 |
| Minimum Detect | 270 | Minimum Non-Detect | 250 |
| Maximum Detect | 490 | Maximum Non-Detect | 670 |
| Variance Detects | 5057 | Percent Non-Detects | 91.72% |
| Mean Detects | 322.5 | SD Detects | 71.11 |
| Median Detects | 295 | CV Detects | 0.221 |
| Skewness Detects | 1.744 | Kurtosis Detects | 2.172 |
| Mean of Logged Detects | 5.757 | SD of Logged Detects | 0.195 |

Normal GOF Test on Detects Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.738 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.859 | Detected Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.32 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.256 | Detected Data Not Normal at 5% Significance Level |

Detected Data Not Normal at 5% Significance Level

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

| | | | |
|---|---|---|---|
| Mean | 257 | Standard Error of Mean | 2.668 |
| SD | 29.22 | 95% KM (BCA) UCL | 262 |
| 95% KM (t) UCL | 261.4 | 95% KM (Percentile Bootstrap) UCL | 261.5 |
| 95% KM (z) UCL | 261.4 | 95% KM Bootstrap t UCL | 264.4 |
| 90% KM Chebyshev UCL | 265 | 95% KM Chebyshev UCL | 268.6 |
| 97.5% KM Chebyshev UCL | 273.7 | 99% KM Chebyshev UCL | 283.6 |

Gamma GOF Tests on Detected Observations Only

| | | |
|---|---|---|
| A-D Test Statistic | 1.202 | Anderson-Darling GOF Test |
| 5% A-D Critical Value | 0.731 | Detected Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.305 | Kolmogrov-Smirnoff GOF |
| 5% K-S Critical Value | 0.245 | Detected Data Not Gamma Distributed at 5% Significance Level |

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

| | | | |
|---|---|---|---|
| k hat (MLE) | 26.55 | k star (bias corrected MLE) | 19.97 |
| Theta hat (MLE) | 12.15 | Theta star (bias corrected MLE) | 16.15 |
| nu hat (MLE) | 637.3 | nu star (bias corrected) | 479.3 |
| MLE Mean (bias corrected) | 322.5 | MLE Sd (bias corrected) | 72.17 |

Gamma Kaplan-Meier (KM) Statistics

| | | | |
|---|---|---|---|
| k hat (KM) | 77.37 | nu hat (KM) | 22437 |
| Approximate Chi Square Value (N/A, α) | 22090 | Adjusted Chi Square Value (N/A, β) | 22086 |
| 95% Gamma Approximate KM-UCL (use when n>=50) | 261.1 | 95% Gamma Adjusted KM-UCL (use when n<50) | 261.1 |

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 0.01 | Mean | 90.94 |
| Maximum | 490 | Median | 67.75 |
| SD | 96.06 | CV | 1.056 |
| k hat (MLE) | 0.31 | k star (bias corrected MLE) | 0.308 |
| Theta hat (MLE) | 293.1 | Theta star (bias corrected MLE) | 294.8 |
| nu hat (MLE) | 89.98 | nu star (bias corrected) | 89.45 |
| MLE Mean (bias corrected) | 90.94 | MLE Sd (bias corrected) | 163.7 |
| | | Adjusted Level of Significance (β) | 0.0483 |
| Approximate Chi Square Value (89.45, α) | 68.64 | Adjusted Chi Square Value (89.45, β) | 68.46 |
| 95% Gamma Approximate UCL (use when n>=50) | 118.5 | 95% Gamma Adjusted UCL (use when n<50) | 118.8 |

Lognormal GOF Test on Detected Observations Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.782 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.859 | Detected Data Not Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.292 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.256 | Detected Data Not Lognormal at 5% Significance Level |

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 156.1 | Mean in Log Scale | 4.972 |
| SD in Original Scale | 67.62 | SD in Log Scale | 0.393 |
| 95% t UCL (assumes normality of ROS data) | 165.4 | 95% Percentile Bootstrap UCL | 165.5 |
| 95% BCA Bootstrap UCL | 165.8 | 95% Bootstrap t UCL | 166.9 |
| 95% H-UCL (Log ROS) | 165.1 | | |

DL/2 Statistics

| DL/2 Normal | | DL/2 Log-Transformed | |
|---|---|---|---|
| Mean in Original Scale | 161.3 | Mean in Log Scale | 5.024 |
| SD in Original Scale | 66.22 | SD in Log Scale | 0.319 |
| 95% t UCL (Assumes normality) | 170.4 | 95% H-Stat UCL | 167.5 |

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

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

| | | | |
|---|---|---|---|
| 95% KM (t) UCL | 261.4 | 95% KM (% Bootstrap) UCL | 261.5 |

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

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

**EPHw(C19-C32)**

## General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 93 |
| Number of Distinct Detected Data | 66 | Number of Non-Detect Data | 56 |
| | | Percent Non-Detects | 37.58% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 250 | Minimum Detected | 5.521 |
| Maximum Detected | 2580 | Maximum Detected | 7.856 |
| Mean of Detected | 811.7 | Mean of Detected | 6.526 |
| SD of Detected | 541.3 | SD of Detected | 0.566 |
| Minimum Non-Detect | 250 | Minimum Non-Detect | 5.521 |
| Maximum Non-Detect | 270 | Maximum Non-Detect | 5.598 |

| | | |
|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | Number treated as Non-Detect | 58 |
| For all methods (except KM, DL/2, and ROS Methods), | Number treated as Detected | 91 |
| Observations < Largest ND are treated as NDs | Single DL Non-Detect Percentage | 38.93% |

## UCL Statistics

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Lilliefors Test Statistic | 0.176 | Lilliefors Test Statistic | 0.11 |
| 5% Lilliefors Critical Value | 0.0919 | 5% Lilliefors Critical Value | 0.0919 |
| 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 | 553.7 | Mean | 5.889 |
| SD | 541.7 | SD | 0.937 |
| 95% DL/2 (t) UCL | 627.2 | 95% H-Stat (DL/2) UCL | 661.1 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 401.2 | Mean in Log Scale | 6 |
| SD | 723.5 | SD in Log Scale | 0.858 |
| 95% MLE (t) UCL | 499.3 | Mean in Original Scale | 575.5 |
| 95% MLE (Tiku) UCL | 510.6 | SD in Original Scale | 526.4 |
| | | 95% t UCL | 646.9 |
| | | 95% Percentile Bootstrap UCL | 648.5 |
| | | 95% BCA Bootstrap UCL | 658.4 |
| | | 95% H UCL | 675.3 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 2.961 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 274.1 | |
| nu star | 550.8 | |
| | | |
| A-D Test Statistic | 2.335 | Nonparametric Statistics |
| 5% A-D Critical Value | 0.759 | Kaplan-Meier (KM) Method |
| K-S Test Statistic | 0.759 | Mean 600.6 |
| 5% K-S Critical Value | 0.0934 | SD 504.9 |
| Data not Gamma Distributed at 5% Significance Level | | SE of Mean 41.59 |
| | | 95% KM (t) UCL 669.4 |
| Assuming Gamma Distribution | | 95% KM (z) UCL 669 |
| Gamma ROS Statistics using Extrapolated Data | | 95% KM (jackknife) UCL 666.2 |
| Minimum | 0.000001 | 95% KM (bootstrap t) UCL 680 |

| | | | |
|---|---|---|---|
| Maximum | 2580 | 95% KM (BCA) UCL | 675.3 |
| Mean | 506.6 | 95% KM (Percentile Bootstrap) UCL | 671.9 |
| Median | 410 | 95% KM (Chebyshev) UCL | 781.9 |
| SD | 581.2 | 97.5% KM (Chebyshev) UCL | 860.3 |
| k star | 0.112 | 99% KM (Chebyshev) UCL | 1014 |
| Theta star | 4541 | | |
| Nu star | 33.25 | Potential UCLs to Use | |
| AppChi2 | 21.06 | 95% KM (BCA) UCL | 675.3 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 799.7 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 803.3 | | |

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.

EPHw(C19-C32)(Silica gel)

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 69 |
| Number of Distinct Detected Data | 45 | Number of Non-Detect Data | 80 |
| | | Percent Non-Detects | 53.69% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 260 | Minimum Detected | 5.561 |
| Maximum Detected | 1350 | Maximum Detected | 7.208 |
| Mean of Detected | 497 | Mean of Detected | 6.114 |
| SD of Detected | 240.3 | SD of Detected | 0.42 |
| Minimum Non-Detect | 250 | Minimum Non-Detect | 5.521 |
| Maximum Non-Detect | 3100 | Maximum Non-Detect | 8.039 |

| | | | |
|---|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | | Number treated as Non-Detect | 149 |
| 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 | |
|---|---|---|---|
| Lilliefors Test Statistic | 0.162 | Lilliefors Test Statistic | 0.104 |
| 5% Lilliefors Critical Value | 0.107 | 5% Lilliefors Critical Value | 0.107 |
| 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 | 321.3 | Mean | 5.48 |
| SD | 281.3 | SD | 0.733 |
| 95% DL/2 (t) UCL | 359.5 | 95% H-Stat (DL/2) UCL | 353.4 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE method failed to converge properly | | Mean in Log Scale | 5.519 |
| | | SD in Log Scale | 0.697 |
| | | Mean in Original Scale | 316.9 |
| | | SD in Original Scale | 237.7 |
| | | 95% t UCL | 349.1 |

| | |
|---|---|
| 95% Percentile Bootstrap UCL | 349.8 |
| 95% BCA Bootstrap UCL | 350.8 |
| 95% H-UCL | 355.7 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 5.247 |
| Theta Star | 94.7 |
| nu star | 724.1 |
| | |
| A-D Test Statistic | 1.736 |
| 5% A-D Critical Value | 0.754 |
| K-S Test Statistic | 0.754 |
| 5% K-S Critical Value | 0.107 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 1350 |
| Mean | 233.7 |
| Median | 48.97 |
| SD | 294.8 |
| k star | 0.0962 |
| Theta star | 2429 |
| Nu star | 28.66 |
| AppChi2 | 17.44 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 383.9 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 385.8 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data appear Lognormal at 5% Significance Level

**Nonparametric Statistics**

Kaplan-Meier (KM) Method

| | |
|---|---|
| Mean | 372.6 |
| SD | 202 |
| SE of Mean | 16.85 |
| 95% KM (t) UCL | 400.5 |
| 95% KM (z) UCL | 400.3 |
| 95% KM (jackknife) UCL | 400.4 |
| 95% KM (bootstrap t) UCL | 401.9 |
| 95% KM (BCA) UCL | 401.2 |
| 95% KM (Percentile Bootstrap) UCL | 401.7 |
| 95% KM (Chebyshev) UCL | 446 |
| 97.5% KM (Chebyshev) UCL | 477.8 |
| 99% KM (Chebyshev) UCL | 540.3 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 400.5 |
| 95% KM (% Bootstrap) 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, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

**VPHw**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 19 |
| Number of Distinct Detected Data | 12 | Number of Non-Detect Data | 130 |
| | | Percent Non-Detects | 87.25% |

**Raw Statistics**

| | |
|---|---|
| Minimum Detected | 110 |
| Maximum Detected | 570 |
| Mean of Detected | 231.1 |
| SD of Detected | 131.6 |
| Minimum Non-Detect | 100 |
| Maximum Non-Detect | 100 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum Detected | 4.7 |
| Maximum Detected | 6.346 |
| Mean of Detected | 5.296 |
| SD of Detected | 0.554 |
| Minimum Non-Detect | 4.605 |
| Maximum Non-Detect | 4.605 |

**UCL Statistics**

**Normal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.854 |

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.871 |

| | |
|---|---|
| 5% Shapiro Wilk Critical Value | 0.901 |

Data not Normal at 5% Significance Level

| | |
|---|---|
| 5% Shapiro Wilk Critical Value | 0.901 |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 73.09 |
| SD | 76.01 |
| 95% DL/2 (t) UCL | 83.39 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE yields a negative mean**

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 4.088 |
| SD | 0.502 |
| 95% H-Stat (DL/2) UCL | 72.96 |
| | |
| Log ROS Method | |
| Mean in Log Scale | 3.003 |
| SD in Log Scale | 1.395 |
| Mean in Original Scale | 50.75 |
| SD in Original Scale | 85.81 |
| 95% t UCL | 62.39 |
| 95% Percentile Bootstrap UCL | 63.41 |
| 95% BCA Bootstrap UCL | 65.17 |
| 95% H-UCL | 71.78 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 3.034 |
| Theta Star | 76.17 |
| nu star | 115.3 |
| | |
| A-D Test Statistic | 0.985 |
| 5% A-D Critical Value | 0.746 |
| K-S Test Statistic | 0.746 |
| 5% K-S Critical Value | 0.2 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 570 |
| Mean | 29.46 |
| Median | 0.000001 |
| SD | 89.92 |
| k star | 0.0617 |
| Theta star | 477.4 |
| Nu star | 18.39 |
| AppChi2 | 9.675 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 56.01 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 56.37 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 125.4 |
| SD | 61 |
| SE of Mean | 5.135 |
| 95% KM (t) UCL | 133.9 |
| 95% KM (z) UCL | 133.9 |
| 95% KM (jackknife) UCL | 133.7 |
| 95% KM (bootstrap t) UCL | 136.7 |
| 95% KM (BCA) UCL | 134.5 |
| 95% KM (Percentile Bootstrap) UCL | 134.2 |
| 95% KM (Chebyshev) UCL | 147.8 |
| 97.5% KM (Chebyshev) UCL | 157.5 |
| 99% KM (Chebyshev) UCL | 176.5 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 133.9 |
| 95% KM (% Bootstrap) UCL | 134.2 |

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

**VHw (C6-C10)**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 25 |

| | |
|---|---|
| Number of Distinct Detected Data | 17 |
| Number of Non-Detect Data | 124 |
| Percent Non-Detects | 83.22% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 100 | Minimum Detected | 4.605 |
| Maximum Detected | 850 | Maximum Detected | 6.745 |
| Mean of Detected | 259.6 | Mean of Detected | 5.397 |
| SD of Detected | 164.3 | SD of Detected | 0.573 |
| Minimum Non-Detect | 100 | Minimum Non-Detect | 4.605 |
| Maximum Non-Detect | 100 | Maximum Non-Detect | 4.605 |

## UCL Statistics

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.792 | Shapiro Wilk Test Statistic | 0.912 |
| 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 | 85.17 | Mean | 4.161 |
| SD | 102.7 | SD | 0.603 |
| 95% DL/2 (t) UCL | 99.1 | 95% H-Stat (DL/2) UCL | 84.5 |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE yields a negative mean | | Mean in Log Scale | 3.418 |
| | | SD in Log Scale | 1.317 |
| | | Mean in Original Scale | 69.81 |
| | | SD in Original Scale | 110.8 |
| | | 95% t UCL | 84.84 |
| | | 95% Percentile Bootstrap UCL | 86.14 |
| | | 95% BCA Bootstrap UCL | 88.53 |
| | | 95% H-UCL | 95.39 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 2.885 | Data Follow Appr. Gamma Distribution at 5% Significance Level |
| Theta Star | 89.98 | |
| nu star | 144.3 | |
| A-D Test Statistic | 0.926 | |
| 5% A-D Critical Value | 0.751 | |
| K-S Test Statistic | 0.751 | |
| 5% K-S Critical Value | 0.176 | |
| Data follow Appr. Gamma Distribution at 5% Significance Level | | |

| Assuming Gamma Distribution | | Nonparametric Statistics | |
|---|---|---|---|
| Gamma ROS Statistics using Extrapolated Data | | Kaplan-Meier (KM) Method | |
| Minimum | 0.000001 | Mean | 126.8 |
| Maximum | 850 | SD | 88.9 |
| Mean | 43.56 | SE of Mean | 7.433 |
| Median | 0.000001 | 95% KM (t) UCL | 139.1 |
| SD | 117.7 | 95% KM (z) UCL | 139 |
| k star | 0.0632 | 95% KM (jackknife) UCL | 138.9 |
| Theta star | 689.7 | 95% KM (bootstrap t) UCL | 142.5 |
| | | 95% KM (BCA) UCL | 145.3 |
| | | 95% KM (Percentile Bootstrap) UCL | 141.7 |
| | | 95% KM (Chebyshev) UCL | 159.2 |
| | | 97.5% KM (Chebyshev) UCL | 173.2 |
| | | 99% KM (Chebyshev) UCL | 200.7 |

| | | | |
|---|---|---|---|
| Nu star | 18.82 | Potential UCLs to Use | |
| AppChi2 | 9.986 | 95% KM (t) UCL | 139.1 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 82.09 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 82.61 | | |

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.

Benzene

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 68 |
| Number of Distinct Detected Data | 68 | Number of Non-Detect Data | 81 |
| | | Percent Non-Detects | 54.36% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.55 | Minimum Detected | -0.598 |
| Maximum Detected | 280 | Maximum Detected | 5.635 |
| Mean of Detected | 30.33 | Mean of Detected | 2.028 |
| SD of Detected | 59.46 | SD of Detected | 1.72 |
| Minimum Non-Detect | 0.5 | Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | 0.5 | Maximum Non-Detect | -0.693 |

UCL Statistics

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Lilliefors Test Statistic | 0.308 | Lilliefors Test Statistic | 0.0739 |
| 5% Lilliefors Critical Value | 0.107 | 5% Lilliefors Critical Value | 0.107 |
| 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 | 13.98 | Mean | 0.172 |
| SD | 42.74 | SD | 2.062 |
| 95% DL/2 (t) UCL | 19.77 | 95% H-Stat (DL/2) UCL | 17.61 |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE yields a negative mean | | Mean in Log Scale | -0.58 |
| | | SD in Log Scale | 2.98 |
| | | Mean in Original Scale | 13.94 |
| | | SD in Original Scale | 42.75 |
| | | 95% t UCL | 19.74 |
| | | 95% Percentile Bootstrap UCL | 19.74 |
| | | 95% BCA Bootstrap UCL | 21.33 |
| | | 95% H-UCL | 144.2 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 0.454 | Data appear Lognormal at 5% Significance Level |
| Theta Star | 66.88 | |
| nu star | 61.68 | |

| | |
|---|---|
| A-D Test Statistic | 2.596 |
| 5% A-D Critical Value | 0.825 |
| K-S Test Statistic | 0.825 |
| 5% K-S Critical Value | 0.115 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| Gamma ROS Statistics using Extrapolated Data | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 280 |
| Mean | 13.84 |
| Median | 0.000001 |
| SD | 42.78 |
| k star | 0.0921 |
| Theta star | 150.4 |
| Nu star | 27.43 |
| AppChi2 | 16.49 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 23.03 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 23.15 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

| Kaplan-Meier (KM) Method | |
|---|---|
| Mean | 14.14 |
| SD | 42.54 |
| SE of Mean | 3.511 |
| 95% KM (t) UCL | 19.95 |
| 95% KM (z) UCL | 19.92 |
| 95% KM (jackknife) UCL | 19.91 |
| 95% KM (bootstrap t) UCL | 22.29 |
| 95% KM (BCA) UCL | 20.46 |
| 95% KM (Percentile Bootstrap) UCL | 20.11 |
| 95% KM (Chebyshev) UCL | 29.45 |
| 97.5% KM (Chebyshev) UCL | 36.07 |
| 99% KM (Chebyshev) UCL | 49.08 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (Chebyshev) UCL | 29.45 |

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.

**Ethylbenzene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 5 |
| Number of Distinct Detected Data | 5 | Number of Non-Detect Data | 144 |
| | | Percent Non-Detects | 96.64% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.61 | Minimum Detected | -0.494 |
| Maximum Detected | 3.55 | Maximum Detected | 1.267 |
| Mean of Detected | 1.508 | Mean of Detected | 0.189 |
| SD of Detected | 1.207 | SD of Detected | 0.721 |
| Minimum Non-Detect | 0.5 | Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | 0.5 | Maximum Non-Detect | -0.693 |

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 | 0.81 | Shapiro Wilk Test Statistic | 0.918 |
| 5% Shapiro Wilk Critical Value | 0.762 | 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 | 0.292 |
| SD | 0.302 |
| 95% DL/2 (t) UCL | 0.333 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE yields a negative mean**

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -1.333 |
| SD | 0.308 |
| 95% H-Stat (DL/2) UCL | 0.289 |
| | |
| Log ROS Method | |
| Mean in Log Scale | -6.101 |
| SD in Log Scale | 2.838 |
| Mean in Original Scale | 0.0705 |
| SD in Original Scale | 0.338 |
| 95% t UCL | 0.116 |
| 95% Percentile Bootstrap UCL | 0.122 |
| 95% BCA Bootstrap UCL | 0.151 |
| 95% H-UCL | 0.346 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 1.095 |
| Theta Star | 1.377 |
| nu star | 10.95 |
| | |
| A-D Test Statistic | 0.367 |
| 5% A-D Critical Value | 0.684 |
| K-S Test Statistic | 0.684 |
| 5% K-S Critical Value | 0.36 |

Data appear Gamma Distributed at 5% Significance Level

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 3.55 |
| Mean | 0.0506 |
| Median | 0.000001 |
| SD | 0.337 |
| k star | 0.0833 |
| Theta star | 0.607 |
| Nu star | 24.83 |
| AppChi2 | 14.48 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.0868 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.0872 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.64 |
| SD | 0.255 |
| SE of Mean | 0.0234 |
| 95% KM (t) UCL | 0.679 |
| 95% KM (z) UCL | 0.679 |
| 95% KM (jackknife) UCL | 0.675 |
| 95% KM (bootstrap t) UCL | 0.716 |
| 95% KM (BCA) UCL | 1.573 |
| 95% KM (Percentile Bootstrap) UCL | 1.21 |
| 95% KM (Chebyshev) UCL | 0.742 |
| 97.5% KM (Chebyshev) UCL | 0.786 |
| 99% KM (Chebyshev) UCL | 0.873 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.679 |
| 95% KM (Percentile Bootstrap) UCL | 1.21 |

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.

**Styrene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 149 |
| | | 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 Styrene was not processed!

Toluene

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 5 |
| Number of Distinct Detected Data | 5 | Number of Non-Detect Data | 144 |
| | | Percent Non-Detects | 96.64% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.6 | Minimum Detected | -0.511 |
| Maximum Detected | 8.63 | Maximum Detected | 2.155 |
| Mean of Detected | 3.14 | Mean of Detected | 0.671 |
| SD of Detected | 3.303 | SD of Detected | 1.119 |
| Minimum Non-Detect | 0.5 | Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | 1.1 | Maximum Non-Detect | 0.0953 |

| | | |
|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | Number treated as Non-Detect | 146 |
| 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 | 97.99% |

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 | 0.834 | Shapiro Wilk Test Statistic | 0.934 |
| 5% Shapiro Wilk Critical Value | 0.762 | 5% Shapiro Wilk Critical Value | 0.762 |
| 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 | 0.351 | Mean | -1.307 |
| SD | 0.753 | SD | 0.421 |
| 95% DL/2 (t) UCL | 0.453 | 95% H-Stat (DL/2) UCL | 0.315 |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE method failed to converge properly | | Mean in Log Scale | -8.077 |
| | | SD in Log Scale | 3.894 |
| | | Mean in Original Scale | 0.118 |
| | | SD in Original Scale | 0.785 |
| | | 95% t UCL | 0.224 |
| | | 95% Percentile Bootstrap UCL | 0.247 |

| | |
|---|---|
| 95% BCA Bootstrap UCL | 0.326 |
| 95% H-UCL | 3.855 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.612 |
| Theta Star | 5.134 |
| nu star | 6.116 |
| | |
| A-D Test Statistic | 0.294 |
| 5% A-D Critical Value | 0.689 |
| K-S Test Statistic | 0.689 |
| 5% K-S Critical Value | 0.363 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 8.63 |
| Mean | 0.105 |
| Median | 0.000001 |
| SD | 0.785 |
| k star | 0.0787 |
| Theta star | 1.339 |
| Nu star | 23.45 |
| AppChi2 | 13.43 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.184 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.185 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.685 |
| SD | 0.709 |
| SE of Mean | 0.0649 |
| 95% KM (t) UCL | 0.793 |
| 95% KM (z) UCL | 0.792 |
| 95% KM (jackknife) UCL | 0.78 |
| 95% KM (bootstrap t) UCL | 0.868 |
| 95% KM (BCA) UCL | 3.624 |
| 95% KM (Percentile Bootstrap) UCL | 2.387 |
| 95% KM (Chebyshev) UCL | 0.968 |
| 97.5% KM (Chebyshev) UCL | 1.091 |
| 99% KM (Chebyshev) UCL | 1.331 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.793 |
| 95% KM (Percentile Bootstrap) UCL | 2.387 |

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.

**ortho-Xylene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 145 | Number of Detected Data | 1 |
| Number of Distinct Detected Data | 1 | Number of Non-Detect Data | 144 |
| | | Percent Non-Detects | 99.31% |

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 ortho-Xylene was not processed!

**meta- & para-Xylene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 145 | Number of Detected Data | 8 |
| Number of Distinct Detected Data | 8 | Number of Non-Detect Data | 137 |
| | | Percent Non-Detects | 94.48% |

| Raw Statistics | |
|---|---|
| Minimum Detected | 0.53 |
| Maximum Detected | 2.71 |
| Mean of Detected | 0.933 |
| SD of Detected | 0.728 |
| Minimum Non-Detect | 0.5 |
| Maximum Non-Detect | 0.5 |

| Log-transformed Statistics | |
|---|---|
| Minimum Detected | -0.635 |
| Maximum Detected | 0.997 |
| Mean of Detected | -0.227 |
| SD of Detected | 0.52 |
| Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | -0.693 |

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 | |
|---|---|
| Shapiro Wilk Test Statistic | 0.559 |
| 5% Shapiro Wilk Critical Value | 0.818 |

Data not Normal at 5% Significance Level

| Lognormal Distribution Test with Detected Values Only | |
|---|---|
| Shapiro Wilk Test Statistic | 0.696 |
| 5% Shapiro Wilk Critical Value | 0.818 |

Data not Lognormal at 5% Significance Level

| Assuming Normal Distribution | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.288 |
| SD | 0.224 |
| 95% DL/2 (t) UCL | 0.318 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |

MLE yields a negative mean

| Assuming Lognormal Distribution | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -1.322 |
| SD | 0.289 |
| 95% H-Stat (DL/2) UCL | 0.29 |
| | |
| Log ROS Method | |
| Mean in Log Scale | -3.44 |
| SD in Log Scale | 1.591 |
| Mean in Original Scale | 0.109 |
| SD in Original Scale | 0.267 |
| 95% t UCL | 0.146 |
| 95% Percentile Bootstrap UCL | 0.148 |
| 95% BCA Bootstrap UCL | 0.167 |
| 95% H-UCL | 0.165 |

| Gamma Distribution Test with Detected Values Only | |
|---|---|
| k star (bias corrected) | 2.176 |
| Theta Star | 0.429 |
| nu star | 34.82 |
| | |
| A-D Test Statistic | 1.366 |
| 5% A-D Critical Value | 0.72 |
| K-S Test Statistic | 0.72 |
| 5% K-S Critical Value | 0.296 |

Data not Gamma Distributed at 5% Significance Level

| Assuming Gamma Distribution | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 2.71 |

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

| Nonparametric Statistics | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.552 |
| SD | 0.184 |
| SE of Mean | 0.0164 |
| 95% KM (t) UCL | 0.579 |
| 95% KM (z) UCL | 0.579 |
| 95% KM (jackknife) UCL | 0.605 |
| 95% KM (bootstrap t) UCL | 0.673 |
| 95% KM (BCA) UCL | 0.674 |

| | | | |
|---|---|---|---|
| Mean | 0.0514 | 95% KM (Percentile Bootstrap) UCL | 0.659 |
| Median | 0.000001 | 95% KM (Chebyshev) UCL | 0.624 |
| SD | 0.267 | 97.5% KM (Chebyshev) UCL | 0.654 |
| k star | 0.0852 | 99% KM (Chebyshev) UCL | 0.715 |
| Theta star | 0.604 | | |
| Nu star | 24.72 | Potential UCLs to Use | |
| AppChi2 | 14.39 | 95% KM (t) UCL | 0.579 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.0883 | 95% KM (% Bootstrap) UCL | 0.659 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.0888 | | |

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.

Xylenes

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 2 |
| Number of Distinct Detected Data | 2 | Number of Non-Detect Data | 147 |
| | | Percent Non-Detects | 98.66% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.93 | Minimum Detected | -0.0726 |
| Maximum Detected | 3.24 | Maximum Detected | 1.176 |
| Mean of Detected | 2.085 | Mean of Detected | 0.552 |
| SD of Detected | 1.633 | SD of Detected | 0.883 |
| Minimum Non-Detect | 0.75 | Minimum Non-Detect | -0.288 |
| Maximum Non-Detect | 0.75 | Maximum Non-Detect | -0.288 |

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

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 | N/A | Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A | 5% Shapiro Wilk Critical Value | N/A |
| 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 | 0.398 |
| SD | 0.239 |
| 95% DL/2 (t) UCL | 0.43 |

| | |
|---|---|
| Mean | -0.96 |
| SD | 0.191 |
| 95% H-Stat (DL/2) UCL | 0.4 |

| | |
|---|---|
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE method failed to converge properly**

| | |
|---|---|
| Log ROS Method | |
| Mean in Log Scale | N/A |
| SD in Log Scale | N/A |
| Mean in Original Scale | N/A |
| SD in Original Scale | N/A |
| 95% t UCL | N/A |
| 95% Percentile Bootstrap UCL | N/A |
| 95% BCA Bootstrap UCL | N/A |
| 95% H-UCL | N/A |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | N/A |
| Theta Star | N/A |
| nu star | N/A |
| A-D Test Statistic | N/A |
| 5% A-D Critical Value | N/A |
| K-S Test Statistic | N/A |
| 5% K-S Critical Value | N/A |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| Gamma ROS Statistics using Extrapolated Data | |
|---|---|
| Minimum | N/A |
| Maximum | N/A |
| Mean | N/A |
| Median | N/A |
| SD | N/A |
| k star | N/A |
| Theta star | N/A |
| Nu star | N/A |
| AppChi2 | N/A |
| 95% Gamma Approximate UCL (Use when n >= 40) | N/A |
| 95% Adjusted Gamma UCL (Use when n < 40) | N/A |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| Kaplan-Meier (KM) Method | |
|---|---|
| Mean | 0.946 |
| SD | 0.189 |
| SE of Mean | 0.0219 |
| 95% KM (t) UCL | 0.982 |
| 95% KM (z) UCL | 0.981 |
| 95% KM (jackknife) UCL | N/A |
| 95% KM (bootstrap t) UCL | N/A |
| 95% KM (BCA) UCL | N/A |
| 95% KM (Percentile Bootstrap) UCL | N/A |
| 95% KM (Chebyshev) UCL | 1.041 |
| 97.5% KM (Chebyshev) UCL | 1.082 |
| 99% KM (Chebyshev) UCL | 1.163 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.982 |
| 95% KM (% Bootstrap) UCL | N/A |

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.

**MTBE**

**General Statistics**

| | |
|---|---|
| Number of Valid Data | 3 |
| Number of Distinct Detected Data | 2 |

| | |
|---|---|
| Number of 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 MTBE 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.

From File: PAH Input.wst

## Summary Statistics for Raw Full Data Sets

| Variable | NumObs | Minimum | Maximum | Mean | Median | Variance | SD | MAD/0.675 | Skewness | Kurtosis | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_Acenaphthene | 149 | 0.0139 | 0.056 | 0.0283 | 0.0273 | 5.643E-05 | 0.00751 | 0.00718 | 0.779 | 0.88 | 0.266 |
| LnROS_Acenaphthylene | 149 | 0.0367 | 0.068 | 0.0499 | 0.0495 | 3.538E-05 | 0.00595 | 0.00596 | 0.352 | 0.0183 | 0.119 |
| LnROS_Acridine | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Anthracene | 149 | 1.565E-05 | 0.166 | 0.00695 | 0.00149 | 0.0003441 | 0.0185 | 0.00193 | 5.874 | 41.8 | 2.669 |
| ROS_Benz(a)anthracene | 149 | 1.19E-05 | 0.137 | 0.00458 | 0.00102 | 0.0001822 | 0.0135 | 0.00129 | 7.322 | 65.22 | 2.947 |
| LnROS_Benzo(a)pyrene | 149 | 8.58E-07 | 0.418 | 0.0119 | 0.0005312 | 0.00242 | 0.0492 | 0.0007554 | 6.241 | 42.27 | 4.13 |
| S_Benzo(b)fluoranthene | 149 | 9.414E-05 | 0.218 | 0.014 | 0.00455 | 0.0008158 | 0.0286 | 0.00542 | 4.533 | 24.75 | 2.041 |
| OS_Benzo(g,h,i)perylene | 149 | 5.469E-05 | 0.283 | 0.0161 | 0.00405 | 0.00148 | 0.0385 | 0.00509 | 4.976 | 28.21 | 2.397 |
| S_Benzo(k)fluoranthene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Chrysene | 149 | 0.0425 | 0.06 | 0.0504 | 0.0503 | 1.084E-05 | 0.00329 | 0.00323 | 0.217 | -0.00975 | 0.0653 |
| _Dibenz(a,h)anthracene | 149 | 3.795E-06 | 0.122 | 0.00336 | 0.0005256 | 0.0001362 | 0.0117 | 0.0006946 | 8.017 | 75.44 | 3.473 |
| LnROS_Fluoranthene | 149 | 0.0002862 | 0.289 | 0.0227 | 0.00901 | 0.00167 | 0.0408 | 0.00998 | 4.283 | 22.71 | 1.795 |
| LnROS_Fluorene | 149 | 0.00794 | 0.067 | 0.0249 | 0.0228 | 0.0001163 | 0.0108 | 0.00946 | 1.189 | 1.82 | 0.433 |
| _Indeno(1,2,3-c,d)pyrene | 149 | 0.0115 | 0.071 | 0.0296 | 0.0278 | 0.0001141 | 0.0107 | 0.00972 | 1.02 | 1.432 | 0.361 |
| LnROS_Naphthalene | 149 | 0.00125 | 0.28 | 0.0305 | 0.0174 | 0.00168 | 0.041 | 0.0155 | 3.644 | 16.81 | 1.346 |
| LnROS_Phenanthrene | 149 | 0.0001548 | 0.28 | 0.0239 | 0.00758 | 0.00221 | 0.0471 | 0.00891 | 3.631 | 13.91 | 1.969 |
| LnROS_Pyrene | 149 | 2.067E-05 | 0.624 | 0.0255 | 0.00366 | 0.00561 | 0.0749 | 0.00492 | 5.566 | 35.77 | 2.931 |
| LnROS_Quinoline | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Total PAHs | 145 | 0.0003104 | 2.12 | 0.114 | 0.0227 | 0.081 | 0.285 | 0.0288 | 4.692 | 25.38 | 2.506 |

## Percentiles for Raw Full Data Sets

| Variable | NumObs | 5%ile | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | 99%ile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_Acenaphthene | 149 | 0.0181 | 0.0198 | 0.0219 | 0.023 | 0.0273 | 0.0324 | 0.0341 | 0.0377 | 0.0413 | 0.0497 |
| LnROS_Acenaphthylene | 149 | 0.0409 | 0.0426 | 0.0448 | 0.0457 | 0.0495 | 0.0537 | 0.0548 | 0.0576 | 0.0601 | 0.0648 |
| LnROS_Acridine | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Anthracene | 149 | 7.995E-05 | 0.0001489 | 0.0003253 | 0.0004394 | 0.00149 | 0.00507 | 0.00685 | 0.015 | 0.0279 | 0.0899 |
| ROS_Benz(a)anthracene | 149 | 5.926E-05 | 0.0001094 | 0.000237 | 0.0003194 | 0.00102 | 0.00325 | 0.00438 | 0.00949 | 0.0176 | 0.0552 |
| LnROS_Benzo(a)pyrene | 149 | 9.397E-06 | 2.354E-05 | 7.069E-05 | 0.0001056 | 0.0005312 | 0.00309 | 0.00461 | 0.0172 | 0.0286 | 0.272 |
| S_Benzo(b)fluoranthene | 149 | 0.0003771 | 0.00064 | 0.00124 | 0.00161 | 0.00455 | 0.0129 | 0.0166 | 0.0323 | 0.0602 | 0.155 |
| OS_Benzo(g,h,i)perylene | 149 | 0.0002552 | 0.0004591 | 0.0009604 | 0.00128 | 0.00405 | 0.0129 | 0.0171 | 0.0357 | 0.0643 | 0.225 |
| S_Benzo(k)fluoranthene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Chrysene | 149 | 0.0452 | 0.0463 | 0.0476 | 0.0482 | 0.0503 | 0.0525 | 0.0531 | 0.0547 | 0.0559 | 0.0584 |
| _Dibenz(a,h)anthracene | 149 | 2.245E-05 | 4.424E-05 | 0.0001039 | 0.0001444 | 0.0005256 | 0.00198 | 0.00275 | 0.00646 | 0.0128 | 0.0446 |
| LnROS_Fluoranthene | 149 | 0.0009899 | 0.00159 | 0.00288 | 0.00363 | 0.00901 | 0.0229 | 0.0288 | 0.0512 | 0.0912 | 0.213 |
| LnROS_Fluorene | 149 | 0.0116 | 0.0134 | 0.0161 | 0.0172 | 0.0228 | 0.0303 | 0.0324 | 0.0389 | 0.045 | 0.059 |
| _Indeno(1,2,3-c,d)pyrene | 149 | 0.0157 | 0.0178 | 0.0207 | 0.0219 | 0.0278 | 0.0353 | 0.0374 | 0.0436 | 0.0492 | 0.0617 |
| LnROS_Naphthalene | 149 | 0.00344 | 0.00488 | 0.0075 | 0.00887 | 0.0174 | 0.0334 | 0.0402 | 0.0676 | 0.105 | 0.222 |
| LnROS_Phenanthrene | 149 | 0.0006349 | 0.00109 | 0.00215 | 0.0028 | 0.00758 | 0.0211 | 0.0275 | 0.0524 | 0.118 | 0.243 |
| LnROS_Pyrene | 149 | 0.0001331 | 0.0002708 | 0.0006617 | 0.0009335 | 0.00366 | 0.0149 | 0.021 | 0.0554 | 0.105 | 0.404 |
| LnROS_Quinoline | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Total PAHs | 145 | 0.00137 | 0.00256 | 0.00572 | 0.00783 | 0.0227 | 0.0761 | 0.104 | 0.234 | 0.524 | 1.441 |

## General UCL Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| From File | PAH Input.wst |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**Acenaphthene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 2 |
| Number of Distinct Detected Data | 2 | Number of Non-Detect Data | 147 |
| | | Percent Non-Detects | 98.66% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.052 | Minimum Detected | -2.957 |
| Maximum Detected | 0.056 | Maximum Detected | -2.882 |
| Mean of Detected | 0.054 | Mean of Detected | -2.919 |
| SD of Detected | 0.00283 | SD of Detected | 0.0524 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.3 | Maximum Non-Detect | -1.204 |

| | | |
|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | Number treated as Non-Detect | 149 |
| 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: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

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 | N/A | Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A | 5% Shapiro Wilk Critical Value | N/A |
| 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 | 0.0358 | Mean | -3.451 |
| SD | 0.0231 | SD | 0.433 |
| 95% DL/2 (t) UCL | 0.0389 | 95% H-Stat (DL/2) UCL | 0.0371 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |

MLE method failed to converge properly

| | |
|---|---|
| Mean in Log Scale | N/A |
| SD in Log Scale | N/A |
| Mean in Original Scale | N/A |
| SD in Original Scale | N/A |
| 95% t UCL | N/A |
| 95% Percentile Bootstrap UCL | N/A |
| 95% BCA Bootstrap UCL | N/A |
| 95% H-UCL | N/A |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | N/A |
| Theta Star | N/A |
| nu star | N/A |
| A-D Test Statistic | N/A |
| 5% A-D Critical Value | N/A |
| K-S Test Statistic | N/A |
| 5% K-S Critical Value | N/A |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | N/A |
| Maximum | N/A |
| Mean | N/A |
| Median | N/A |
| SD | N/A |
| k star | N/A |
| Theta star | N/A |
| Nu star | N/A |
| AppChi2 | N/A |
| 95% Gamma Approximate UCL (Use when n >= 40) | N/A |
| 95% Adjusted Gamma UCL (Use when n < 40) | N/A |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

Kaplan-Meier (KM) Method

| | |
|---|---|
| Mean | 0.052 |
| SD | 0.0003903 |
| SE of Mean | 5.413E-05 |
| 95% KM (t) UCL | 0.0521 |
| 95% KM (z) UCL | 0.0521 |
| 95% KM (jackknife) UCL | 0.0546 |
| 95% KM (bootstrap t) UCL | 0.052 |
| 95% KM (BCA) UCL | 0.056 |
| 95% KM (Percentile Bootstrap) UCL | 0.056 |
| 95% KM (Chebyshev) UCL | 0.0523 |
| 97.5% KM (Chebyshev) UCL | 0.0524 |
| 99% KM (Chebyshev) UCL | 0.0526 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.0521 |
| 95% KM (% Bootstrap) UCL | 0.056 |

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.

Acenaphthylene

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 2 |
| Number of Distinct Detected Data | 2 | Number of Non-Detect Data | 147 |
| | | Percent Non-Detects | 98.66% |

**Raw Statistics**

| | |
|---|---|
| Minimum Detected | 0.066 |
| Maximum Detected | 0.068 |
| Mean of Detected | 0.067 |
| SD of Detected | 0.00141 |
| Minimum Non-Detect | 0.05 |
| Maximum Non-Detect | 0.05 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum Detected | -2.718 |
| Maximum Detected | -2.688 |
| Mean of Detected | -2.703 |
| SD of Detected | 0.0211 |
| Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | -2.996 |

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

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**

| | |
|---|---|
| Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.0256 |
| SD | 0.00485 |
| 95% DL/2 (t) UCL | 0.0262 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |

MLE method failed to converge properly

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -3.676 |
| SD | 0.114 |
| 95% H-Stat (DL/2) UCL | 0.0259 |
| | |
| Log ROS Method | |
| Mean in Log Scale | N/A |
| SD in Log Scale | N/A |
| Mean in Original Scale | N/A |
| SD in Original Scale | N/A |
| 95% t UCL | N/A |
| 95% Percentile Bootstrap UCL | N/A |
| 95% BCA Bootstrap UCL | N/A |
| 95% H-UCL | N/A |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | N/A |
| Theta Star | N/A |
| nu star | N/A |
| | |
| A-D Test Statistic | N/A |
| 5% A-D Critical Value | N/A |
| K-S Test Statistic | N/A |
| 5% K-S Critical Value | N/A |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | N/A |
| Maximum | N/A |
| Mean | N/A |

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.066 |
| SD | 0.0001633 |
| SE of Mean | 1.892E-05 |
| 95% KM (t) UCL | 0.066 |
| 95% KM (z) UCL | 0.066 |
| 95% KM (jackknife) UCL | N/A |
| 95% KM (bootstrap t) UCL | N/A |
| 95% KM (BCA) UCL | N/A |
| 95% KM (Percentile Bootstrap) UCL | N/A |

| | | | |
|---|---|---|---|
| Median | N/A | 95% KM (Chebyshev) UCL | 0.0661 |
| SD | N/A | 97.5% KM (Chebyshev) UCL | 0.0661 |
| k star | N/A | 99% KM (Chebyshev) UCL | 0.0662 |
| Theta star | N/A | | |
| Nu star | N/A | **Potential UCLs to Use** | |
| AppChi2 | N/A | 95% KM (t) UCL | 0.066 |
| 95% Gamma Approximate UCL (Use when n >= 40) | N/A | 95% KM (% Bootstrap) UCL | N/A |
| 95% Adjusted Gamma UCL (Use when n < 40) | 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.

## Acridine

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 149 |
| | | 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 Acridine was not processed!

## Anthracene

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 4 |
| Number of Distinct Detected Data | 4 | Number of Non-Detect Data | 145 |
| | | Percent Non-Detects | 97.32% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.062 | Minimum Detected | -2.781 |
| Maximum Detected | 0.166 | Maximum Detected | -1.796 |
| Mean of Detected | 0.102 | Mean of Detected | -2.354 |
| SD of Detected | 0.0456 | SD of Detected | 0.42 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.05 | Maximum Non-Detect | -2.996 |

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**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.903 |
| 5% Shapiro Wilk Critical Value | 0.748 |

Data appear Normal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.0271 |
| SD | 0.014 |
| 95% DL/2 (t) UCL | 0.029 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE yields a negative mean**

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.968 |
| 5% Shapiro Wilk Critical Value | 0.748 |

Data appear Lognormal at 5% Significance Level

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -3.653 |
| SD | 0.225 |
| 95% H-Stat (DL/2) UCL | 0.0274 |
| | |
| Log ROS Method | |
| Mean in Log Scale | -6.503 |
| SD in Log Scale | 1.804 |
| Mean in Original Scale | 0.00695 |
| SD in Original Scale | 0.0185 |
| 95% t UCL | 0.00946 |
| 95% Percentile Bootstrap UCL | 0.00969 |
| 95% BCA Bootstrap UCL | 0.0105 |
| 95% H-UCL | 0.012 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 2.017 |
| Theta Star | 0.0505 |
| nu star | 16.13 |
| | |
| A-D Test Statistic | 0.28 |
| 5% A-D Critical Value | 0.658 |
| K-S Test Statistic | 0.658 |
| 5% K-S Critical Value | 0.395 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 0.166 |
| Mean | 0.00273 |
| Median | 0.000001 |
| SD | 0.0177 |
| k star | 0.108 |
| Theta star | 0.0252 |
| Nu star | 32.28 |
| AppChi2 | 20.3 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.00435 |
| 95% Adjusted Gamma UCL (Use when n < 40) | N/A |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.0631 |
| SD | 0.00911 |
| SE of Mean | 0.0008623 |
| 95% KM (t) UCL | 0.0645 |
| 95% KM (z) UCL | 0.0645 |
| 95% KM (jackknife) UCL | 0.0739 |
| 95% KM (bootstrap t) UCL | 0.0649 |
| 95% KM (BCA) UCL | 0.101 |
| 95% KM (Percentile Bootstrap) UCL | 0.101 |
| 95% KM (Chebyshev) UCL | 0.0668 |
| 97.5% KM (Chebyshev) UCL | 0.0685 |
| 99% KM (Chebyshev) UCL | 0.0716 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.0645 |
| 95% KM (Percentile Bootstrap) UCL | 0.101 |

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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## General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 3 |
| Number of Distinct Detected Data | 3 | Number of Non-Detect Data | 146 |
| | | Percent Non-Detects | 97.99% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.051 | Minimum Detected | -2.976 |
| Maximum Detected | 0.137 | Maximum Detected | -1.988 |
| Mean of Detected | 0.0823 | Mean of Detected | -2.598 |
| SD of Detected | 0.0475 | SD of Detected | 0.533 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.2 | Maximum Non-Detect | -1.609 |

| | | |
|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | Number treated as Non-Detect | 149 |
| 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 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 | 0.819 | Shapiro Wilk Test Statistic | 0.858 |
| 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 | 0.027 | Mean | -3.647 |
| SD | 0.0117 | SD | 0.213 |
| 95% DL/2 (t) UCL | 0.0286 | 95% H-Stat (DL/2) UCL | 0.0275 |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE method failed to converge properly | | Mean in Log Scale | -6.885 |
| | | SD in Log Scale | 1.749 |
| | | Mean in Original Scale | 0.00458 |
| | | SD in Original Scale | 0.0135 |
| | | 95% t UCL | 0.00641 |
| | | 95% Percentile Bootstrap UCL | 0.0065 |
| | | 95% BCA Bootstrap UCL | 0.0074 |
| | | 95% H-UCL | 0.00727 |

| 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 | 0.0516 |
| 5% K-S Critical Value | N/A | SD | 0.00707 |
| Data not Gamma Distributed at 5% Significance Level | | SE of Mean | 0.000712 |
| | | 95% KM (t) UCL | 0.0528 |
| **Assuming Gamma Distribution** | | 95% KM (z) UCL | 0.0528 |
| Gamma ROS Statistics using Extrapolated Data | | 95% KM (jackknife) UCL | 0.0568 |
| Minimum | N/A | 95% KM (bootstrap t) UCL | 0.0559 |
| Maximum | N/A | 95% KM (BCA) UCL | 0.137 |
| Mean | N/A | 95% KM (Percentile Bootstrap) UCL | N/A |
| Median | N/A | 95% KM (Chebyshev) UCL | 0.0547 |
| SD | N/A | 97.5% KM (Chebyshev) UCL | 0.0561 |
| k star | N/A | 99% KM (Chebyshev) UCL | 0.0587 |
| Theta star | N/A | | |
| Nu star | N/A | **Potential UCLs to Use** | |
| AppChi2 | N/A | 95% KM (t) UCL | 0.0528 |
| 95% Gamma Approximate UCL (Use when n >= 40) | N/A | 95% KM (Percentile Bootstrap) UCL | N/A |
| 95% Adjusted Gamma UCL (Use when n < 40) | 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(a)pyrene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 21 |
| Number of Distinct Detected Data | 19 | Number of Non-Detect Data | 128 |
| | | Percent Non-Detects | 85.91% |

| **Raw Statistics** | | **Log-transformed Statistics** | |
|---|---|---|---|
| Minimum Detected | 0.012 | Minimum Detected | -4.423 |
| Maximum Detected | 0.418 | Maximum Detected | -0.872 |
| Mean of Detected | 0.0772 | Mean of Detected | -3.297 |
| SD of Detected | 0.112 | SD of Detected | 1.127 |
| Minimum Non-Detect | 0.01 | Minimum Non-Detect | -4.605 |
| Maximum Non-Detect | 0.1 | Maximum Non-Detect | -2.303 |

| | | | |
|---|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | | Number treated as Non-Detect | 144 |
| For all methods (except KM, DL/2, and ROS Methods), | | Number treated as Detected | 5 |
| Observations < Largest ND are treated as NDs | | Single DL Non-Detect Percentage | 96.64% |

**UCL Statistics**

| **Normal Distribution Test with Detected Values Only** | | **Lognormal Distribution Test with Detected Values Only** | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.631 | Shapiro Wilk Test Statistic | 0.816 |
| 5% Shapiro Wilk Critical Value | 0.908 | 5% Shapiro Wilk Critical Value | 0.908 |
| 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 | 0.0162 |
| SD | 0.0484 |
| 95% DL/2 (t) UCL | 0.0228 |

| | |
|---|---|
| Mean | -4.928 |
| SD | 0.851 |
| 95% H-Stat (DL/2) UCL | 0.012 |

| | |
|---|---|
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE yields a negative mean**

| | |
|---|---|
| Log ROS Method | |
| Mean in Log Scale | -7.445 |
| SD in Log Scale | 2.558 |
| Mean in Original Scale | 0.0119 |
| SD in Original Scale | 0.0492 |
| 95% t UCL | 0.0186 |
| 95% Percentile Bootstrap UCL | 0.0192 |
| 95% BCA Bootstrap UCL | 0.0217 |
| 95% H-UCL | 0.0356 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.722 |
| Theta Star | 0.107 |
| nu star | 30.34 |
| A-D Test Statistic | 2.35 |
| 5% A-D Critical Value | 0.78 |
| K-S Test Statistic | 0.78 |
| 5% K-S Critical Value | 0.196 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 0.418 |
| Mean | 0.0109 |
| Median | 0.000001 |
| SD | 0.0493 |
| k star | 0.106 |
| Theta star | 0.103 |
| Nu star | 31.55 |
| AppChi2 | 19.72 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.0174 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.0175 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.0212 |
| SD | 0.047 |
| SE of Mean | 0.00395 |
| 95% KM (t) UCL | 0.0278 |
| 95% KM (z) UCL | 0.0277 |
| 95% KM (jackknife) UCL | 0.027 |
| 95% KM (bootstrap t) UCL | 0.0335 |
| 95% KM (BCA) UCL | 0.0297 |
| 95% KM (Percentile Bootstrap) UCL | 0.0287 |
| 95% KM (Chebyshev) UCL | 0.0384 |
| 97.5% KM (Chebyshev) UCL | 0.0459 |
| 99% KM (Chebyshev) UCL | 0.0605 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (BCA) UCL | 0.0297 |

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 | 149 |
| Number of Distinct Detected Data | 10 |

| | |
|---|---|
| Number of Detected Data | 10 |
| Number of Non-Detect Data | 139 |
| Percent Non-Detects | 93.29% |

**Raw Statistics**

| | |
|---|---|
| Minimum Detected | 0.053 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum Detected | -2.937 |

| | |
|---|---|
| Maximum Detected | 0.218 |
| Mean of Detected | 0.101 |
| SD of Detected | 0.0559 |
| Minimum Non-Detect | 0.05 |
| Maximum Non-Detect | 0.05 |

| | |
|---|---|
| Maximum Detected | -1.523 |
| Mean of Detected | -2.413 |
| SD of Detected | 0.491 |
| Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | -2.996 |

## UCL Statistics

**Normal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.81 |
| 5% Shapiro Wilk Critical Value | 0.842 |

Data not Normal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.0301 |
| SD | 0.0235 |
| 95% DL/2 (t) UCL | 0.0333 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE yields a negative mean**

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.882 |
| 5% Shapiro Wilk Critical Value | 0.842 |

Data appear Lognormal at 5% Significance Level

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -3.603 |
| SD | 0.342 |
| 95% H-Stat (DL/2) UCL | 0.0303 |
| | |
| Log ROS Method | |
| Mean in Log Scale | -5.389 |
| SD in Log Scale | 1.535 |
| Mean in Original Scale | 0.014 |
| SD in Original Scale | 0.0286 |
| 95% t UCL | 0.0179 |
| 95% Percentile Bootstrap UCL | 0.018 |
| 95% BCA Bootstrap UCL | 0.0189 |
| 95% H-UCL | 0.021 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 3.153 |
| Theta Star | 0.0319 |
| nu star | 63.06 |
| | |
| A-D Test Statistic | 0.691 |
| 5% A-D Critical Value | 0.729 |
| K-S Test Statistic | 0.729 |
| 5% K-S Critical Value | 0.268 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 0.218 |
| Mean | 0.00676 |
| Median | 0.000001 |
| SD | 0.0288 |
| k star | 0.103 |
| Theta star | 0.0655 |
| Nu star | 30.75 |
| AppChi2 | 19.08 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.0109 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.0109 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data appear Gamma Distributed at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.0562 |
| SD | 0.0182 |
| SE of Mean | 0.00157 |
| 95% KM (t) UCL | 0.0588 |
| 95% KM (z) UCL | 0.0588 |
| 95% KM (jackknife) UCL | 0.0587 |
| 95% KM (bootstrap t) UCL | 0.0601 |
| 95% KM (BCA) UCL | 0.0715 |
| 95% KM (Percentile Bootstrap) UCL | 0.0681 |
| 95% KM (Chebyshev) UCL | 0.0631 |
| 97.5% KM (Chebyshev) UCL | 0.066 |
| 99% KM (Chebyshev) UCL | 0.0718 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.0588 |

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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General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 5 |
| Number of Distinct Detected Data | 5 | Number of Non-Detect Data | 144 |
| | | Percent Non-Detects | 96.64% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.091 | Minimum Detected | -2.397 |
| Maximum Detected | 0.283 | Maximum Detected | -1.262 |
| Mean of Detected | 0.192 | Mean of Detected | -1.728 |
| SD of Detected | 0.0802 | SD of Detected | 0.465 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.05 | Maximum Non-Detect | -2.996 |

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 | 0.95 | Shapiro Wilk Test Statistic | 0.94 |
| 5% Shapiro Wilk Critical Value | 0.762 | 5% Shapiro Wilk Critical Value | 0.762 |
| 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 | 0.0306 | Mean | -3.623 |
| SD | 0.033 | SD | 0.362 |
| 95% DL/2 (t) UCL | 0.0351 | 95% H-Stat (DL/2) UCL | 0.03 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE yields a negative mean | | Mean in Log Scale | -5.505 |
| | | SD in Log Scale | 1.704 |
| | | Mean in Original Scale | 0.0161 |
| | | SD in Original Scale | 0.0385 |
| | | 95% t UCL | 0.0213 |
| | | 95% Percentile Bootstrap UCL | 0.0218 |
| | | 95% BCA Bootstrap UCL | 0.0233 |
| | | 95% H-UCL | 0.0262 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 2.692 | Data appear Normal at 5% Significance Level |
| Theta Star | 0.0715 | |

| | |
|---|---|
| nu star | 26.92 |

| | |
|---|---|
| A-D Test Statistic | 0.255 |
| 5% A-D Critical Value | 0.68 |
| K-S Test Statistic | 0.68 |
| 5% K-S Critical Value | 0.358 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 0.283 |
| Mean | 0.00646 |
| Median | 0.000001 |
| SD | 0.0372 |
| k star | 0.0999 |
| Theta star | 0.0646 |
| Nu star | 29.77 |
| AppChi2 | 18.31 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.0105 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.0105 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

Kaplan-Meier (KM) Method

| | |
|---|---|
| Mean | 0.0944 |
| SD | 0.0225 |
| SE of Mean | 0.00206 |
| 95% KM (t) UCL | 0.0978 |
| 95% KM (z) UCL | 0.0978 |
| 95% KM (jackknife) UCL | 0.126 |
| 95% KM (bootstrap t) UCL | 0.0973 |
| 95% KM (BCA) UCL | 0.26 |
| 95% KM (Percentile Bootstrap) UCL | 0.189 |
| 95% KM (Chebyshev) UCL | 0.103 |
| 97.5% KM (Chebyshev) UCL | 0.107 |
| 99% KM (Chebyshev) UCL | 0.115 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.0978 |
| 95% KM (Percentile Bootstrap) 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, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

**Benzo(k)fluoranthene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 1 |
| Number of Distinct Detected Data | 1 | Number of Non-Detect Data | 148 |
| | | Percent Non-Detects | 99.33% |

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 Benzo(k)fluoranthene was not processed!

**Chrysene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 2 |
| Number of Distinct Detected Data | 2 | Number of Non-Detect Data | 147 |
| | | Percent Non-Detects | 98.66% |

**Raw Statistics**

| | |
|---|---|
| Minimum Detected | 0.059 |
| Maximum Detected | 0.06 |
| Mean of Detected | 0.0595 |
| SD of Detected | 0.0007071 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum Detected | -2.83 |
| Maximum Detected | -2.813 |
| Mean of Detected | -2.822 |
| SD of Detected | 0.0119 |

| | | | |
|---|---|---|---|
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| 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 | 149 |
| Number treated as Detected | 0 |
| Single DL Non-Detect Percentage | 100.00% |

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

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**

| | |
|---|---|
| Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.0267 |
| SD | 0.00863 |
| 95% DL/2 (t) UCL | 0.0279 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |

MLE method failed to converge properly

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -3.648 |
| SD | 0.189 |
| 95% H-Stat (DL/2) UCL | 0.0272 |
| | |
| Log ROS Method | |
| Mean in Log Scale | N/A |
| SD in Log Scale | N/A |
| Mean in Original Scale | N/A |
| SD in Original Scale | N/A |
| 95% t UCL | N/A |
| 95% Percentile Bootstrap UCL | N/A |
| 95% BCA Bootstrap UCL | N/A |
| 95% H-UCL | N/A |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | N/A |
| Theta Star | N/A |
| nu star | N/A |
| | |
| A-D Test Statistic | N/A |
| 5% A-D Critical Value | N/A |
| K-S Test Statistic | N/A |
| 5% K-S Critical Value | N/A |

Data not Gamma Distributed at 5% Significance Level

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.059 |
| SD | 8.333E-05 |
| SE of Mean | 9.855E-06 |
| 95% KM (t) UCL | 0.059 |

| Assuming Gamma Distribution | | | |
|---|---|---|---|
| Gamma ROS Statistics using Extrapolated Data | | 95% KM (jackknife) UCL | 0.0597 |
| Minimum | N/A | 95% KM (bootstrap t) UCL | 0.059 |
| Maximum | N/A | 95% KM (BCA) UCL | 0.06 |
| Mean | N/A | 95% KM (Percentile Bootstrap) UCL | N/A |
| Median | N/A | 95% KM (Chebyshev) UCL | 0.059 |
| SD | N/A | 97.5% KM (Chebyshev) UCL | 0.0591 |
| k star | N/A | 99% KM (Chebyshev) UCL | 0.0591 |
| Theta star | N/A | | |
| Nu star | N/A | Potential UCLs to Use | |
| AppChi2 | N/A | 95% KM (t) UCL | 0.059 |
| 95% Gamma Approximate UCL (Use when n >= 40) | N/A | 95% KM (% Bootstrap) UCL | N/A |
| 95% Adjusted Gamma UCL (Use when n < 40) | N/A | | |

95% KM (z) UCL 0.059

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 | 149 | Number of Detected Data | 2 |
| Number of Distinct Detected Data | 2 | Number of Non-Detect Data | 147 |
| | | Percent Non-Detects | 98.66% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.056 | Minimum Detected | -2.882 |
| Maximum Detected | 0.122 | Maximum Detected | -2.104 |
| Mean of Detected | 0.089 | Mean of Detected | -2.493 |
| SD of Detected | 0.0467 | SD of Detected | 0.551 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.09 | Maximum Non-Detect | -2.408 |

| | | |
|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | Number treated as Non-Detect | 148 |
| For all methods (except KM, DL/2, and ROS Methods), | Number treated as Detected | 1 |
| Observations < Largest ND are treated as NDs | Single DL Non-Detect Percentage | 99.33% |

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

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**

| | |
|---|---|
| Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A |

Data not Normal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.0261 |
| SD | 0.00855 |
| 95% DL/2 (t) UCL | 0.0273 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE method failed to converge properly**

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A |

Data not Lognormal at 5% Significance Level

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -3.666 |
| SD | 0.157 |
| 95% H-Stat (DL/2) UCL | 0.0265 |
| | |
| Log ROS Method | |
| Mean in Log Scale | N/A |
| SD in Log Scale | N/A |
| Mean in Original Scale | N/A |
| SD in Original Scale | N/A |
| 95% t UCL | N/A |
| 95% Percentile Bootstrap UCL | N/A |
| 95% BCA Bootstrap UCL | N/A |
| 95% H-UCL | N/A |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | N/A |
| Theta Star | N/A |
| nu star | N/A |
| | |
| A-D Test Statistic | N/A |
| 5% A-D Critical Value | N/A |
| K-S Test Statistic | N/A |
| 5% K-S Critical Value | N/A |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | N/A |
| Maximum | N/A |
| Mean | N/A |
| Median | N/A |
| SD | N/A |
| k star | N/A |
| Theta star | N/A |
| Nu star | N/A |
| AppChi2 | N/A |
| 95% Gamma Approximate UCL (Use when n >= 40) | N/A |
| 95% Adjusted Gamma UCL (Use when n < 40) | N/A |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.0564 |
| SD | 0.00539 |
| SE of Mean | 0.0006243 |
| 95% KM (t) UCL | 0.0575 |
| 95% KM (z) UCL | 0.0575 |
| 95% KM (jackknife) UCL | 0.0991 |
| 95% KM (bootstrap t) UCL | N/A |
| 95% KM (BCA) UCL | N/A |
| 95% KM (Percentile Bootstrap) UCL | N/A |
| 95% KM (Chebyshev) UCL | 0.0592 |
| 97.5% KM (Chebyshev) UCL | 0.0603 |
| 99% KM (Chebyshev) UCL | 0.0627 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.0575 |
| 95% KM (% Bootstrap) UCL | N/A |

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.

**Fluoranthene**

## General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 16 |
| Number of Distinct Detected Data | 16 | Number of Non-Detect Data | 133 |
| | | Percent Non-Detects | 89.26% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.05 | Minimum Detected | -2.996 |
| Maximum Detected | 0.289 | Maximum Detected | -1.241 |
| Mean of Detected | 0.114 | Mean of Detected | -2.316 |
| SD of Detected | 0.0728 | SD of Detected | 0.527 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.1 | Maximum Non-Detect | -2.303 |

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 | 142 |
| Number treated as Detected | 7 |
| Single DL Non-Detect Percentage | 95.30% |

## UCL Statistics

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.754 | Shapiro Wilk Test Statistic | 0.912 |
| 5% Shapiro Wilk Critical Value | 0.887 | 5% Shapiro Wilk Critical Value | 0.887 |
| 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 | 0.0347 | Mean | -3.537 |
| SD | 0.0361 | SD | 0.46 |
| 95% DL/2 (t) UCL | 0.0396 | 95% H-Stat (DL/2) UCL | 0.0346 |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE yields a negative mean | | Mean in Log Scale | -4.693 |
| | | SD in Log Scale | 1.37 |
| | | Mean in Original Scale | 0.0227 |
| | | SD in Original Scale | 0.0408 |
| | | 95% t UCL | 0.0283 |
| | | 95% Percentile Bootstrap UCL | 0.0286 |
| | | 95% BCA Bootstrap UCL | 0.0293 |
| | | 95% H-UCL | 0.0313 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 2.955 | Data Follow Appr. Gamma Distribution at 5% Significance Level |
| Theta Star | 0.0386 | |
| nu star | 94.57 | |
| A-D Test Statistic | 0.75 | |
| 5% A-D Critical Value | 0.743 | |
| K-S Test Statistic | 0.743 | |
| 5% K-S Critical Value | 0.216 | |
| Data follow Appr. Gamma Distribution at 5% Significance Level | | |

| Assuming Gamma Distribution | | Nonparametric Statistics | |
|---|---|---|---|
| Gamma ROS Statistics using Extrapolated Data | | Kaplan-Meier (KM) Method | |
| Minimum | 0.000001 | Mean | 0.0569 |
| Maximum | 0.289 | SD | 0.0305 |
| | | SE of Mean | 0.00258 |
| | | 95% KM (t) UCL | 0.0612 |
| | | 95% KM (z) UCL | 0.0611 |
| | | 95% KM (jackknife) UCL | 0.0614 |
| | | 95% KM (bootstrap t) UCL | 0.0629 |
| | | 95% KM (BCA) UCL | 0.0705 |

| | | | |
|---|---|---|---|
| Mean | 0.0123 | 95% KM (Percentile Bootstrap) UCL | 0.0678 |
| Median | 0.000001 | 95% KM (Chebyshev) UCL | 0.0681 |
| SD | 0.0424 | 97.5% KM (Chebyshev) UCL | 0.073 |
| k star | 0.102 | 99% KM (Chebyshev) UCL | 0.0825 |
| Theta star | 0.12 | | |
| Nu star | 30.35 | Potential UCLs to Use | |
| AppChi2 | 18.77 | 95% KM (t) UCL | 0.0612 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.0198 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.0199 | | |

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.

Fluorene

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 5 |
| Number of Distinct Detected Data | 5 | Number of Non-Detect Data | 144 |
| | | Percent Non-Detects | 96.64% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.05 | Minimum Detected | -2.996 |
| Maximum Detected | 0.067 | Maximum Detected | -2.703 |
| Mean of Detected | 0.058 | Mean of Detected | -2.852 |
| SD of Detected | 0.00628 | SD of Detected | 0.108 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.1 | Maximum Non-Detect | -2.303 |

| | | |
|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | Number treated as Non-Detect | 149 |
| 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 | 0.99 | Shapiro Wilk Test Statistic | 0.995 |
| 5% Shapiro Wilk Critical Value | 0.762 | 5% Shapiro Wilk Critical Value | 0.762 |
| 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 | 0.0263 | Mean | -3.656 |
| SD | 0.00636 | SD | 0.162 |
| 95% DL/2 (t) UCL | 0.0271 | 95% H-Stat (DL/2) UCL | 0.0268 |

| | |
|---|---|
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE method failed to converge properly**

| | |
|---|---|
| Log ROS Method | |
| Mean in Log Scale | -3.778 |
| SD in Log Scale | 0.417 |
| Mean in Original Scale | 0.0249 |
| SD in Original Scale | 0.0108 |
| 95% t UCL | 0.0264 |
| 95% Percentile Bootstrap UCL | 0.0264 |
| 95% BCA Bootstrap UCL | 0.0264 |
| 95% H-UCL | 0.0265 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 42.97 |
| Theta Star | 0.00135 |
| nu star | 429.7 |
| | |
| A-D Test Statistic | 0.178 |
| 5% A-D Critical Value | 0.678 |
| K-S Test Statistic | 0.678 |
| 5% K-S Critical Value | 0.357 |

Data appear Gamma Distributed at 5% Significance Level

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 0.067 |
| Mean | 0.00329 |
| Median | 0.000001 |
| SD | 0.012 |
| k star | 0.114 |
| Theta star | 0.0288 |
| Nu star | 34.06 |
| AppChi2 | 21.71 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.00516 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.00518 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.0503 |
| SD | 0.00178 |
| SE of Mean | 0.0001633 |
| 95% KM (t) UCL | 0.0505 |
| 95% KM (z) UCL | 0.0505 |
| 95% KM (jackknife) UCL | 0.0534 |
| 95% KM (bootstrap t) UCL | 0.0505 |
| 95% KM (BCA) UCL | 0.06 |
| 95% KM (Percentile Bootstrap) UCL | N/A |
| 95% KM (Chebyshev) UCL | 0.051 |
| 97.5% KM (Chebyshev) UCL | 0.0513 |
| 99% KM (Chebyshev) UCL | 0.0519 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.0505 |
| 95% KM (Percentile Bootstrap) UCL | N/A |

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-c,d)pyrene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 2 |
| Number of Distinct Detected Data | 2 | Number of Non-Detect Data | 147 |
| | | Percent Non-Detects | 98.66% |

| **Raw Statistics** | | **Log-transformed Statistics** | |
|---|---|---|---|
| Minimum Detected | 0.065 | Minimum Detected | -2.733 |
| Maximum Detected | 0.071 | Maximum Detected | -2.645 |
| Mean of Detected | 0.068 | Mean of Detected | -2.689 |
| SD of Detected | 0.00424 | SD of Detected | 0.0624 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |

| | | | |
|---|---|---|---|
| Maximum Non-Detect | 0.05 | Maximum Non-Detect | -2.996 |

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

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 | N/A | Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A | 5% Shapiro Wilk Critical Value | N/A |
| 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 | 0.0256 | Mean | -3.675 |
| SD | 0.00498 | SD | 0.116 |
| 95% DL/2 (t) UCL | 0.0263 | 95% H-Stat (DL/2) UCL | 0.0259 |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE method failed to converge properly | | Mean in Log Scale | N/A |
| | | SD in Log Scale | N/A |
| | | Mean in Original Scale | N/A |
| | | SD in Original Scale | N/A |
| | | 95% t UCL | N/A |
| | | 95% Percentile Bootstrap UCL | N/A |
| | | 95% BCA Bootstrap UCL | N/A |
| | | 95% H-UCL | N/A |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only | |
|---|---|---|---|
| k star (bias corrected) | N/A | Data do not follow a Discernable Distribution (0.05) | |
| 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 | 0.065 |
| 5% K-S Critical Value | N/A | SD | 0.0004899 |
| Data not Gamma Distributed at 5% Significance Level | | SE of Mean | 5.676E-05 |
| | | 95% KM (t) UCL | 0.0651 |
| **Assuming Gamma Distribution** | | 95% KM (z) UCL | 0.0651 |
| Gamma ROS Statistics using Extrapolated Data | | 95% KM (jackknife) UCL | N/A |
| Minimum | N/A | 95% KM (bootstrap t) UCL | N/A |
| Maximum | N/A | 95% KM (BCA) UCL | N/A |

| | | | |
|---|---|---|---|
| Mean | N/A | 95% KM (Percentile Bootstrap) UCL | N/A |
| Median | N/A | 95% KM (Chebyshev) UCL | 0.0653 |
| SD | N/A | 97.5% KM (Chebyshev) UCL | 0.0654 |
| k star | N/A | 99% KM (Chebyshev) UCL | 0.0656 |
| Theta star | N/A | | |
| Nu star | N/A | **Potential UCLs to Use** | |
| AppChi2 | N/A | 95% KM (t) UCL | 0.0651 |
| 95% Gamma Approximate UCL (Use when n >= 40) | N/A | 95% KM (% Bootstrap) UCL | N/A |
| 95% Adjusted Gamma UCL (Use when n < 40) | 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.

**Naphthalene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 22 |
| Number of Distinct Detected Data | 21 | Number of Non-Detect Data | 127 |
| | | Percent Non-Detects | 85.23% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.051 | Minimum Detected | -2.976 |
| Maximum Detected | 0.28 | Maximum Detected | -1.273 |
| Mean of Detected | 0.105 | Mean of Detected | -2.39 |
| SD of Detected | 0.0641 | SD of Detected | 0.496 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.3 | Maximum Non-Detect | -1.204 |

| | | |
|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | Number treated as Non-Detect | 149 |
| 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 | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.748 | Shapiro Wilk Test Statistic | 0.878 |
| 5% Shapiro Wilk Critical Value | 0.911 | 5% Shapiro Wilk Critical Value | 0.911 |
| 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 | 0.0446 | Mean | -3.338 |
| SD | 0.041 | SD | 0.59 |
| 95% DL/2 (t) UCL | 0.0501 | 95% H-Stat (DL/2) UCL | 0.0463 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE method failed to converge properly | | Mean in Log Scale | -4.038 |
| | | SD in Log Scale | 1.034 |
| | | Mean in Original Scale | 0.0305 |
| | | SD in Original Scale | 0.041 |
| | | 95% t UCL | 0.036 |
| | | 95% Percentile Bootstrap UCL | 0.0366 |

| | |
|---|---|
| 95% BCA Bootstrap UCL | 0.0376 |
| 95% H-UCL | 0.0364 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 3.399 |
| Theta Star | 0.0308 |
| nu star | 149.6 |
| | |
| A-D Test Statistic | 1.3 |
| 5% A-D Critical Value | 0.747 |
| K-S Test Statistic | 0.747 |
| 5% K-S Critical Value | 0.186 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 0.28 |
| Mean | 0.016 |
| Median | 0.000001 |
| SD | 0.0447 |
| k star | 0.105 |
| Theta star | 0.152 |
| Nu star | 31.32 |
| AppChi2 | 19.54 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.0257 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.0258 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.0595 |
| SD | 0.0311 |
| SE of Mean | 0.00266 |
| 95% KM (t) UCL | 0.0639 |
| 95% KM (z) UCL | 0.0639 |
| 95% KM (jackknife) UCL | 0.0639 |
| 95% KM (bootstrap t) UCL | 0.065 |
| 95% KM (BCA) UCL | 0.0691 |
| 95% KM (Percentile Bootstrap) UCL | 0.0678 |
| 95% KM (Chebyshev) UCL | 0.0711 |
| 97.5% KM (Chebyshev) UCL | 0.0761 |
| 99% KM (Chebyshev) UCL | 0.086 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.0639 |
| 95% KM (% Bootstrap) UCL | 0.0678 |

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.

**Phenanthrene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 13 |
| Number of Distinct Detected Data | 13 | Number of Non-Detect Data | 136 |
| | | Percent Non-Detects | 91.28% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.052 | Minimum Detected | -2.957 |
| Maximum Detected | 0.28 | Maximum Detected | -1.273 |
| Mean of Detected | 0.151 | Mean of Detected | -2.034 |
| SD of Detected | 0.0779 | SD of Detected | 0.586 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.1 | Maximum Non-Detect | -2.303 |

| | | |
|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | Number treated as Non-Detect | 140 |
| For all methods (except KM, DL/2, and ROS Methods), | Number treated as Detected | 9 |
| Observations < Largest ND are treated as NDs | Single DL Non-Detect Percentage | 93.96% |

**UCL Statistics**

**Normal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.934 |
| 5% Shapiro Wilk Critical Value | 0.866 |

Data appear Normal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.0365 |
| SD | 0.042 |
| 95% DL/2 (t) UCL | 0.0422 |
| | |
| Maximum Likelihood Estimate(MLE) Method | |
| Mean | 0.205 |
| SD | 0.0573 |
| 95% MLE (t) UCL | 0.212 |
| 95% MLE (Tiku) UCL | 0.236 |

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.922 |
| 5% Shapiro Wilk Critical Value | 0.866 |

Data appear Lognormal at 5% Significance Level

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -3.529 |
| SD | 0.502 |
| 95% H-Stat (DL/2) UCL | 0.0359 |
| | |
| Log ROS Method | |
| Mean in Log Scale | -4.866 |
| SD in Log Scale | 1.537 |
| Mean in Original Scale | 0.0239 |
| SD in Original Scale | 0.0471 |
| 95% t UCL | 0.0303 |
| 95% Percentile Bootstrap UCL | 0.0302 |
| 95% BCA Bootstrap UCL | 0.0311 |
| 95% H UCL | 0.0355 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 2.842 |
| Theta Star | 0.0532 |
| nu star | 73.9 |
| | |
| A-D Test Statistic | 0.326 |
| 5% A-D Critical Value | 0.738 |
| K-S Test Statistic | 0.738 |
| 5% K-S Critical Value | 0.238 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 0.28 |
| Mean | 0.0132 |
| Median | 0.000001 |
| SD | 0.0482 |
| k star | 0.099 |
| Theta star | 0.133 |
| Nu star | 29.49 |
| AppChi2 | 18.1 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.0215 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.0216 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.0607 |
| SD | 0.0357 |
| SE of Mean | 0.00304 |
| 95% KM (t) UCL | 0.0657 |
| 95% KM (z) UCL | 0.0657 |
| 95% KM (jackknife) UCL | 0.0646 |
| 95% KM (bootstrap t) UCL | 0.0669 |
| 95% KM (BCA) UCL | 0.116 |
| 95% KM (Percentile Bootstrap) UCL | 0.0976 |
| 95% KM (Chebyshev) UCL | 0.0739 |
| 97.5% KM (Chebyshev) UCL | 0.0797 |
| 99% KM (Chebyshev) UCL | 0.0909 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.0657 |
| 95% KM (Percentile Bootstrap) UCL | 0.0976 |

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.

**Pyrene**

## General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 16 |
| Number of Distinct Detected Data | 15 | Number of Non-Detect Data | 133 |
| | | Percent Non-Detects | 89.26% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.055 | Minimum Detected | -2.9 |
| Maximum Detected | 0.624 | Maximum Detected | -0.472 |
| Mean of Detected | 0.178 | Mean of Detected | -2.03 |
| SD of Detected | 0.163 | SD of Detected | 0.758 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.07 | Maximum Non-Detect | -2.659 |

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 | 136 |
| Number treated as Detected | 13 |
| Single DL Non-Detect Percentage | 91.28% |

## UCL Statistics

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.747 | Shapiro Wilk Test Statistic | 0.899 |
| 5% Shapiro Wilk Critical Value | 0.887 | 5% Shapiro Wilk Critical Value | 0.887 |
| 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 | 0.0415 | Mean | -3.508 |
| SD | 0.0704 | SD | 0.569 |
| 95% DL/2 (t) UCL | 0.051 | 95% H-Stat (DL/2) UCL | 0.0384 |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE yields a negative mean | | Mean in Log Scale | -5.587 |
| | | SD in Log Scale | 2.053 |
| | | Mean in Original Scale | 0.0255 |
| | | SD in Original Scale | 0.0749 |
| | | 95% t UCL | 0.0357 |
| | | 95% Percentile Bootstrap UCL | 0.0364 |
| | | 95% BCA Bootstrap UCL | 0.0386 |
| | | 95% H-UCL | 0.0543 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 1.502 | Data appear Lognormal at 5% Significance Level |
| Theta Star | 0.118 | |
| nu star | 48.07 | |
| A-D Test Statistic | 0.94 | |
| 5% A-D Critical Value | 0.752 | |
| K-S Test Statistic | 0.752 | |
| 5% K-S Critical Value | 0.218 | |
| Data not Gamma Distributed at 5% Significance Level | | |

| Assuming Gamma Distribution | | Nonparametric Statistics | |
|---|---|---|---|
| Gamma ROS Statistics using Extrapolated Data | | Kaplan-Meier (KM) Method | |
| Minimum | 0.000001 | Mean | 0.0682 |
| Maximum | 0.624 | SD | 0.0643 |
| | | SE of Mean | 0.00544 |
| | | 95% KM (t) UCL | 0.0772 |
| | | 95% KM (z) UCL | 0.0771 |
| | | 95% KM (jackknife) UCL | 0.0757 |
| | | 95% KM (bootstrap t) UCL | 0.0828 |
| | | 95% KM (BCA) UCL | 0.0919 |

| | | | |
|---|---|---|---|
| Mean | 0.0191 | 95% KM (Percentile Bootstrap) UCL | 0.0845 |
| Median | 0.000001 | 95% KM (Chebyshev) UCL | 0.0919 |
| SD | 0.0759 | 97.5% KM (Chebyshev) UCL | 0.102 |
| k star | 0.0977 | 99% KM (Chebyshev) UCL | 0.122 |
| Theta star | 0.196 | | |
| Nu star | 29.11 | **Potential UCLs to Use** | |
| AppChi2 | 17.79 | 95% KM (t) UCL | 0.0772 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.0312 | 95% KM (% Bootstrap) UCL | 0.0845 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.0314 | | |

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.

**Quinoline**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 149 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 149 |
| | | 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 Quinoline was not processed!

**Total PAHs**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 145 | Number of Detected Data | 14 |
| Number of Distinct Detected Data | 12 | Number of Non-Detect Data | 131 |
| | | Percent Non-Detects | 90.34% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.27 | Minimum Detected | -1.309 |
| Maximum Detected | 2.12 | Maximum Detected | 0.751 |
| Mean of Detected | 0.796 | Mean of Detected | -0.442 |
| SD of Detected | 0.562 | SD of Detected | 0.674 |
| Minimum Non-Detect | 0.21 | Minimum Non-Detect | -1.561 |
| Maximum Non-Detect | 0.43 | Maximum Non-Detect | -0.844 |

| | | | |
|---|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | | Number treated as Non-Detect | 135 |
| For all methods (except KM, DL/2, and ROS Methods), | | Number treated as Detected | 10 |
| Observations < Largest ND are treated as NDs | | Single DL Non-Detect Percentage | 93.10% |

**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 | 0.94 |
| 5% Shapiro Wilk Critical Value | 0.874 | 5% Shapiro Wilk Critical Value | 0.874 |

Data not Normal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.18 |
| SD | 0.264 |
| 95% DL/2 (t) UCL | 0.216 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE yields a negative mean**

Data appear Lognormal at 5% Significance Level

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -2.016 |
| SD | 0.57 |
| 95% H-Stat (DL/2) UCL | 0.171 |
| | |
| Log ROS Method | |
| Mean in Log Scale | -3.697 |
| SD in Log Scale | 1.765 |
| Mean in Original Scale | 0.114 |
| SD in Original Scale | 0.285 |
| 95% t UCL | 0.153 |
| 95% Percentile Bootstrap UCL | 0.154 |
| 95% BCA Bootstrap UCL | 0.166 |
| 95% H-UCL | 0.183 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 2.008 |
| Theta Star | 0.396 |
| nu star | 56.22 |
| | |
| A-D Test Statistic | 0.389 |
| 5% A-D Critical Value | 0.744 |
| K-S Test Statistic | 0.744 |
| 5% K-S Critical Value | 0.231 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 2.12 |
| Mean | 0.0768 |
| Median | 0.000001 |
| SD | 0.29 |
| k star | 0.0862 |
| Theta star | 0.891 |
| Nu star | 25.01 |
| AppChi2 | 14.62 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.131 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.132 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data appear Gamma Distributed at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.321 |
| SD | 0.229 |
| SE of Mean | 0.0197 |
| 95% KM (t) UCL | 0.353 |
| 95% KM (z) UCL | 0.353 |
| 95% KM (jackknife) UCL | 0.352 |
| 95% KM (bootstrap t) UCL | 0.376 |
| 95% KM (BCA) UCL | 0.415 |
| 95% KM (Percentile Bootstrap) UCL | 0.377 |
| 95% KM (Chebyshev) UCL | 0.407 |
| 97.5% KM (Chebyshev) UCL | 0.444 |
| 99% KM (Chebyshev) UCL | 0.517 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.353 |

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.

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General Statistics on Uncensored Full Data | | | | | | | | |
| 2 | | | Date/Time of Computation | 9/23/2015 2:14:02 PM | | | | | | | | |
| 3 | | | User Selected Options | | | | | | | | | |
| 4 | | | From File | Porewater_EasternSeep_Metals_Input.xls | | | | | | | | |
| 5 | | | Full Precision | OFF | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | From File: Porewater_EasternSeep_Metals_Input.xls | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 9 | | | | General Statistics for Uncensored Data Sets | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 11 | Variable | NumObs | # Missing | Minimum | Maximum | Mean | SD | SEM | MAD/0.675 | Skewness | Kurtosis | |
| 12 | LnROS_Aluminum | 136 | 0 | 0.165 | 835 | 11.8 | 72.04 | 6.177 | 2.824 | 11.24 | 129 | |
| 13 | LnROS_Antimony | 136 | 0 | 0.0122 | 1.58 | 0.141 | 0.189 | 0.0162 | 0.0677 | 4.504 | 26.87 | |
| 14 | LnROS_Arsenic | 136 | 0 | 0.109 | 35.8 | 1.428 | 3.153 | 0.27 | 0.693 | 9.831 | 106.5 | |
| 15 | LnROS_Barium | 136 | 0 | 2.85 | 667 | 126.9 | 102.7 | 8.807 | 77.09 | 2.047 | 6.395 | |
| 16 | LnROS_Beryllium | 136 | 0 | 3.0125E-5 | 0.0398 | 0.00312 | 0.00585 | 5.0175E-4 | 0.0013 | 4.062 | 19.66 | |
| 17 | LnROS_Boron | 136 | 0 | 65.5 | 3260 | 1018 | 847.8 | 72.7 | 760.6 | 0.795 | -0.441 | |
| 18 | LnROS_Cadmium | 136 | 0 | 0.00275 | 1.55 | 0.126 | 0.202 | 0.0173 | 0.0663 | 4.147 | 22.89 | |
| 19 | LnROS_Calcium | 136 | 0 | 2280 | 548000 | 199937 | 117570 | 10082 | 126019 | 0.659 | 0.125 | |
| 20 | LnROS_Cesium | 136 | 0 | 0.00338 | 0.0446 | 0.014 | 0.00799 | 6.8489E-4 | 0.00655 | 1.553 | 2.988 | |
| 21 | LnROS_Chromium | 136 | 0 | 0.00845 | 1.41 | 0.161 | 0.196 | 0.0168 | 0.0867 | 3.376 | 15.34 | |
| 22 | LnROS_Cobalt | 136 | 0 | 0.0154 | 59.2 | 5.742 | 9.5 | 0.815 | 2.421 | 2.963 | 10.53 | |
| 23 | LnROS_Copper | 136 | 0 | 0.0792 | 7.22 | 1.357 | 1.515 | 0.13 | 0.835 | 2.134 | 4.334 | |
| 24 | LnROS_Gallium | 136 | 0 | 1.000E-10 | 0.171 | 0.00126 | 0.0147 | 0.00126 | 0 | 11.66 | 136 | |
| 25 | LnROS_Iron | 135 | 0 | 0.181 | 85700 | 4632 | 13111 | 1128 | 557 | 4.437 | 21.28 | |
| 26 | LnROS_Lead | 136 | 0 | 9.9231E-5 | 1.63 | 0.0768 | 0.213 | 0.0183 | 0.0156 | 4.955 | 28.3 | |
| 27 | LnROS_Lithium | 136 | 0 | 1.44 | 145 | 35.87 | 31.28 | 2.683 | 23.25 | 1.321 | 1.255 | |
| 28 | LnROS_Magnesium | 136 | 0 | 3490 | 967000 | 331215 | 231094 | 19816 | 248332 | 0.613 | -0.509 | |
| 29 | LnROS_Manganese | 136 | 0 | 0.91 | 21000 | 3063 | 3701 | 317.4 | 2259 | 1.836 | 3.931 | |
| 30 | LnROS_Molybdenum | 136 | 0 | 0.0463 | 41.4 | 4.476 | 6.963 | 0.597 | 1.951 | 3.019 | 11.35 | |
| 31 | LnROS_Nickel | 136 | 0 | 0.191 | 63.2 | 6.344 | 9.327 | 0.8 | 3.143 | 3.682 | 16.46 | |
| 32 | LnROS_Phosphorus | 134 | 0 | 0.24 | 6800 | 193.4 | 672.7 | 58.11 | 36.91 | 7.841 | 72.16 | |
| 33 | LnROS_Potassium | 136 | 0 | 4400 | 258000 | 79486 | 63478 | 5443 | 72053 | 0.691 | -0.468 | |
| 34 | LnROS_Rhenium | 136 | 0 | 5.2531E-4 | 0.242 | 0.0246 | 0.036 | 0.00309 | 0.0116 | 2.972 | 11.46 | |
| 35 | LnROS_Rubidium | 136 | 0 | 1.624 | 74.9 | 21.18 | 18.11 | 1.553 | 19.33 | 0.889 | 0.0662 | |
| 36 | LnROS_Selenium | 136 | 0 | 0.00442 | 8.3 | 0.316 | 0.784 | 0.0672 | 0.134 | 8.213 | 80.86 | |
| 37 | LnROS_Silicon | 136 | 0 | 1670 | 9850 | 5107 | 2344 | 201 | 2446 | 0.491 | -0.97 | |
| 38 | LnROS_Silver | 136 | 0 | 1.000E-10 | 0.03 | 2.2059E-4 | 0.00257 | 2.2059E-4 | 0 | 11.66 | 136 | |
| 39 | LnROS_Sodium | 136 | 0 | 142000 | 7390000 | 2332449 | 1849757 | 158615 | 1868050 | 0.62 | -0.811 | |
| 40 | LnROS_Strontium | 136 | 0 | 23 | 6780 | 2830 | 1671 | 143.3 | 2076 | 0.366 | -0.775 | |
| 41 | LnROS_Tellurium | 136 | 0 | 0.00244 | 0.062 | 0.0153 | 0.0108 | 9.2692E-4 | 0.00788 | 1.586 | 2.846 | |
| 42 | LnROS_Thallium | 136 | 0 | 1.6264E-4 | 0.28 | 0.0258 | 0.0442 | 0.00379 | 0.00922 | 3.064 | 11.52 | |
| 43 | LnROS_Thorium | 136 | 0 | 1.1773E-5 | 0.0656 | 0.00319 | 0.00802 | 6.8765E-4 | 9.6156E-4 | 5.555 | 36.1 | |
| 44 | LnROS_Tin | 136 | 0 | 1.000E-10 | 2.2 | 0.0162 | 0.189 | 0.0162 | 0 | 11.66 | 136 | |
| 45 | LnROS_Titanium | 136 | 0 | 0.0027 | 12.4 | 0.449 | 1.295 | 0.111 | 0.149 | 7.232 | 60.11 | |
| 46 | LnROS_Tungsten | 136 | 0 | 2.9073E-4 | 1.2 | 0.0472 | 0.149 | 0.0127 | 0.015 | 7.071 | 53.06 | |
| 47 | LnROS_Uranium | 136 | 0 | 0.00749 | 31.7 | 3.887 | 6.178 | 0.53 | 1.556 | 2.229 | 4.996 | |
| 48 | LnROS_Vanadium | 136 | 0 | 0.0372 | 8.18 | 0.675 | 0.897 | 0.0769 | 0.371 | 5.075 | 37.35 | |
| 49 | LnROS_Yttrium | 136 | 0 | 0.00941 | 2.74 | 0.225 | 0.392 | 0.0336 | 0.0927 | 4.637 | 25.21 | |
| 50 | LnROS_Zinc | 136 | 0 | 0.773 | 440 | 38.5 | 67.65 | 5.801 | 14.01 | 3.697 | 15.28 | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | | | | | | | | | | | | |
| 52 | **Percentiles for Uncensored Data Sets** | | | | | | | | | | | |
| 53 | | | | | | | | | | | | |
| 54 | **Variable** | | **NumObs** | **# Missing** | **10%ile** | **20%ile** | **25%ile(Q1)** | **50%ile(Q2)** | **75%ile(Q3)** | **80%ile** | **90%ile** | **95%ile** |
| 55 | LnROS_Aluminum | | 136 | 0 | 0.622 | 1.153 | 1.291 | 2.851 | 6.5 | 7 | 10.55 | 18.4 |
| 56 | LnROS_Antimony | | 136 | 0 | 0.0332 | 0.044 | 0.0513 | 0.091 | 0.148 | 0.171 | 0.256 | 0.435 |
| 57 | LnROS_Arsenic | | 136 | 0 | 0.288 | 0.417 | 0.49 | 0.865 | 1.595 | 1.795 | 2.31 | 2.75 |
| 58 | LnROS_Barium | | 136 | 0 | 31.4 | 52.9 | 58.8 | 102 | 162.8 | 182 | 244.5 | 317 |
| 59 | LnROS_Beryllium | | 136 | 0 | 1.6340E-4 | 3.0317E-4 | 3.9409E-4 | 0.0011 | 0.00297 | 0.0038 | 0.00758 | 0.0132 |
| 60 | LnROS_Boron | | 136 | 0 | 170 | 261 | 303.8 | 690 | 1640 | 1780 | 2265 | 2655 |
| 61 | LnROS_Cadmium | | 136 | 0 | 0.0112 | 0.0178 | 0.0223 | 0.0605 | 0.144 | 0.173 | 0.32 | 0.479 |
| 62 | LnROS_Calcium | | 136 | 0 | 62250 | 98300 | 105750 | 202500 | 268000 | 296000 | 351000 | 401250 |
| 63 | LnROS_Cesium | | 136 | 0 | 0.00598 | 0.00749 | 0.0084 | 0.0123 | 0.0173 | 0.019 | 0.0238 | 0.029 |
| 64 | LnROS_Chromium | | 136 | 0 | 0.0276 | 0.0418 | 0.0498 | 0.0969 | 0.193 | 0.229 | 0.349 | 0.496 |
| 65 | LnROS_Cobalt | | 136 | 0 | 0.143 | 0.226 | 0.437 | 1.78 | 6.81 | 8.76 | 16.55 | 23.6 |
| 66 | LnROS_Copper | | 136 | 0 | 0.211 | 0.311 | 0.381 | 0.84 | 1.613 | 1.93 | 2.77 | 5.48 |
| 67 | LnROS_Gallium | | 136 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 |
| 68 | LnROS_Iron | | 135 | 0 | 5.614 | 13.46 | 18 | 379 | 2285 | 3172 | 8486 | 26570 |
| 69 | LnROS_Lead | | 136 | 0 | 9.4358E-4 | 0.00214 | 0.00298 | 0.0117 | 0.0484 | 0.061 | 0.132 | 0.453 |
| 70 | LnROS_Lithium | | 136 | 0 | 6.306 | 10.93 | 12.94 | 26 | 50 | 61 | 80 | 101 |
| 71 | LnROS_Magnesium | | 136 | 0 | 71800 | 117000 | 129250 | 291500 | 488750 | 529000 | 656000 | 742000 |
| 72 | LnROS_Manganese | | 136 | 0 | 31.9 | 163 | 349.3 | 1635 | 4115 | 4440 | 9180 | 10525 |
| 73 | LnROS_Molybdenum | | 136 | 0 | 0.202 | 0.44 | 0.545 | 1.514 | 5.1 | 7.4 | 11.25 | 16.33 |
| 74 | LnROS_Nickel | | 136 | 0 | 0.85 | 1.26 | 1.508 | 3.36 | 6.795 | 7.49 | 14.3 | 22.38 |
| 75 | LnROS_Phosphorus | | 134 | 0 | 2.22 | 5.159 | 7.176 | 27.48 | 107 | 149 | 378.2 | 744.2 |
| 76 | LnROS_Potassium | | 136 | 0 | 11300 | 14700 | 20425 | 62300 | 125000 | 141000 | 169000 | 196500 |
| 77 | LnROS_Rhenium | | 136 | 0 | 0.00214 | 0.00387 | 0.00482 | 0.0113 | 0.0251 | 0.0326 | 0.0777 | 0.0989 |
| 78 | LnROS_Rubidium | | 136 | 0 | 2.919 | 4.02 | 4.999 | 16.75 | 32.78 | 36.5 | 45.95 | 57.1 |
| 79 | LnROS_Selenium | | 136 | 0 | 0.0216 | 0.0379 | 0.0487 | 0.117 | 0.283 | 0.381 | 0.659 | 1.086 |
| 80 | LnROS_Silicon | | 136 | 0 | 2460 | 2800 | 3113 | 4390 | 7000 | 7660 | 8590 | 9388 |
| 81 | LnROS_Silver | | 136 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 |
| 82 | LnROS_Sodium | | 136 | 0 | 400500 | 591000 | 727500 | 1745000 | 3970000 | 4200000 | 5035000 | 5622500 |
| 83 | LnROS_Strontium | | 136 | 0 | 819.5 | 1260 | 1330 | 2740 | 4100 | 4300 | 5115 | 5665 |
| 84 | LnROS_Tellurium | | 136 | 0 | 0.00523 | 0.00684 | 0.0077 | 0.0122 | 0.02 | 0.022 | 0.0314 | 0.0384 |
| 85 | LnROS_Thallium | | 136 | 0 | 9.2803E-4 | 0.00184 | 0.00242 | 0.00755 | 0.0265 | 0.0388 | 0.075 | 0.101 |
| 86 | LnROS_Thorium | | 136 | 0 | 8.3442E-5 | 1.7853E-4 | 2.4093E-4 | 7.6294E-4 | 0.00245 | 0.0033 | 0.00782 | 0.0113 |
| 87 | LnROS_Tin | | 136 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 |
| 88 | LnROS_Titanium | | 136 | 0 | 0.0162 | 0.0318 | 0.0406 | 0.121 | 0.36 | 0.504 | 0.896 | 1.489 |
| 89 | LnROS_Tungsten | | 136 | 0 | 0.00169 | 0.00321 | 0.00422 | 0.0121 | 0.0358 | 0.047 | 0.0811 | 0.146 |
| 90 | LnROS_Uranium | | 136 | 0 | 0.0673 | 0.105 | 0.15 | 1.11 | 4.29 | 5.33 | 14 | 17.25 |
| 91 | LnROS_Vanadium | | 136 | 0 | 0.0946 | 0.172 | 0.212 | 0.38 | 0.87 | 0.98 | 1.53 | 1.79 |
| 92 | LnROS_Yttrium | | 136 | 0 | 0.0335 | 0.0492 | 0.0544 | 0.104 | 0.227 | 0.27 | 0.452 | 0.758 |
| 93 | LnROS_Zinc | | 136 | 0 | 3.45 | 6.5 | 7.975 | 14.3 | 39.8 | 50.6 | 73.25 | 181 |

| | M |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | CV |
| 12 | 6.107 |
| 13 | 1.339 |
| 14 | 2.208 |
| 15 | 0.81 |
| 16 | 1.878 |
| 17 | 0.833 |
| 18 | 1.596 |
| 19 | 0.588 |
| 20 | 0.569 |
| 21 | 1.218 |
| 22 | 1.655 |
| 23 | 1.116 |
| 24 | 11.66 |
| 25 | 2.83 |
| 26 | 2.773 |
| 27 | 0.872 |
| 28 | 0.698 |
| 29 | 1.208 |
| 30 | 1.556 |
| 31 | 1.47 |
| 32 | 3.479 |
| 33 | 0.799 |
| 34 | 1.461 |
| 35 | 0.855 |
| 36 | 2.479 |
| 37 | 0.459 |
| 38 | 11.66 |
| 39 | 0.793 |
| 40 | 0.59 |
| 41 | 0.704 |
| 42 | 1.711 |
| 43 | 2.517 |
| 44 | 11.66 |
| 45 | 2.883 |
| 46 | 3.148 |
| 47 | 1.589 |
| 48 | 1.328 |
| 49 | 1.745 |
| 50 | 1.757 |

| | M |
|---|---|
| 51 | |
| 52 | |
| 53 | |
| 54 | **99%ile** |
| 55 | 91.34 |
| 56 | 0.793 |
| 57 | 7.223 |
| 58 | 482.8 |
| 59 | 0.0326 |
| 60 | 3133 |
| 61 | 0.986 |
| 62 | 525550 |
| 63 | 0.0428 |
| 64 | 0.98 |
| 65 | 43.17 |
| 66 | 6.564 |
| 67 | 1.000E-10 |
| 68 | 72612 |
| 69 | 1.082 |
| 70 | 127.6 |
| 71 | 885700 |
| 72 | 13315 |
| 73 | 35.78 |
| 74 | 51.07 |
| 75 | 2459 |
| 76 | 243050 |
| 77 | 0.156 |
| 78 | 71.86 |
| 79 | 2.198 |
| 80 | 9823 |
| 81 | 1.000E-10 |
| 82 | 6354500 |
| 83 | 6641 |
| 84 | 0.0491 |
| 85 | 0.213 |
| 86 | 0.0435 |
| 87 | 1.000E-10 |
| 88 | 5.951 |
| 89 | 0.885 |
| 90 | 26.75 |
| 91 | 3.589 |
| 92 | 2.359 |
| 93 | 344.4 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | UCL Statistics for Data Sets with Non-Detects | | | | | | | | | | | |
| 2 | | | | | | | | | | | | |
| 3 | User Selected Options | | | | | | | | | | | |
| 4 | Date/Time of Computation | | | 9/23/2015 2:14:15 PM | | | | | | | | |
| 5 | From File | | | Porewater_EasternSeep_Metals_Input.xls | | | | | | | | |
| 6 | Full Precision | | | OFF | | | | | | | | |
| 7 | Confidence Coefficient | | | 95% | | | | | | | | |
| 8 | Number of Bootstrap Operations | | | 2000 | | | | | | | | |
| 9 | | | | | | | | | | | | |
| 10 | Aluminum | | | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| 12 | General Statistics | | | | | | | | | | | |
| 13 | Total Number of Observations | | | | | 136 | Number of Distinct Observations | | | | | 58 |
| 14 | Number of Detects | | | | | 66 | Number of Non-Detects | | | | | 70 |
| 15 | Number of Distinct Detects | | | | | 55 | Number of Distinct Non-Detects | | | | | 5 |
| 16 | Minimum Detect | | | | | 1.2 | Minimum Non-Detect | | | | | 1 |
| 17 | Maximum Detect | | | | | 835 | Maximum Non-Detect | | | | | 6 |
| 18 | Variance Detects | | | | | 10555 | Percent Non-Detects | | | | | 51.47% |
| 19 | Mean Detects | | | | | 22.4 | SD Detects | | | | | 102.7 |
| 20 | Median Detects | | | | | 6.5 | CV Detects | | | | | 4.586 |
| 21 | Skewness Detects | | | | | 7.858 | Kurtosis Detects | | | | | 62.9 |
| 22 | Mean of Logged Detects | | | | | 1.906 | SD of Logged Detects | | | | | 1.05 |
| 23 | | | | | | | | | | | | |
| 24 | Normal GOF Test on Detects Only | | | | | | | | | | | |
| 25 | Shapiro Wilk Test Statistic | | | | | 0.189 | Normal GOF Test on Detected Observations Only | | | | | |
| 26 | 5% Shapiro Wilk P Value | | | | | 0 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 27 | Lilliefors Test Statistic | | | | | 0.434 | Lilliefors GOF Test | | | | | |
| 28 | 5% Lilliefors Critical Value | | | | | 0.109 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 29 | Detected Data Not Normal at 5% Significance Level | | | | | | | | | | | |
| 30 | | | | | | | | | | | | |
| 31 | Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs | | | | | | | | | | | |
| 32 | Mean | | | | | 11.97 | Standard Error of Mean | | | | | 6.201 |
| 33 | SD | | | | | 71.75 | 95% KM (BCA) UCL | | | | | 24.34 |
| 34 | 95% KM (t) UCL | | | | | 22.24 | 95% KM (Percentile Bootstrap) UCL | | | | | 23.86 |
| 35 | 95% KM (z) UCL | | | | | 22.16 | 95% KM Bootstrap t UCL | | | | | 94.43 |
| 36 | 90% KM Chebyshev UCL | | | | | 30.57 | 95% KM Chebyshev UCL | | | | | 38.99 |
| 37 | 97.5% KM Chebyshev UCL | | | | | 50.69 | 99% KM Chebyshev UCL | | | | | 73.66 |
| 38 | | | | | | | | | | | | |
| 39 | Gamma GOF Tests on Detected Observations Only | | | | | | | | | | | |
| 40 | A-D Test Statistic | | | | | 9.68 | Anderson-Darling GOF Test | | | | | |
| 41 | 5% A-D Critical Value | | | | | 0.814 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 42 | K-S Test Statistic | | | | | 0.3 | Kolmogrov-Smirnoff GOF | | | | | |
| 43 | 5% K-S Critical Value | | | | | 0.116 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 44 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | | | | | | | |
| 45 | | | | | | | | | | | | |
| 46 | Gamma Statistics on Detected Data Only | | | | | | | | | | | |
| 47 | k hat (MLE) | | | | | 0.524 | k star (bias corrected MLE) | | | | | 0.51 |
| 48 | Theta hat (MLE) | | | | | 42.75 | Theta star (bias corrected MLE) | | | | | 43.9 |
| 49 | nu hat (MLE) | | | | | 69.18 | nu star (bias corrected) | | | | | 67.37 |
| 50 | MLE Mean (bias corrected) | | | | | 22.4 | MLE Sd (bias corrected) | | | | | 31.36 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | | | | | | | | | | | | |
| 52 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 53 | | | | | k hat (KM) | 0.0278 | | | | | nu hat (KM) | 7.565 |
| 54 | | | | | Approximate Chi Square Value (7.56, α) | 2.486 | | | | | Adjusted Chi Square Value (7.56, β) | 2.455 |
| 55 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 36.42 | | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | 36.88 |
| 56 | Gamma (KM) may not be used when k hat (KM) is < 0.1 | | | | | | | | | | | |
| 57 | | | | | | | | | | | | |
| 58 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 59 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 60 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 61 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 62 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 63 | | | | | Minimum | 0.01 | | | | | Mean | 10.88 |
| 64 | | | | | Maximum | 835 | | | | | Median | 0.01 |
| 65 | | | | | SD | 72.17 | | | | | CV | 6.634 |
| 66 | | | | | k hat (MLE) | 0.193 | | | | | k star (bias corrected MLE) | 0.194 |
| 67 | | | | | Theta hat (MLE) | 56.33 | | | | | Theta star (bias corrected MLE) | 56.15 |
| 68 | | | | | nu hat (MLE) | 52.52 | | | | | nu star (bias corrected) | 52.7 |
| 69 | | | | | MLE Mean (bias corrected) | 10.88 | | | | | MLE Sd (bias corrected) | 24.71 |
| 70 | | | | | | | | | | | Adjusted Level of Significance (β) | 0.0482 |
| 71 | | | | | Approximate Chi Square Value (52.70, α) | 37.02 | | | | | Adjusted Chi Square Value (52.70, β) | 36.88 |
| 72 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 15.48 | | | | | 95% Gamma Adjusted UCL (use when n<50) | 15.54 |
| 73 | | | | | | | | | | | | |
| 74 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 75 | | | | | Lilliefors Test Statistic | 0.161 | **Lilliefors GOF Test** | | | | | |
| 76 | | | | | 5% Lilliefors Critical Value | 0.109 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 77 | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 78 | | | | | | | | | | | | |
| 79 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 80 | | | | | Mean in Original Scale | 11.8 | | | | | Mean in Log Scale | 1.072 |
| 81 | | | | | SD in Original Scale | 72.04 | | | | | SD in Log Scale | 1.245 |
| 82 | | | | | 95% t UCL (assumes normality of ROS data) | 22.03 | | | | | 95% Percentile Bootstrap UCL | 23.74 |
| 83 | | | | | 95% BCA Bootstrap UCL | 30.35 | | | | | 95% Bootstrap t UCL | 95.96 |
| 84 | | | | | 95% H-UCL (Log ROS) | 8.226 | | | | | | |
| 85 | | | | | | | | | | | | |
| 86 | **DL/2 Statistics** | | | | | | | | | | | |
| 87 | | | | | **DL/2 Normal** | | **DL/2 Log-Transformed** | | | | | |
| 88 | | | | | Mean in Original Scale | 12.04 | | | | | Mean in Log Scale | 1.318 |
| 89 | | | | | SD in Original Scale | 72 | | | | | SD in Log Scale | 0.968 |
| 90 | | | | | 95% t UCL (Assumes normality) | 22.27 | | | | | 95% H-Stat UCL | 7.151 |
| 91 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 92 | | | | | | | | | | | | |
| 93 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 94 | **Data do not follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 95 | | | | | | | | | | | | |
| 96 | **Suggested UCL to Use** | | | | | | | | | | | |
| 97 | | | | | 95% KM (BCA) UCL | 24.34 | | | | | | |
| 98 | | | | | | | | | | | | |
| 99 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 100 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

**Antimony**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 136 | Number of Distinct Observations | 44 |
| Number of Detects | 48 | Number of Non-Detects | 88 |
| Number of Distinct Detects | 43 | Number of Distinct Non-Detects | 1 |
| Minimum Detect | 0.027 | Minimum Non-Detect | 0.5 |
| Maximum Detect | 1.58 | Maximum Non-Detect | 0.5 |
| Variance Detects | 0.0857 | Percent Non-Detects | 64.71% |
| Mean Detects | 0.2 | SD Detects | 0.293 |
| Median Detects | 0.095 | CV Detects | 1.464 |
| Skewness Detects | 2.949 | Kurtosis Detects | 10.15 |
| Mean of Logged Detects | -2.207 | SD of Logged Detects | 0.988 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.587 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.947 | Detected Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.352 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.128 | Detected Data Not Normal at 5% Significance Level |

**Detected Data Not Normal at 5% Significance Level**

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

| | | | |
|---|---|---|---|
| Mean | 0.132 | Standard Error of Mean | 0.018 |
| SD | 0.187 | 95% KM (BCA) UCL | 0.163 |
| 95% KM (t) UCL | 0.161 | 95% KM (Percentile Bootstrap) UCL | 0.163 |
| 95% KM (z) UCL | 0.161 | 95% KM Bootstrap t UCL | 0.174 |
| 90% KM Chebyshev UCL | 0.186 | 95% KM Chebyshev UCL | 0.21 |
| 97.5% KM Chebyshev UCL | 0.244 | 99% KM Chebyshev UCL | 0.311 |

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 3.668 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.78 | Detected Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.235 | **Kolmogrov-Smirnoff GOF** |
| 5% K-S Critical Value | 0.132 | Detected Data Not Gamma Distributed at 5% Significance Level |

**Detected Data Not Gamma Distributed at 5% Significance Level**

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.97 | k star (bias corrected MLE) | 0.924 |
| Theta hat (MLE) | 0.206 | Theta star (bias corrected MLE) | 0.216 |
| nu hat (MLE) | 93.14 | nu star (bias corrected) | 88.66 |
| MLE Mean (bias corrected) | 0.2 | MLE Sd (bias corrected) | 0.208 |

**Gamma Kaplan-Meier (KM) Statistics**

| | | | |
|---|---|---|---|
| k hat (KM) | 0.497 | nu hat (KM) | 135.1 |
| Approximate Chi Square Value (135.09, α) | 109.2 | Adjusted Chi Square Value (135.09, β) | 109 |
| 95% Gamma Approximate KM-UCL (use when n>=50) | 0.163 | 95% Gamma Adjusted KM-UCL (use when n<50) | 0.163 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 151 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 152 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 153 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 154 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 155 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 156 | | | | | Minimum | 0.01 | | | | Mean | | 0.149 |
| 157 | | | | | Maximum | 1.58 | | | | Median | | 0.0837 |
| 158 | | | | | SD | 0.207 | | | | CV | | 1.39 |
| 159 | | | | | k hat (MLE) | 0.783 | | | | k star (bias corrected MLE) | | 0.77 |
| 160 | | | | | Theta hat (MLE) | 0.19 | | | | Theta star (bias corrected MLE) | | 0.193 |
| 161 | | | | | nu hat (MLE) | 212.9 | | | | nu star (bias corrected) | | 209.5 |
| 162 | | | | | MLE Mean (bias corrected) | 0.149 | | | | MLE Sd (bias corrected) | | 0.17 |
| 163 | | | | | | | | | | Adjusted Level of Significance (β) | | 0.0482 |
| 164 | | | | | Approximate Chi Square Value (209.52, α) | 177 | | | | Adjusted Chi Square Value (209.52, β) | | 176.7 |
| 165 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.176 | | | | 95% Gamma Adjusted UCL (use when n<50) | | 0.177 |
| 166 | | | | | | | | | | | | |
| 167 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 168 | | | | | Shapiro Wilk Test Statistic | 0.9 | | | | **Shapiro Wilk GOF Test** | | |
| 169 | | | | | 5% Shapiro Wilk Critical Value | 0.947 | | | | Detected Data Not Lognormal at 5% Significance Level | | |
| 170 | | | | | Lilliefors Test Statistic | 0.141 | | | | **Lilliefors GOF Test** | | |
| 171 | | | | | 5% Lilliefors Critical Value | 0.128 | | | | Detected Data Not Lognormal at 5% Significance Level | | |
| 172 | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 173 | | | | | | | | | | | | |
| 174 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 175 | | | | | Mean in Original Scale | 0.141 | | | | Mean in Log Scale | | -2.384 |
| 176 | | | | | SD in Original Scale | 0.189 | | | | SD in Log Scale | | 0.857 |
| 177 | | | | | 95% t UCL (assumes normality of ROS data) | 0.168 | | | | 95% Percentile Bootstrap UCL | | 0.168 |
| 178 | | | | | 95% BCA Bootstrap UCL | 0.179 | | | | 95% Bootstrap t UCL | | 0.179 |
| 179 | | | | | 95% H-UCL (Log ROS) | 0.155 | | | | | | |
| 180 | | | | | | | | | | | | |
| 181 | **DL/2 Statistics** | | | | | | | | | | | |
| 182 | | | | | **DL/2 Normal** | | | | | **DL/2 Log-Transformed** | | |
| 183 | | | | | Mean in Original Scale | 0.232 | | | | Mean in Log Scale | | -1.676 |
| 184 | | | | | SD in Original Scale | 0.174 | | | | SD in Log Scale | | 0.704 |
| 185 | | | | | 95% t UCL (Assumes normality) | 0.257 | | | | 95% H-Stat UCL | | 0.27 |
| 186 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 187 | | | | | | | | | | | | |
| 188 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 189 | **Data do not follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 190 | | | | | | | | | | | | |
| 191 | **Suggested UCL to Use** | | | | | | | | | | | |
| 192 | | | | | 95% KM (t) UCL | 0.161 | | | | 95% KM (% Bootstrap) UCL | | 0.163 |
| 193 | | | | | | | | | | | | |
| 194 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 195 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 196 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 197 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 198 | | | | | | | | | | | | |
| 199 | **Arsenic** | | | | | | | | | | | |
| 200 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 201 | **General Statistics** | | | | | | | | | | | |
| 202 | | | | | Total Number of Observations | 136 | | | | Number of Distinct Observations | | 55 |
| 203 | | | | | Number of Detects | 54 | | | | Number of Non-Detects | | 82 |
| 204 | | | | | Number of Distinct Detects | 50 | | | | Number of Distinct Non-Detects | | 6 |
| 205 | | | | | Minimum Detect | 0.16 | | | | Minimum Non-Detect | | 2 |
| 206 | | | | | Maximum Detect | 35.8 | | | | Maximum Non-Detect | | 23 |
| 207 | | | | | Variance Detects | 23.52 | | | | Percent Non-Detects | | 60.29% |
| 208 | | | | | Mean Detects | 2.36 | | | | SD Detects | | 4.85 |
| 209 | | | | | Median Detects | 1.6 | | | | CV Detects | | 2.055 |
| 210 | | | | | Skewness Detects | 6.441 | | | | Kurtosis Detects | | 44.65 |
| 211 | | | | | Mean of Logged Detects | 0.269 | | | | SD of Logged Detects | | 1.003 |
| 212 | | | | | | | | | | | | |
| 213 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 214 | | | | | Shapiro Wilk Test Statistic | 0.35 | **Normal GOF Test on Detected Observations Only** | | | | | |
| 215 | | | | | 5% Shapiro Wilk P Value | 0 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 216 | | | | | Lilliefors Test Statistic | 0.351 | **Lilliefors GOF Test** | | | | | |
| 217 | | | | | 5% Lilliefors Critical Value | 0.121 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 218 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 219 | | | | | | | | | | | | |
| 220 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 221 | | | | | Mean | 1.473 | | | | Standard Error of Mean | | 0.28 |
| 222 | | | | | SD | 3.142 | | | | 95% KM (BCA) UCL | | 2.016 |
| 223 | | | | | 95% KM (t) UCL | 1.937 | | | | 95% KM (Percentile Bootstrap) UCL | | 2.012 |
| 224 | | | | | 95% KM (z) UCL | 1.934 | | | | 95% KM Bootstrap t UCL | | 2.526 |
| 225 | | | | | 90% KM Chebyshev UCL | 2.313 | | | | 95% KM Chebyshev UCL | | 2.694 |
| 226 | | | | | 97.5% KM Chebyshev UCL | 3.222 | | | | 99% KM Chebyshev UCL | | 4.26 |
| 227 | | | | | | | | | | | | |
| 228 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 229 | | | | | A-D Test Statistic | 1.951 | **Anderson-Darling GOF Test** | | | | | |
| 230 | | | | | 5% A-D Critical Value | 0.781 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 231 | | | | | K-S Test Statistic | 0.202 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 232 | | | | | 5% K-S Critical Value | 0.125 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 233 | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 234 | | | | | | | | | | | | |
| 235 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 236 | | | | | k hat (MLE) | 0.981 | | | | k star (bias corrected MLE) | | 0.939 |
| 237 | | | | | Theta hat (MLE) | 2.405 | | | | Theta star (bias corrected MLE) | | 2.513 |
| 238 | | | | | nu hat (MLE) | 106 | | | | nu star (bias corrected) | | 101.4 |
| 239 | | | | | MLE Mean (bias corrected) | 2.36 | | | | MLE Sd (bias corrected) | | 2.436 |
| 240 | | | | | | | | | | | | |
| 241 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 242 | | | | | k hat (KM) | 0.22 | | | | nu hat (KM) | | 59.81 |
| 243 | | | | | Approximate Chi Square Value (59.81, α) | 43.02 | | | | Adjusted Chi Square Value (59.81, β) | | 42.87 |
| 244 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 2.048 | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | 2.055 |
| 245 | | | | | | | | | | | | |
| 246 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 247 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 248 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 249 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 250 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 251 | | | | | Minimum | 0.01 | | | | | Mean | 1.25 |
| 252 | | | | | Maximum | 35.8 | | | | | Median | 0.602 |
| 253 | | | | | SD | 3.226 | | | | | CV | 2.581 |
| 254 | | | | | k hat (MLE) | 0.393 | | | | | k star (bias corrected MLE) | 0.389 |
| 255 | | | | | Theta hat (MLE) | 3.181 | | | | | Theta star (bias corrected MLE) | 3.211 |
| 256 | | | | | nu hat (MLE) | 106.9 | | | | | nu star (bias corrected) | 105.9 |
| 257 | | | | | MLE Mean (bias corrected) | 1.25 | | | | | MLE Sd (bias corrected) | 2.004 |
| 258 | | | | | | | | | | | Adjusted Level of Significance (β) | 0.0482 |
| 259 | | | | | Approximate Chi Square Value (105.87, α) | 83.12 | | | | | Adjusted Chi Square Value (105.87, β) | 82.91 |
| 260 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 1.592 | | | | | 95% Gamma Adjusted UCL (use when n<50) | 1.596 |
| 261 | | | | | | | | | | | | |
| 262 | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | | |
| 263 | | | | | Lilliefors Test Statistic | 0.117 | | | | | **Lilliefors GOF Test** | |
| 264 | | | | | 5% Lilliefors Critical Value | 0.121 | | | | | Detected Data appear Lognormal at 5% Significance Level | |
| 265 | | | | | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | |
| 266 | | | | | | | | | | | | |
| 267 | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | |
| 268 | | | | | Mean in Original Scale | 1.428 | | | | | Mean in Log Scale | -0.131 |
| 269 | | | | | SD in Original Scale | 3.153 | | | | | SD in Log Scale | 0.874 |
| 270 | | | | | 95% t UCL (assumes normality of ROS data) | 1.876 | | | | | 95% Percentile Bootstrap UCL | 1.965 |
| 271 | | | | | 95% BCA Bootstrap UCL | 2.206 | | | | | 95% Bootstrap t UCL | 2.692 |
| 272 | | | | | 95% H-UCL (Log ROS) | 1.503 | | | | | | |
| 273 | | | | | | | | | | | | |
| 274 | | | | | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | |
| 275 | | | | | KM Mean (logged) | -0.1 | | | | | 95% H-UCL (KM -Log) | 1.576 |
| 276 | | | | | KM SD (logged) | 0.888 | | | | | 95% Critical H Value (KM-Log) | 2.099 |
| 277 | | | | | KM Standard Error of Mean (logged) | 0.118 | | | | | | |
| 278 | | | | | | | | | | | | |
| 279 | | | | | **DL/2 Statistics** | | | | | | | |
| 280 | | | | | **DL/2 Normal** | | **DL/2 Log-Transformed** | | | | | |
| 281 | | | | | Mean in Original Scale | 1.687 | | | | | Mean in Log Scale | 0.166 |
| 282 | | | | | SD in Original Scale | 3.233 | | | | | SD in Log Scale | 0.691 |
| 283 | | | | | 95% t UCL (Assumes normality) | 2.146 | | | | | 95% H-Stat UCL | 1.684 |
| 284 | | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | |
| 285 | | | | | | | | | | | | |
| 286 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 287 | | | | | **Detected Data appear Lognormal Distributed at 5% Significance Level** | | | | | | | |
| 288 | | | | | | | | | | | | |
| 289 | | | | | **Suggested UCL to Use** | | | | | | | |
| 290 | | | | | 95% KM (BCA) UCL | 2.016 | | | | | | |
| 291 | | | | | | | | | | | | |
| 292 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 293 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 294 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 295 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 296 | | | | | | | | | | | | |
| 297 | | | | | | | | | | | | |
| 298 | **Barium** | | | | | | | | | | | |
| 299 | | | | | | | | | | | | |
| 300 | | | | | **General Statistics** | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 301 | | | | | Total Number of Observations | 136 | | | | | Number of Distinct Observations | 122 |
| 302 | | | | | | | | | | | Number of Missing Observations | 0 |
| 303 | | | | | Minimum | 2.85 | | | | | Mean | 126.9 |
| 304 | | | | | Maximum | 667 | | | | | Median | 102 |
| 305 | | | | | SD | 102.7 | | | | | Std. Error of Mean | 8.807 |
| 306 | | | | | Coefficient of Variation | 0.81 | | | | | Skewness | 2.047 |
| 307 | | | | | | | | | | | | |
| 308 | | | | | **Normal GOF Test** | | | | | | | |
| 309 | | | | | Shapiro Wilk Test Statistic | 0.842 | **Shapiro Wilk GOF Test** | | | | | |
| 310 | | | | | 5% Shapiro Wilk P Value | 0 | Data Not Normal at 5% Significance Level | | | | | |
| 311 | | | | | Lilliefors Test Statistic | 0.14 | **Lilliefors GOF Test** | | | | | |
| 312 | | | | | 5% Lilliefors Critical Value | 0.076 | Data Not Normal at 5% Significance Level | | | | | |
| 313 | | | | | **Data Not Normal at 5% Significance Level** | | | | | | | |
| 314 | | | | | | | | | | | | |
| 315 | | | | | **Assuming Normal Distribution** | | | | | | | |
| 316 | | | | | **95% Normal UCL** | | **95% UCLs (Adjusted for Skewness)** | | | | | |
| 317 | | | | | 95% Student's-t UCL | 141.5 | | | | | 95% Adjusted-CLT UCL (Chen-1995) | 143 |
| 318 | | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | 141.7 |
| 319 | | | | | | | | | | | | |
| 320 | | | | | **Gamma GOF Test** | | | | | | | |
| 321 | | | | | A-D Test Statistic | 0.315 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 322 | | | | | 5% A-D Critical Value | 0.769 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 323 | | | | | K-S Test Statistic | 0.0462 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 324 | | | | | 5% K-S Critical Value | 0.0815 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 325 | | | | | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | |
| 326 | | | | | | | | | | | | |
| 327 | | | | | **Gamma Statistics** | | | | | | | |
| 328 | | | | | k hat (MLE) | 1.652 | | | | | k star (bias corrected MLE) | 1.621 |
| 329 | | | | | Theta hat (MLE) | 76.79 | | | | | Theta star (bias corrected MLE) | 78.29 |
| 330 | | | | | nu hat (MLE) | 449.4 | | | | | nu star (bias corrected) | 440.8 |
| 331 | | | | | MLE Mean (bias corrected) | 126.9 | | | | | MLE Sd (bias corrected) | 99.66 |
| 332 | | | | | | | | | | | Approximate Chi Square Value (0.05) | 393.1 |
| 333 | | | | | Adjusted Level of Significance | 0.0482 | | | | | Adjusted Chi Square Value | 392.6 |
| 334 | | | | | | | | | | | | |
| 335 | | | | | **Assuming Gamma Distribution** | | | | | | | |
| 336 | | | | | 95% Approximate Gamma UCL (use when n>=50) | 142.3 | | | | | 95% Adjusted Gamma UCL (use when n<50) | 142.4 |
| 337 | | | | | | | | | | | | |
| 338 | | | | | **Lognormal GOF Test** | | | | | | | |
| 339 | | | | | Shapiro Wilk Test Statistic | 0.946 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 340 | | | | | 5% Shapiro Wilk P Value | 5.0133E-5 | Data Not Lognormal at 5% Significance Level | | | | | |
| 341 | | | | | Lilliefors Test Statistic | 0.0887 | **Lilliefors Lognormal GOF Test** | | | | | |
| 342 | | | | | 5% Lilliefors Critical Value | 0.076 | Data Not Lognormal at 5% Significance Level | | | | | |
| 343 | | | | | **Data Not Lognormal at 5% Significance Level** | | | | | | | |
| 344 | | | | | | | | | | | | |
| 345 | | | | | **Lognormal Statistics** | | | | | | | |
| 346 | | | | | Minimum of Logged Data | 1.047 | | | | | Mean of logged Data | 4.511 |
| 347 | | | | | Maximum of Logged Data | 6.503 | | | | | SD of logged Data | 0.917 |
| 348 | | | | | | | | | | | | |
| 349 | | | | | **Assuming Lognormal Distribution** | | | | | | | |
| 350 | | | | | 95% H-UCL | 163.9 | | | | | 90% Chebyshev (MVUE) UCL | 176.4 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 351 | | | | | 95% Chebyshev (MVUE) UCL | 193.7 | | | | 97.5% Chebyshev (MVUE) UCL | | 217.8 |
| 352 | | | | | 99% Chebyshev (MVUE) UCL | 265.1 | | | | | | |
| 353 | | | | | | | | | | | | |
| 354 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 355 | | | | | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | |
| 356 | | | | | | | | | | | | |
| 357 | | | | | **Nonparametric Distribution Free UCLs** | | | | | | | |
| 358 | | | | | 95% CLT UCL | 141.4 | | | | 95% Jackknife UCL | | 141.5 |
| 359 | | | | | 95% Standard Bootstrap UCL | 141.3 | | | | 95% Bootstrap-t UCL | | 143.9 |
| 360 | | | | | 95% Hall's Bootstrap UCL | 144 | | | | 95% Percentile Bootstrap UCL | | 141.7 |
| 361 | | | | | 95% BCA Bootstrap UCL | 141.4 | | | | | | |
| 362 | | | | | 90% Chebyshev(Mean, Sd) UCL | 153.3 | | | | 95% Chebyshev(Mean, Sd) UCL | | 165.3 |
| 363 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 181.9 | | | | 99% Chebyshev(Mean, Sd) UCL | | 214.5 |
| 364 | | | | | | | | | | | | |
| 365 | | | | | **Suggested UCL to Use** | | | | | | | |
| 366 | | | | | 95% Approximate Gamma UCL | 142.3 | | | | | | |
| 367 | | | | | | | | | | | | |
| 368 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 369 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | |
| 370 | | | | | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | |
| 371 | | | | | For additional insight the user may want to consult a statistician. | | | | | | | |
| 372 | | | | | | | | | | | | |
| 373 | **Beryllium** | | | | | | | | | | | |
| 374 | | | | | | | | | | | | |
| 375 | | | | | **General Statistics** | | | | | | | |
| 376 | | | | | Total Number of Observations | 136 | | | | Number of Distinct Observations | | 8 |
| 377 | | | | | Number of Detects | 5 | | | | Number of Non-Detects | | 131 |
| 378 | | | | | Number of Distinct Detects | 5 | | | | Number of Distinct Non-Detects | | 3 |
| 379 | | | | | Minimum Detect | 0.0057 | | | | Minimum Non-Detect | | 0.005 |
| 380 | | | | | Maximum Detect | 0.0362 | | | | Maximum Non-Detect | | 0.5 |
| 381 | | | | | Variance Detects | 1.4414E-4 | | | | Percent Non-Detects | | 96.32% |
| 382 | | | | | Mean Detects | 0.0156 | | | | SD Detects | | 0.012 |
| 383 | | | | | Median Detects | 0.013 | | | | CV Detects | | 0.772 |
| 384 | | | | | Skewness Detects | 1.81 | | | | Kurtosis Detects | | 3.608 |
| 385 | | | | | Mean of Logged Detects | -4.364 | | | | SD of Logged Detects | | 0.685 |
| 386 | | | | | | | | | | | | |
| 387 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 388 | | | | | Shapiro Wilk Test Statistic | 0.802 | | | | **Shapiro Wilk GOF Test** | | |
| 389 | | | | | 5% Shapiro Wilk Critical Value | 0.762 | | | | Detected Data appear Normal at 5% Significance Level | | |
| 390 | | | | | Lilliefors Test Statistic | 0.352 | | | | **Lilliefors GOF Test** | | |
| 391 | | | | | 5% Lilliefors Critical Value | 0.396 | | | | Detected Data appear Normal at 5% Significance Level | | |
| 392 | | | | | **Detected Data appear Normal at 5% Significance Level** | | | | | | | |
| 393 | | | | | | | | | | | | |
| 394 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |
| 395 | | | | | Mean | 0.00637 | | | | Standard Error of Mean | | 8.7030E-4 |
| 396 | | | | | SD | 0.005 | | | | 95% KM (BCA) UCL | | 0.00792 |
| 397 | | | | | 95% KM (t) UCL | 0.00781 | | | | 95% KM (Percentile Bootstrap) UCL | | 0.00785 |
| 398 | | | | | 95% KM (z) UCL | 0.0078 | | | | 95% KM Bootstrap t UCL | | 0.00822 |
| 399 | | | | | 90% KM Chebyshev UCL | 0.00898 | | | | 95% KM Chebyshev UCL | | 0.0102 |
| 400 | | | | | 97.5% KM Chebyshev UCL | 0.0118 | | | | 99% KM Chebyshev UCL | | 0.015 |

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| 401 | | | | | | | | | | | | |
| 402 | | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | |
| 403 | | | | | A-D Test Statistic | 0.36 | **Anderson-Darling GOF Test** | | | | | |
| 404 | | | | | 5% A-D Critical Value | 0.683 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 405 | | | | | K-S Test Statistic | 0.284 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 406 | | | | | 5% K-S Critical Value | 0.36 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 407 | | | | | | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | |
| 408 | | | | | | | | | | | | |
| 409 | | | | | | **Gamma Statistics on Detected Data Only** | | | | | | |
| 410 | | | | | k hat (MLE) | 2.645 | k star (bias corrected MLE) | | | | | 1.191 |
| 411 | | | | | Theta hat (MLE) | 0.00588 | Theta star (bias corrected MLE) | | | | | 0.0131 |
| 412 | | | | | nu hat (MLE) | 26.45 | nu star (bias corrected) | | | | | 11.91 |
| 413 | | | | | MLE Mean (bias corrected) | 0.0156 | MLE Sd (bias corrected) | | | | | 0.0143 |
| 414 | | | | | | | | | | | | |
| 415 | | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | |
| 416 | | | | | k hat (KM) | 1.625 | nu hat (KM) | | | | | 442.1 |
| 417 | | | | | Approximate Chi Square Value (442.10, α) | 394.4 | Adjusted Chi Square Value (442.10, β) | | | | | 393.9 |
| 418 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.00714 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 0.00715 |
| 419 | | | | | | | | | | | | |
| 420 | | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | |
| 421 | | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | |
| 422 | | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | |
| 423 | | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | |
| 424 | | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | |
| 425 | | | | | Minimum | 0.0057 | Mean | | | | | 0.0108 |
| 426 | | | | | Maximum | 0.0362 | Median | | | | | 0.01 |
| 427 | | | | | SD | 0.00375 | CV | | | | | 0.349 |
| 428 | | | | | k hat (MLE) | 16.68 | k star (bias corrected MLE) | | | | | 16.32 |
| 429 | | | | | Theta hat (MLE) | 6.4539E-4 | Theta star (bias corrected MLE) | | | | | 6.5975E-4 |
| 430 | | | | | nu hat (MLE) | 4537 | nu star (bias corrected) | | | | | 4438 |
| 431 | | | | | MLE Mean (bias corrected) | 0.0108 | MLE Sd (bias corrected) | | | | | 0.00266 |
| 432 | | | | | | | Adjusted Level of Significance (β) | | | | | 0.0482 |
| 433 | | | | | Approximate Chi Square Value (N/A, α) | 4284 | Adjusted Chi Square Value (N/A, β) | | | | | 4283 |
| 434 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.0112 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 0.0112 |
| 435 | | | | | | | | | | | | |
| 436 | | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | |
| 437 | | | | | Shapiro Wilk Test Statistic | 0.954 | **Shapiro Wilk GOF Test** | | | | | |
| 438 | | | | | 5% Shapiro Wilk Critical Value | 0.762 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 439 | | | | | Lilliefors Test Statistic | 0.245 | **Lilliefors GOF Test** | | | | | |
| 440 | | | | | 5% Lilliefors Critical Value | 0.396 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 441 | | | | | | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | |
| 442 | | | | | | | | | | | | |
| 443 | | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | |
| 444 | | | | | Mean in Original Scale | 0.00312 | Mean in Log Scale | | | | | -6.81 |
| 445 | | | | | SD in Original Scale | 0.00585 | SD in Log Scale | | | | | 1.479 |
| 446 | | | | | 95% t UCL (assumes normality of ROS data) | 0.00395 | 95% Percentile Bootstrap UCL | | | | | 0.00393 |
| 447 | | | | | 95% BCA Bootstrap UCL | 0.00419 | 95% Bootstrap t UCL | | | | | 0.00425 |
| 448 | | | | | 95% H-UCL (Log ROS) | 0.00463 | | | | | | |
| 449 | | | | | | | | | | | | |
| 450 | | | | | | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 451 | | | | | KM Mean (logged) | -5.167 | | | | | 95% H-UCL (KM -Log) | 0.00646 |
| 452 | | | | | KM SD (logged) | 0.373 | | | | | 95% Critical H Value (KM-Log) | 1.761 |
| 453 | | | | | KM Standard Error of Mean (logged) | 0.0688 | | | | | | |
| 454 | | | | | | | | | | | | |
| 455 | | | | | DL/2 Statistics | | | | | | | |
| 456 | | | | DL/2 Normal | | | | | DL/2 Log-Transformed | | | |
| 457 | | | | | Mean in Original Scale | 0.173 | | | | | Mean in Log Scale | -2.665 |
| 458 | | | | | SD in Original Scale | 0.114 | | | | | SD in Log Scale | 1.913 |
| 459 | | | | | 95% t UCL (Assumes normality) | 0.189 | | | | | 95% H-Stat UCL | 0.73 |
| 460 | | | | | DL/2 is not a recommended method, provided for comparisons and historical reasons | | | | | | | |
| 461 | | | | | | | | | | | | |
| 462 | | | | | Nonparametric Distribution Free UCL Statistics | | | | | | | |
| 463 | | | | | Detected Data appear Normal Distributed at 5% Significance Level | | | | | | | |
| 464 | | | | | | | | | | | | |
| 465 | | | | | Suggested UCL to Use | | | | | | | |
| 466 | | | | | 95% KM (t) UCL | 0.00781 | | | | | 95% KM (Percentile Bootstrap) UCL | 0.00785 |
| 467 | | | | | | | | | | | | |
| 468 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 469 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 470 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 471 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 472 | | | | | | | | | | | | |
| 473 | | | | | | | | | | | | |
| 474 | Boron | | | | | | | | | | | |
| 475 | | | | | | | | | | | | |
| 476 | | | | | General Statistics | | | | | | | |
| 477 | | | | | Total Number of Observations | 136 | | | | | Number of Distinct Observations | 118 |
| 478 | | | | | | | | | | | Number of Missing Observations | 0 |
| 479 | | | | | Minimum | 65.5 | | | | | Mean | 1018 |
| 480 | | | | | Maximum | 3260 | | | | | Median | 690 |
| 481 | | | | | SD | 847.8 | | | | | Std. Error of Mean | 72.7 |
| 482 | | | | | Coefficient of Variation | 0.833 | | | | | Skewness | 0.795 |
| 483 | | | | | | | | | | | | |
| 484 | | | | | Normal GOF Test | | | | | | | |
| 485 | | | | | Shapiro Wilk Test Statistic | 0.868 | | | | | Shapiro Wilk GOF Test | |
| 486 | | | | | 5% Shapiro Wilk P Value | 0 | | | | | Data Not Normal at 5% Significance Level | |
| 487 | | | | | Lilliefors Test Statistic | 0.161 | | | | | Lilliefors GOF Test | |
| 488 | | | | | 5% Lilliefors Critical Value | 0.076 | | | | | Data Not Normal at 5% Significance Level | |
| 489 | | | | | Data Not Normal at 5% Significance Level | | | | | | | |
| 490 | | | | | | | | | | | | |
| 491 | | | | | Assuming Normal Distribution | | | | | | | |
| 492 | | | | | 95% Normal UCL | | | | | | 95% UCLs (Adjusted for Skewness) | |
| 493 | | | | | 95% Student's-t UCL | 1139 | | | | | 95% Adjusted-CLT UCL (Chen-1995) | 1143 |
| 494 | | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | 1140 |
| 495 | | | | | | | | | | | | |
| 496 | | | | | Gamma GOF Test | | | | | | | |
| 497 | | | | | A-D Test Statistic | 2.206 | | | | | Anderson-Darling Gamma GOF Test | |
| 498 | | | | | 5% A-D Critical Value | 0.776 | | | | | Data Not Gamma Distributed at 5% Significance Level | |
| 499 | | | | | K-S Test Statistic | 0.125 | | | | | Kolmogrov-Smirnoff Gamma GOF Test | |
| 500 | | | | | 5% K-S Critical Value | 0.082 | | | | | Data Not Gamma Distributed at 5% Significance Level | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 501 | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 502 | | | | | | | | | | | | |
| 503 | **Gamma Statistics** | | | | | | | | | | | |
| 504 | | | | | k hat (MLE) | 1.293 | k star (bias corrected MLE) | | | | | 1.269 |
| 505 | | | | | Theta hat (MLE) | 787.6 | Theta star (bias corrected MLE) | | | | | 802.2 |
| 506 | | | | | nu hat (MLE) | 351.7 | nu star (bias corrected) | | | | | 345.3 |
| 507 | | | | | MLE Mean (bias corrected) | 1018 | MLE Sd (bias corrected) | | | | | 903.9 |
| 508 | | | | | | | Approximate Chi Square Value (0.05) | | | | | 303.2 |
| 509 | | | | | Adjusted Level of Significance | 0.0482 | Adjusted Chi Square Value | | | | | 302.8 |
| 510 | | | | | | | | | | | | |
| 511 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 512 | | | | 95% Approximate Gamma UCL (use when n>=50)) | | 1160 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 1161 |
| 513 | | | | | | | | | | | | |
| 514 | **Lognormal GOF Test** | | | | | | | | | | | |
| 515 | | | | | Shapiro Wilk Test Statistic | 0.929 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 516 | | | | | 5% Shapiro Wilk P Value | 9.0238E-8 | Data Not Lognormal at 5% Significance Level | | | | | |
| 517 | | | | | Lilliefors Test Statistic | 0.122 | **Lilliefors Lognormal GOF Test** | | | | | |
| 518 | | | | | 5% Lilliefors Critical Value | 0.076 | Data Not Lognormal at 5% Significance Level | | | | | |
| 519 | **Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 520 | | | | | | | | | | | | |
| 521 | **Lognormal Statistics** | | | | | | | | | | | |
| 522 | | | | | Minimum of Logged Data | 4.182 | Mean of logged Data | | | | | 6.492 |
| 523 | | | | | Maximum of Logged Data | 8.089 | SD of logged Data | | | | | 1.017 |
| 524 | | | | | | | | | | | | |
| 525 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 526 | | | | | 95% H-UCL | 1343 | 90% Chebyshev (MVUE) UCL | | | | | 1450 |
| 527 | | | | | 95% Chebyshev (MVUE) UCL | 1608 | 97.5% Chebyshev (MVUE) UCL | | | | | 1827 |
| 528 | | | | | 99% Chebyshev (MVUE) UCL | 2258 | | | | | | |
| 529 | | | | | | | | | | | | |
| 530 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 531 | **Data do not follow a Discernible Distribution (0.05)** | | | | | | | | | | | |
| 532 | | | | | | | | | | | | |
| 533 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 534 | | | | | 95% CLT UCL | 1138 | 95% Jackknife UCL | | | | | 1139 |
| 535 | | | | | 95% Standard Bootstrap UCL | 1139 | 95% Bootstrap-t UCL | | | | | 1144 |
| 536 | | | | | 95% Hall's Bootstrap UCL | 1138 | 95% Percentile Bootstrap UCL | | | | | 1135 |
| 537 | | | | | 95% BCA Bootstrap UCL | 1145 | | | | | | |
| 538 | | | | | 90% Chebyshev(Mean, Sd) UCL | 1237 | 95% Chebyshev(Mean, Sd) UCL | | | | | 1335 |
| 539 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 1472 | 99% Chebyshev(Mean, Sd) UCL | | | | | 1742 |
| 540 | | | | | | | | | | | | |
| 541 | **Suggested UCL to Use** | | | | | | | | | | | |
| 542 | | | | | 95% Chebyshev (Mean, Sd) UCL | 1335 | | | | | | |
| 543 | | | | | | | | | | | | |
| 544 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 545 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 546 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |
| 547 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 548 | | | | | | | | | | | | |
| 549 | **Cadmium** | | | | | | | | | | | |
| 550 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 551 | General Statistics | | | | | | | | | | | |
| 552 | Total Number of Observations | | | | | 136 | Number of Distinct Observations | | | | | 92 |
| 553 | Number of Detects | | | | | 94 | Number of Non-Detects | | | | | 42 |
| 554 | Number of Distinct Detects | | | | | 87 | Number of Distinct Non-Detects | | | | | 6 |
| 555 | Minimum Detect | | | | | 0.0068 | Minimum Non-Detect | | | | | 0.005 |
| 556 | Maximum Detect | | | | | 1.55 | Maximum Non-Detect | | | | | 0.2 |
| 557 | Variance Detects | | | | | 0.0517 | Percent Non-Detects | | | | | 30.88% |
| 558 | Mean Detects | | | | | 0.174 | SD Detects | | | | | 0.227 |
| 559 | Median Detects | | | | | 0.103 | CV Detects | | | | | 1.31 |
| 560 | Skewness Detects | | | | | 3.634 | Kurtosis Detects | | | | | 17.25 |
| 561 | Mean of Logged Detects | | | | | -2.323 | SD of Logged Detects | | | | | 1.104 |
| 562 | | | | | | | | | | | | |
| 563 | Normal GOF Test on Detects Only | | | | | | | | | | | |
| 564 | Shapiro Wilk Test Statistic | | | | | 0.643 | Normal GOF Test on Detected Observations Only | | | | | |
| 565 | 5% Shapiro Wilk P Value | | | | | 0 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 566 | Lilliefors Test Statistic | | | | | 0.232 | Lilliefors GOF Test | | | | | |
| 567 | 5% Lilliefors Critical Value | | | | | 0.0914 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 568 | Detected Data Not Normal at 5% Significance Level | | | | | | | | | | | |
| 569 | | | | | | | | | | | | |
| 570 | Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs | | | | | | | | | | | |
| 571 | Mean | | | | | 0.126 | Standard Error of Mean | | | | | 0.0174 |
| 572 | SD | | | | | 0.201 | 95% KM (BCA) UCL | | | | | 0.159 |
| 573 | 95% KM (t) UCL | | | | | 0.155 | 95% KM (Percentile Bootstrap) UCL | | | | | 0.156 |
| 574 | 95% KM (z) UCL | | | | | 0.154 | 95% KM Bootstrap t UCL | | | | | 0.166 |
| 575 | 90% KM Chebyshev UCL | | | | | 0.178 | 95% KM Chebyshev UCL | | | | | 0.202 |
| 576 | 97.5% KM Chebyshev UCL | | | | | 0.234 | 99% KM Chebyshev UCL | | | | | 0.299 |
| 577 | | | | | | | | | | | | |
| 578 | Gamma GOF Tests on Detected Observations Only | | | | | | | | | | | |
| 579 | A-D Test Statistic | | | | | 1.016 | Anderson-Darling GOF Test | | | | | |
| 580 | 5% A-D Critical Value | | | | | 0.783 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 581 | K-S Test Statistic | | | | | 0.0923 | Kolmogrov-Smirnoff GOF | | | | | |
| 582 | 5% K-S Critical Value | | | | | 0.095 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 583 | Detected data follow Appr. Gamma Distribution at 5% Significance Level | | | | | | | | | | | |
| 584 | | | | | | | | | | | | |
| 585 | Gamma Statistics on Detected Data Only | | | | | | | | | | | |
| 586 | k hat (MLE) | | | | | 1.009 | k star (bias corrected MLE) | | | | | 0.983 |
| 587 | Theta hat (MLE) | | | | | 0.172 | Theta star (bias corrected MLE) | | | | | 0.176 |
| 588 | nu hat (MLE) | | | | | 189.6 | nu star (bias corrected) | | | | | 184.9 |
| 589 | MLE Mean (bias corrected) | | | | | 0.174 | MLE Sd (bias corrected) | | | | | 0.175 |
| 590 | | | | | | | | | | | | |
| 591 | Gamma Kaplan-Meier (KM) Statistics | | | | | | | | | | | |
| 592 | k hat (KM) | | | | | 0.391 | nu hat (KM) | | | | | 106.5 |
| 593 | Approximate Chi Square Value (106.45, α) | | | | | 83.64 | Adjusted Chi Square Value (106.45, β) | | | | | 83.43 |
| 594 | 95% Gamma Approximate KM-UCL (use when n>=50) | | | | | 0.16 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 0.161 |
| 595 | | | | | | | | | | | | |
| 596 | Gamma ROS Statistics using Imputed Non-Detects | | | | | | | | | | | |
| 597 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 598 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 599 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 600 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 601 | | | | | Minimum | 0.0068 | | | | | Mean | 0.123 |
| 602 | | | | | Maximum | 1.55 | | | | | Median | 0.0605 |
| 603 | | | | | SD | 0.203 | | | | | CV | 1.65 |
| 604 | | | | | k hat (MLE) | 0.66 | | | | | k star (bias corrected MLE) | 0.651 |
| 605 | | | | | Theta hat (MLE) | 0.187 | | | | | Theta star (bias corrected MLE) | 0.189 |
| 606 | | | | | nu hat (MLE) | 179.7 | | | | | nu star (bias corrected) | 177 |
| 607 | | | | | MLE Mean (bias corrected) | 0.123 | | | | | MLE Sd (bias corrected) | 0.153 |
| 608 | | | | | | | | | | | Adjusted Level of Significance (β) | 0.0482 |
| 609 | | | | | Approximate Chi Square Value (177.03, α) | 147.3 | | | | | Adjusted Chi Square Value (177.03, β) | 147 |
| 610 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.148 | | | | | 95% Gamma Adjusted UCL (use when n<50) | 0.148 |
| 611 | | | | | | | | | | | | |
| 612 | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | | |
| 613 | | | | | Lilliefors Test Statistic | 0.068 | | | **Lilliefors GOF Test** | | | |
| 614 | | | | | 5% Lilliefors Critical Value | 0.0914 | | | Detected Data appear Lognormal at 5% Significance Level | | | |
| 615 | | | | | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | |
| 616 | | | | | | | | | | | | |
| 617 | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | |
| 618 | | | | | Mean in Original Scale | 0.126 | | | | | Mean in Log Scale | -2.879 |
| 619 | | | | | SD in Original Scale | 0.202 | | | | | SD in Log Scale | 1.314 |
| 620 | | | | | 95% t UCL (assumes normality of ROS data) | 0.155 | | | | | 95% Percentile Bootstrap UCL | 0.159 |
| 621 | | | | | 95% BCA Bootstrap UCL | 0.161 | | | | | 95% Bootstrap t UCL | 0.166 |
| 622 | | | | | 95% H-UCL (Log ROS) | 0.177 | | | | | | |
| 623 | | | | | | | | | | | | |
| 624 | | | | | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | |
| 625 | | | | | KM Mean (logged) | -2.896 | | | | | 95% H-UCL (KM -Log) | 0.173 |
| 626 | | | | | KM SD (logged) | 1.311 | | | | | 95% Critical H Value (KM-Log) | 2.496 |
| 627 | | | | | KM Standard Error of Mean (logged) | 0.122 | | | | | | |
| 628 | | | | | | | | | | | | |
| 629 | | | | | **DL/2 Statistics** | | | | | | | |
| 630 | | | | | **DL/2 Normal** | | | | **DL/2 Log-Transformed** | | | |
| 631 | | | | | Mean in Original Scale | 0.127 | | | | | Mean in Log Scale | -2.796 |
| 632 | | | | | SD in Original Scale | 0.201 | | | | | SD in Log Scale | 1.205 |
| 633 | | | | | 95% t UCL (Assumes normality) | 0.156 | | | | | 95% H-Stat UCL | 0.162 |
| 634 | | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | |
| 635 | | | | | | | | | | | | |
| 636 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 637 | | | | | **Detected Data appear Approximate Gamma Distributed at 5% Significance Level** | | | | | | | |
| 638 | | | | | | | | | | | | |
| 639 | | | | | **Suggested UCL to Use** | | | | | | | |
| 640 | | | | | 95% KM (BCA) UCL | 0.159 | | | | | 95% GROS Approximate Gamma UCL | 0.148 |
| 641 | | | | | 95% Approximate Gamma KM-UCL | 0.16 | | | | | | |
| 642 | | | | | | | | | | | | |
| 643 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 644 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 645 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 646 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 647 | | | | | | | | | | | | |
| 648 | | | | | | | | | | | | |
| 649 | **Calcium** | | | | | | | | | | | |
| 650 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 651 | | | | | | General Statistics | | | | | | |
| 652 | | | | | Total Number of Observations | 136 | | | | Number of Distinct Observations | | 119 |
| 653 | | | | | | | | | | Number of Missing Observations | | 0 |
| 654 | | | | | Minimum | 2280 | | | | Mean | | 199937 |
| 655 | | | | | Maximum | 548000 | | | | Median | | 202500 |
| 656 | | | | | SD | 117570 | | | | Std. Error of Mean | | 10082 |
| 657 | | | | | Coefficient of Variation | 0.588 | | | | Skewness | | 0.659 |
| 658 | | | | | | | | | | | | |
| 659 | | | | | | Normal GOF Test | | | | | | |
| 660 | | | | | Shapiro Wilk Test Statistic | 0.948 | | | | Shapiro Wilk GOF Test | | |
| 661 | | | | | 5% Shapiro Wilk P Value | 9.2160E-5 | | | | Data Not Normal at 5% Significance Level | | |
| 662 | | | | | Lilliefors Test Statistic | 0.099 | | | | Lilliefors GOF Test | | |
| 663 | | | | | 5% Lilliefors Critical Value | 0.076 | | | | Data Not Normal at 5% Significance Level | | |
| 664 | | | | | | Data Not Normal at 5% Significance Level | | | | | | |
| 665 | | | | | | | | | | | | |
| 666 | | | | | | Assuming Normal Distribution | | | | | | |
| 667 | | | | | 95% Normal UCL | | | | | 95% UCLs (Adjusted for Skewness) | | |
| 668 | | | | | 95% Student's-t UCL | 216634 | | | | 95% Adjusted-CLT UCL (Chen-1995) | | 217128 |
| 669 | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | | 216729 |
| 670 | | | | | | | | | | | | |
| 671 | | | | | | Gamma GOF Test | | | | | | |
| 672 | | | | | A-D Test Statistic | 0.804 | | | | Anderson-Darling Gamma GOF Test | | |
| 673 | | | | | 5% A-D Critical Value | 0.764 | | | | Data Not Gamma Distributed at 5% Significance Level | | |
| 674 | | | | | K-S Test Statistic | 0.101 | | | | Kolmogrov-Smirnoff Gamma GOF Test | | |
| 675 | | | | | 5% K-S Critical Value | 0.0811 | | | | Data Not Gamma Distributed at 5% Significance Level | | |
| 676 | | | | | | Data Not Gamma Distributed at 5% Significance Level | | | | | | |
| 677 | | | | | | | | | | | | |
| 678 | | | | | | Gamma Statistics | | | | | | |
| 679 | | | | | k hat (MLE) | 2.287 | | | | k star (bias corrected MLE) | | 2.242 |
| 680 | | | | | Theta hat (MLE) | 87409 | | | | Theta star (bias corrected MLE) | | 89186 |
| 681 | | | | | nu hat (MLE) | 622.2 | | | | nu star (bias corrected) | | 609.8 |
| 682 | | | | | MLE Mean (bias corrected) | 199937 | | | | MLE Sd (bias corrected) | | 133534 |
| 683 | | | | | | | | | | Approximate Chi Square Value (0.05) | | 553.5 |
| 684 | | | | | Adjusted Level of Significance | 0.0482 | | | | Adjusted Chi Square Value | | 552.9 |
| 685 | | | | | | | | | | | | |
| 686 | | | | | | Assuming Gamma Distribution | | | | | | |
| 687 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 220267 | | | | 95% Adjusted Gamma UCL (use when n<50) | | 220494 |
| 688 | | | | | | | | | | | | |
| 689 | | | | | | Lognormal GOF Test | | | | | | |
| 690 | | | | | Shapiro Wilk Test Statistic | 0.894 | | | | Shapiro Wilk Lognormal GOF Test | | |
| 691 | | | | | 5% Shapiro Wilk P Value | 2.331E-14 | | | | Data Not Lognormal at 5% Significance Level | | |
| 692 | | | | | Lilliefors Test Statistic | 0.126 | | | | Lilliefors Lognormal GOF Test | | |
| 693 | | | | | 5% Lilliefors Critical Value | 0.076 | | | | Data Not Lognormal at 5% Significance Level | | |
| 694 | | | | | | Data Not Lognormal at 5% Significance Level | | | | | | |
| 695 | | | | | | | | | | | | |
| 696 | | | | | | Lognormal Statistics | | | | | | |
| 697 | | | | | Minimum of Logged Data | 7.732 | | | | Mean of logged Data | | 11.97 |
| 698 | | | | | Maximum of Logged Data | 13.21 | | | | SD of logged Data | | 0.811 |
| 699 | | | | | | | | | | | | |
| 700 | | | | | | Assuming Lognormal Distribution | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 701 | | | | | 95% H-UCL | 253246 | | | | 90% Chebyshev (MVUE) UCL | | 271137 |
| 702 | | | | | 95% Chebyshev (MVUE) UCL | 294745 | | | | 97.5% Chebyshev (MVUE) UCL | | 327512 |
| 703 | | | | | 99% Chebyshev (MVUE) UCL | 391876 | | | | | | |
| 704 | | | | | | | | | | | | |
| 705 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 706 | | | | | **Data do not follow a Discernible Distribution (0.05)** | | | | | | | |
| 707 | | | | | | | | | | | | |
| 708 | | | | | **Nonparametric Distribution Free UCLs** | | | | | | | |
| 709 | | | | | 95% CLT UCL | 216519 | | | | 95% Jackknife UCL | | 216634 |
| 710 | | | | | 95% Standard Bootstrap UCL | 216256 | | | | 95% Bootstrap-t UCL | | 216674 |
| 711 | | | | | 95% Hall's Bootstrap UCL | 216648 | | | | 95% Percentile Bootstrap UCL | | 216848 |
| 712 | | | | | 95% BCA Bootstrap UCL | 217151 | | | | | | |
| 713 | | | | | 90% Chebyshev(Mean, Sd) UCL | 230181 | | | | 95% Chebyshev(Mean, Sd) UCL | | 243881 |
| 714 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 262896 | | | | 99% Chebyshev(Mean, Sd) UCL | | 300246 |
| 715 | | | | | | | | | | | | |
| 716 | | | | | **Suggested UCL to Use** | | | | | | | |
| 717 | | | | | 95% Chebyshev (Mean, Sd) UCL | 243881 | | | | | | |
| 718 | | | | | | | | | | | | |
| 719 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 720 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | |
| 721 | | | | | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | |
| 722 | | | | | For additional insight the user may want to consult a statistician. | | | | | | | |
| 723 | | | | | | | | | | | | |
| 724 | **Cesium** | | | | | | | | | | | |
| 725 | | | | | | | | | | | | |
| 726 | | | | | **General Statistics** | | | | | | | |
| 727 | | | | | Total Number of Observations | 136 | | | | Number of Distinct Observations | | 29 |
| 728 | | | | | Number of Detects | 37 | | | | Number of Non-Detects | | 99 |
| 729 | | | | | Number of Distinct Detects | 28 | | | | Number of Distinct Non-Detects | | 2 |
| 730 | | | | | Minimum Detect | 0.0056 | | | | Minimum Non-Detect | | 0.01 |
| 731 | | | | | Maximum Detect | 0.0446 | | | | Maximum Non-Detect | | 0.5 |
| 732 | | | | | Variance Detects | 7.3010E-5 | | | | Percent Non-Detects | | 72.79% |
| 733 | | | | | Mean Detects | 0.0152 | | | | SD Detects | | 0.00854 |
| 734 | | | | | Median Detects | 0.014 | | | | CV Detects | | 0.562 |
| 735 | | | | | Skewness Detects | 1.888 | | | | Kurtosis Detects | | 4.458 |
| 736 | | | | | Mean of Logged Detects | -4.311 | | | | SD of Logged Detects | | 0.498 |
| 737 | | | | | | | | | | | | |
| 738 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 739 | | | | | Shapiro Wilk Test Statistic | 0.825 | | | | **Shapiro Wilk GOF Test** | | |
| 740 | | | | | 5% Shapiro Wilk Critical Value | 0.936 | | | | Detected Data Not Normal at 5% Significance Level | | |
| 741 | | | | | Lilliefors Test Statistic | 0.147 | | | | **Lilliefors GOF Test** | | |
| 742 | | | | | 5% Lilliefors Critical Value | 0.146 | | | | Detected Data Not Normal at 5% Significance Level | | |
| 743 | | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | | |
| 744 | | | | | | | | | | | | |
| 745 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |
| 746 | | | | | Mean | 0.0141 | | | | Standard Error of Mean | | 0.00129 |
| 747 | | | | | SD | 0.00834 | | | | 95% KM (BCA) UCL | | 0.0162 |
| 748 | | | | | 95% KM (t) UCL | 0.0162 | | | | 95% KM (Percentile Bootstrap) UCL | | 0.0163 |
| 749 | | | | | 95% KM (z) UCL | 0.0162 | | | | 95% KM Bootstrap t UCL | | 0.0169 |
| 750 | | | | | 90% KM Chebyshev UCL | 0.0179 | | | | 95% KM Chebyshev UCL | | 0.0197 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 751 | | | | | 97.5% KM Chebyshev UCL | 0.0221 | | | | 99% KM Chebyshev UCL | | 0.0269 |
| 752 | | | | | | | | | | | | |
| 753 | | | | | Gamma GOF Tests on Detected Observations Only | | | | | | | |
| 754 | | | | | A-D Test Statistic | 0.456 | Anderson-Darling GOF Test | | | | | |
| 755 | | | | | 5% A-D Critical Value | 0.752 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 756 | | | | | K-S Test Statistic | 0.0889 | Kolmogrov-Smirnoff GOF | | | | | |
| 757 | | | | | 5% K-S Critical Value | 0.146 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 758 | | | | | Detected data appear Gamma Distributed at 5% Significance Level | | | | | | | |
| 759 | | | | | | | | | | | | |
| 760 | | | | | Gamma Statistics on Detected Data Only | | | | | | | |
| 761 | | | | | k hat (MLE) | 4.135 | k star (bias corrected MLE) | | | | | 3.817 |
| 762 | | | | | Theta hat (MLE) | 0.00368 | Theta star (bias corrected MLE) | | | | | 0.00399 |
| 763 | | | | | nu hat (MLE) | 306 | nu star (bias corrected) | | | | | 282.5 |
| 764 | | | | | MLE Mean (bias corrected) | 0.0152 | MLE Sd (bias corrected) | | | | | 0.00779 |
| 765 | | | | | | | | | | | | |
| 766 | | | | | Gamma Kaplan-Meier (KM) Statistics | | | | | | | |
| 767 | | | | | k hat (KM) | 2.841 | nu hat (KM) | | | | | 772.6 |
| 768 | | | | | Approximate Chi Square Value (772.62, α) | 709.1 | Adjusted Chi Square Value (772.62, β) | | | | | 708.5 |
| 769 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.0153 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 0.0153 |
| 770 | | | | | | | | | | | | |
| 771 | | | | | Gamma ROS Statistics using Imputed Non-Detects | | | | | | | |
| 772 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 773 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 774 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 775 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 776 | | | | | Minimum | 0.0056 | Mean | | | | | 0.0152 |
| 777 | | | | | Maximum | 0.0446 | Median | | | | | 0.0126 |
| 778 | | | | | SD | 0.00735 | CV | | | | | 0.485 |
| 779 | | | | | k hat (MLE) | 5.473 | k star (bias corrected MLE) | | | | | 5.357 |
| 780 | | | | | Theta hat (MLE) | 0.00277 | Theta star (bias corrected MLE) | | | | | 0.00283 |
| 781 | | | | | nu hat (MLE) | 1489 | nu star (bias corrected) | | | | | 1457 |
| 782 | | | | | MLE Mean (bias corrected) | 0.0152 | MLE Sd (bias corrected) | | | | | 0.00655 |
| 783 | | | | | | | Adjusted Level of Significance (β) | | | | | 0.0482 |
| 784 | | | | | Approximate Chi Square Value (N/A, α) | 1370 | Adjusted Chi Square Value (N/A, β) | | | | | 1369 |
| 785 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.0161 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 0.0161 |
| 786 | | | | | | | | | | | | |
| 787 | | | | | Lognormal GOF Test on Detected Observations Only | | | | | | | |
| 788 | | | | | Shapiro Wilk Test Statistic | 0.968 | Shapiro Wilk GOF Test | | | | | |
| 789 | | | | | 5% Shapiro Wilk Critical Value | 0.936 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 790 | | | | | Lilliefors Test Statistic | 0.0763 | Lilliefors GOF Test | | | | | |
| 791 | | | | | 5% Lilliefors Critical Value | 0.146 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 792 | | | | | Detected Data appear Lognormal at 5% Significance Level | | | | | | | |
| 793 | | | | | | | | | | | | |
| 794 | | | | | Lognormal ROS Statistics Using Imputed Non-Detects | | | | | | | |
| 795 | | | | | Mean in Original Scale | 0.014 | Mean in Log Scale | | | | | -4.407 |
| 796 | | | | | SD in Original Scale | 0.00799 | SD in Log Scale | | | | | 0.531 |
| 797 | | | | | 95% t UCL (assumes normality of ROS data) | 0.0152 | 95% Percentile Bootstrap UCL | | | | | 0.0152 |
| 798 | | | | | 95% BCA Bootstrap UCL | 0.0152 | 95% Bootstrap t UCL | | | | | 0.0153 |
| 799 | | | | | 95% H-UCL (Log ROS) | 0.0153 | | | | | | |
| 800 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 801 | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | | | | | |
| 802 | | | | | KM Mean (logged) | -4.406 | | | | | 95% H-UCL (KM -Log) | 0.0151 |
| 803 | | | | | KM SD (logged) | 0.517 | | | | | 95% Critical H Value (KM-Log) | 1.836 |
| 804 | | | | | KM Standard Error of Mean (logged) | 0.081 | | | | | | |
| 805 | | | | | | | | | | | | |
| 806 | **DL/2 Statistics** | | | | | | | | | | | |
| 807 | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | | | | | |
| 808 | | | | | Mean in Original Scale | 0.175 | | | | | Mean in Log Scale | -2.355 |
| 809 | | | | | SD in Original Scale | 0.11 | | | | | SD in Log Scale | 1.465 |
| 810 | | | | | 95% t UCL (Assumes normality) | 0.191 | | | | | 95% H-Stat UCL | 0.388 |
| 811 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 812 | | | | | | | | | | | | |
| 813 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 814 | **Detected Data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 815 | | | | | | | | | | | | |
| 816 | **Suggested UCL to Use** | | | | | | | | | | | |
| 817 | | | | | 95% KM (t) UCL | 0.0162 | | | | | 95% GROS Approximate Gamma UCL | 0.0161 |
| 818 | | | | | 95% Approximate Gamma KM-UCL | 0.0153 | | | | | | |
| 819 | | | | | | | | | | | | |
| 820 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 821 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 822 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 823 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 824 | | | | | | | | | | | | |
| 825 | **Chromium** | | | | | | | | | | | |
| 826 | | | | | | | | | | | | |
| 827 | **General Statistics** | | | | | | | | | | | |
| 828 | | | | | Total Number of Observations | 136 | | | | | Number of Distinct Observations | 8 |
| 829 | | | | | Number of Detects | 6 | | | | | Number of Non-Detects | 130 |
| 830 | | | | | Number of Distinct Detects | 6 | | | | | Number of Distinct Non-Detects | 2 |
| 831 | | | | | Minimum Detect | 0.56 | | | | | Minimum Non-Detect | 0.5 |
| 832 | | | | | Maximum Detect | 1.41 | | | | | Maximum Non-Detect | 1 |
| 833 | | | | | Variance Detects | 0.104 | | | | | Percent Non-Detects | 95.59% |
| 834 | | | | | Mean Detects | 0.862 | | | | | SD Detects | 0.323 |
| 835 | | | | | Median Detects | 0.77 | | | | | CV Detects | 0.374 |
| 836 | | | | | Skewness Detects | 1.101 | | | | | Kurtosis Detects | 0.532 |
| 837 | | | | | Mean of Logged Detects | -0.203 | | | | | SD of Logged Detects | 0.352 |
| 838 | | | | | | | | | | | | |
| 839 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 840 | | | | | Shapiro Wilk Test Statistic | 0.9 | **Shapiro Wilk GOF Test** | | | | | |
| 841 | | | | | 5% Shapiro Wilk Critical Value | 0.788 | Detected Data appear Normal at 5% Significance Level | | | | | |
| 842 | | | | | Lilliefors Test Statistic | 0.203 | **Lilliefors GOF Test** | | | | | |
| 843 | | | | | 5% Lilliefors Critical Value | 0.362 | Detected Data appear Normal at 5% Significance Level | | | | | |
| 844 | **Detected Data appear Normal at 5% Significance Level** | | | | | | | | | | | |
| 845 | | | | | | | | | | | | |
| 846 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 847 | | | | | Mean | 0.517 | | | | | Standard Error of Mean | 0.00937 |
| 848 | | | | | SD | 0.098 | | | | | 95% KM (BCA) UCL | 0.533 |
| 849 | | | | | 95% KM (t) UCL | 0.533 | | | | | 95% KM (Percentile Bootstrap) UCL | 0.533 |
| 850 | | | | | 95% KM (z) UCL | 0.533 | | | | | 95% KM Bootstrap t UCL | 0.535 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 851 | | | | | 90% KM Chebyshev UCL | 0.545 | | | | | 95% KM Chebyshev UCL | 0.558 |
| 852 | | | | | 97.5% KM Chebyshev UCL | 0.576 | | | | | 99% KM Chebyshev UCL | 0.61 |
| 853 | | | | | | | | | | | | |
| 854 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 855 | | | | | A-D Test Statistic | 0.285 | **Anderson-Darling GOF Test** | | | | | |
| 856 | | | | | 5% A-D Critical Value | 0.698 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 857 | | | | | K-S Test Statistic | 0.209 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 858 | | | | | 5% K-S Critical Value | 0.333 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 859 | | | | | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | |
| 860 | | | | | | | | | | | | |
| 861 | | | | | **Gamma Statistics on Detected Data Only** | | | | | | | |
| 862 | | | | | k hat (MLE) | 9.48 | k star (bias corrected MLE) | | | | | 4.851 |
| 863 | | | | | Theta hat (MLE) | 0.0909 | Theta star (bias corrected MLE) | | | | | 0.178 |
| 864 | | | | | nu hat (MLE) | 113.8 | nu star (bias corrected) | | | | | 58.22 |
| 865 | | | | | MLE Mean (bias corrected) | 0.862 | MLE Sd (bias corrected) | | | | | 0.391 |
| 866 | | | | | | | | | | | | |
| 867 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 868 | | | | | k hat (KM) | 27.87 | nu hat (KM) | | | | | 7582 |
| 869 | | | | | Approximate Chi Square Value (N/A, α) | 7381 | Adjusted Chi Square Value (N/A, β) | | | | | 7378 |
| 870 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.531 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 0.531 |
| 871 | | | | | | | | | | | | |
| 872 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 873 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 874 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 875 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 876 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 877 | | | | | Minimum | 0.01 | Mean | | | | | 0.0664 |
| 878 | | | | | Maximum | 1.41 | Median | | | | | 0.01 |
| 879 | | | | | SD | 0.196 | CV | | | | | 2.953 |
| 880 | | | | | k hat (MLE) | 0.449 | k star (bias corrected MLE) | | | | | 0.444 |
| 881 | | | | | Theta hat (MLE) | 0.148 | Theta star (bias corrected MLE) | | | | | 0.149 |
| 882 | | | | | nu hat (MLE) | 122.1 | nu star (bias corrected) | | | | | 120.7 |
| 883 | | | | | MLE Mean (bias corrected) | 0.0664 | MLE Sd (bias corrected) | | | | | 0.0996 |
| 884 | | | | | | | Adjusted Level of Significance (β) | | | | | 0.0482 |
| 885 | | | | | Approximate Chi Square Value (120.75, α) | 96.37 | Adjusted Chi Square Value (120.75, β) | | | | | 96.14 |
| 886 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.0831 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 0.0833 |
| 887 | | | | | | | | | | | | |
| 888 | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | | |
| 889 | | | | | Shapiro Wilk Test Statistic | 0.944 | **Shapiro Wilk GOF Test** | | | | | |
| 890 | | | | | 5% Shapiro Wilk Critical Value | 0.788 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 891 | | | | | Lilliefors Test Statistic | 0.184 | **Lilliefors GOF Test** | | | | | |
| 892 | | | | | 5% Lilliefors Critical Value | 0.362 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 893 | | | | | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | |
| 894 | | | | | | | | | | | | |
| 895 | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | |
| 896 | | | | | Mean in Original Scale | 0.161 | Mean in Log Scale | | | | | -2.322 |
| 897 | | | | | SD in Original Scale | 0.196 | SD in Log Scale | | | | | 0.997 |
| 898 | | | | | 95% t UCL (assumes normality of ROS data) | 0.189 | 95% Percentile Bootstrap UCL | | | | | 0.19 |
| 899 | | | | | 95% BCA Bootstrap UCL | 0.194 | 95% Bootstrap t UCL | | | | | 0.196 |
| 900 | | | | | 95% H-UCL (Log ROS) | 0.195 | | | | | | |

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| 901 | | | | | | | | | | | | |
| 902 | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | | | | | |
| 903 | | | | | KM Mean (logged) | -0.67 | | | | 95% H-UCL (KM -Log) | | 0.525 |
| 904 | | | | | KM SD (logged) | 0.124 | | | | 95% Critical H Value (KM-Log) | | 1.675 |
| 905 | | | | | KM Standard Error of Mean (logged) | 0.012 | | | | | | |
| 906 | | | | | | | | | | | | |
| 907 | **DL/2 Statistics** | | | | | | | | | | | |
| 908 | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | | | | | |
| 909 | | | | | Mean in Original Scale | 0.323 | | | | Mean in Log Scale | | -1.207 |
| 910 | | | | | SD in Original Scale | 0.163 | | | | SD in Log Scale | | 0.351 |
| 911 | | | | | 95% t UCL (Assumes normality) | 0.346 | | | | 95% H-Stat UCL | | 0.336 |
| 912 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 913 | | | | | | | | | | | | |
| 914 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 915 | **Detected Data appear Normal Distributed at 5% Significance Level** | | | | | | | | | | | |
| 916 | | | | | | | | | | | | |
| 917 | **Suggested UCL to Use** | | | | | | | | | | | |
| 918 | | | | | 95% KM (t) UCL | 0.533 | | | | 95% KM (Percentile Bootstrap) UCL | | 0.533 |
| 919 | | | | | | | | | | | | |
| 920 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 921 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 922 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 923 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 924 | | | | | | | | | | | | |
| 925 | **Cobalt** | | | | | | | | | | | |
| 926 | | | | | | | | | | | | |
| 927 | **General Statistics** | | | | | | | | | | | |
| 928 | | | | | Total Number of Observations | 136 | | | | Number of Distinct Observations | | 130 |
| 929 | | | | | Number of Detects | 131 | | | | Number of Non-Detects | | 5 |
| 930 | | | | | Number of Distinct Detects | 128 | | | | Number of Distinct Non-Detects | | 2 |
| 931 | | | | | Minimum Detect | 0.057 | | | | Minimum Non-Detect | | 0.05 |
| 932 | | | | | Maximum Detect | 59.2 | | | | Maximum Non-Detect | | 0.1 |
| 933 | | | | | Variance Detects | 92.42 | | | | Percent Non-Detects | | 3.676% |
| 934 | | | | | Mean Detects | 5.959 | | | | SD Detects | | 9.614 |
| 935 | | | | | Median Detects | 2.23 | | | | CV Detects | | 1.613 |
| 936 | | | | | Skewness Detects | 2.91 | | | | Kurtosis Detects | | 10.14 |
| 937 | | | | | Mean of Logged Detects | 0.599 | | | | SD of Logged Detects | | 1.716 |
| 938 | | | | | | | | | | | | |
| 939 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 940 | | | | | Shapiro Wilk Test Statistic | 0.641 | **Normal GOF Test on Detected Observations Only** | | | | | |
| 941 | | | | | 5% Shapiro Wilk P Value | 0 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 942 | | | | | Lilliefors Test Statistic | 0.27 | **Lilliefors GOF Test** | | | | | |
| 943 | | | | | 5% Lilliefors Critical Value | 0.0774 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 944 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 945 | | | | | | | | | | | | |
| 946 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 947 | | | | | Mean | 5.742 | | | | Standard Error of Mean | | 0.815 |
| 948 | | | | | SD | 9.465 | | | | 95% KM (BCA) UCL | | 7.234 |
| 949 | | | | | 95% KM (t) UCL | 7.092 | | | | 95% KM (Percentile Bootstrap) UCL | | 7.183 |
| 950 | | | | | 95% KM (z) UCL | 7.082 | | | | 95% KM Bootstrap t UCL | | 7.404 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 951 | | | | | 90% KM Chebyshev UCL | 8.186 | | | | 95% KM Chebyshev UCL | | 9.293 |
| 952 | | | | | 97.5% KM Chebyshev UCL | 10.83 | | | | 99% KM Chebyshev UCL | | 13.85 |
| 953 | | | | | | | | | | | | |
| 954 | | | | | Gamma GOF Tests on Detected Observations Only | | | | | | | |
| 955 | | | | | A-D Test Statistic | 1.933 | Anderson-Darling GOF Test | | | | | |
| 956 | | | | | 5% A-D Critical Value | 0.816 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 957 | | | | | K-S Test Statistic | 0.0936 | Kolmogrov-Smirnoff GOF | | | | | |
| 958 | | | | | 5% K-S Critical Value | 0.086 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 959 | | | | | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | | | |
| 960 | | | | | | | | | | | | |
| 961 | | | | | Gamma Statistics on Detected Data Only | | | | | | | |
| 962 | | | | | k hat (MLE) | 0.531 | | | | k star (bias corrected MLE) | | 0.524 |
| 963 | | | | | Theta hat (MLE) | 11.23 | | | | Theta star (bias corrected MLE) | | 11.38 |
| 964 | | | | | nu hat (MLE) | 139.1 | | | | nu star (bias corrected) | | 137.2 |
| 965 | | | | | MLE Mean (bias corrected) | 5.959 | | | | MLE Sd (bias corrected) | | 8.234 |
| 966 | | | | | | | | | | | | |
| 967 | | | | | Gamma Kaplan-Meier (KM) Statistics | | | | | | | |
| 968 | | | | | k hat (KM) | 0.368 | | | | nu hat (KM) | | 100.1 |
| 969 | | | | | Approximate Chi Square Value (100.12, α) | 78.03 | | | | Adjusted Chi Square Value (100.12, β) | | 77.82 |
| 970 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 7.367 | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | 7.387 |
| 971 | | | | | | | | | | | | |
| 972 | | | | | Gamma ROS Statistics using Imputed Non-Detects | | | | | | | |
| 973 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 974 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 975 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 976 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 977 | | | | | Minimum | 0.01 | | | | Mean | | 5.741 |
| 978 | | | | | Maximum | 59.2 | | | | Median | | 1.78 |
| 979 | | | | | SD | 9.501 | | | | CV | | 1.655 |
| 980 | | | | | k hat (MLE) | 0.478 | | | | k star (bias corrected MLE) | | 0.472 |
| 981 | | | | | Theta hat (MLE) | 12.02 | | | | Theta star (bias corrected MLE) | | 12.16 |
| 982 | | | | | nu hat (MLE) | 129.9 | | | | nu star (bias corrected) | | 128.4 |
| 983 | | | | | MLE Mean (bias corrected) | 5.741 | | | | MLE Sd (bias corrected) | | 8.356 |
| 984 | | | | | | | | | | Adjusted Level of Significance (β) | | 0.0482 |
| 985 | | | | | Approximate Chi Square Value (128.38, α) | 103.2 | | | | Adjusted Chi Square Value (128.38, β) | | 103 |
| 986 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 7.141 | | | | 95% Gamma Adjusted UCL (use when n<50) | | 7.157 |
| 987 | | | | | | | | | | | | |
| 988 | | | | | Lognormal GOF Test on Detected Observations Only | | | | | | | |
| 989 | | | | | Lilliefors Test Statistic | 0.0748 | Lilliefors GOF Test | | | | | |
| 990 | | | | | 5% Lilliefors Critical Value | 0.0774 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 991 | | | | | Detected Data appear Approximate Lognormal at 5% Significance Level | | | | | | | |
| 992 | | | | | | | | | | | | |
| 993 | | | | | Lognormal ROS Statistics Using Imputed Non-Detects | | | | | | | |
| 994 | | | | | Mean in Original Scale | 5.742 | | | | Mean in Log Scale | | 0.451 |
| 995 | | | | | SD in Original Scale | 9.5 | | | | SD in Log Scale | | 1.85 |
| 996 | | | | | 95% t UCL (assumes normality of ROS data) | 7.091 | | | | 95% Percentile Bootstrap UCL | | 7.119 |
| 997 | | | | | 95% BCA Bootstrap UCL | 7.346 | | | | 95% Bootstrap t UCL | | 7.424 |
| 998 | | | | | 95% H-UCL (Log ROS) | 14.23 | | | | | | |
| 999 | | | | | | | | | | | | |
| 1000 | | | | | UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1001 | | | | | KM Mean (logged) | 0.47 | | | | | 95% H-UCL (KM -Log) | 13.03 |
| 1002 | | | | | KM SD (logged) | 1.803 | | | | | 95% Critical H Value (KM-Log) | 3.039 |
| 1003 | | | | | KM Standard Error of Mean (logged) | 0.155 | | | | | | |
| 1004 | | | | | | | | | | | | |
| 1005 | | | | | **DL/2 Statistics** | | | | | | | |
| 1006 | | | | | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | |
| 1007 | | | | | Mean in Original Scale | 5.741 | | | | | Mean in Log Scale | 0.452 |
| 1008 | | | | | SD in Original Scale | 9.5 | | | | | SD in Log Scale | 1.847 |
| 1009 | | | | | 95% t UCL (Assumes normality) | 7.091 | | | | | 95% H-Stat UCL | 14.15 |
| 1010 | | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | |
| 1011 | | | | | | | | | | | | |
| 1012 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 1013 | | | | | **Detected Data appear Approximate Lognormal Distributed at 5% Significance Level** | | | | | | | |
| 1014 | | | | | | | | | | | | |
| 1015 | | | | | **Suggested UCL to Use** | | | | | | | |
| 1016 | | | | | 97.5% KM (Chebyshev) UCL | 10.83 | | | | | | |
| 1017 | | | | | | | | | | | | |
| 1018 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 1019 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 1020 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 1021 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 1022 | | | | | | | | | | | | |
| 1023 | **Copper** | | | | | | | | | | | |
| 1024 | | | | | | | | | | | | |
| 1025 | | | | | **General Statistics** | | | | | | | |
| 1026 | | | | | Total Number of Observations | 136 | | | | | Number of Distinct Observations | 87 |
| 1027 | | | | | Number of Detects | 99 | | | | | Number of Non-Detects | 37 |
| 1028 | | | | | Number of Distinct Detects | 84 | | | | | Number of Distinct Non-Detects | 4 |
| 1029 | | | | | Minimum Detect | 0.21 | | | | | Minimum Non-Detect | 0.2 |
| 1030 | | | | | Maximum Detect | 7.22 | | | | | Maximum Non-Detect | 1 |
| 1031 | | | | | Variance Detects | 2.538 | | | | | Percent Non-Detects | 27.21% |
| 1032 | | | | | Mean Detects | 1.765 | | | | | SD Detects | 1.593 |
| 1033 | | | | | Median Detects | 1.22 | | | | | CV Detects | 0.902 |
| 1034 | | | | | Skewness Detects | 1.869 | | | | | Kurtosis Detects | 2.874 |
| 1035 | | | | | Mean of Logged Detects | 0.252 | | | | | SD of Logged Detects | 0.782 |
| 1036 | | | | | | | | | | | | |
| 1037 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 1038 | | | | | Shapiro Wilk Test Statistic | 0.749 | | | | | **Normal GOF Test on Detected Observations Only** | |
| 1039 | | | | | 5% Shapiro Wilk P Value | 0 | | | | | Detected Data Not Normal at 5% Significance Level | |
| 1040 | | | | | Lilliefors Test Statistic | 0.213 | | | | | **Lilliefors GOF Test** | |
| 1041 | | | | | 5% Lilliefors Critical Value | 0.089 | | | | | Detected Data Not Normal at 5% Significance Level | |
| 1042 | | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | | |
| 1043 | | | | | | | | | | | | |
| 1044 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |
| 1045 | | | | | Mean | 1.358 | | | | | Standard Error of Mean | 0.13 |
| 1046 | | | | | SD | 1.509 | | | | | 95% KM (BCA) UCL | 1.58 |
| 1047 | | | | | 95% KM (t) UCL | 1.573 | | | | | 95% KM (Percentile Bootstrap) UCL | 1.588 |
| 1048 | | | | | 95% KM (z) UCL | 1.572 | | | | | 95% KM Bootstrap t UCL | 1.609 |
| 1049 | | | | | 90% KM Chebyshev UCL | 1.748 | | | | | 95% KM Chebyshev UCL | 1.925 |
| 1050 | | | | | 97.5% KM Chebyshev UCL | 2.171 | | | | | 99% KM Chebyshev UCL | 2.653 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1051 | | | | | | | | | | | | |
| 1052 | | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | |
| 1053 | | | | | A-D Test Statistic | 2.161 | **Anderson-Darling GOF Test** | | | | | |
| 1054 | | | | | 5% A-D Critical Value | 0.768 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1055 | | | | | K-S Test Statistic | 0.119 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 1056 | | | | | 5% K-S Critical Value | 0.0914 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1057 | | | | | | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | |
| 1058 | | | | | | | | | | | | |
| 1059 | | | | | | **Gamma Statistics on Detected Data Only** | | | | | | |
| 1060 | | | | | k hat (MLE) | 1.728 | k star (bias corrected MLE) | | | | | 1.682 |
| 1061 | | | | | Theta hat (MLE) | 1.022 | Theta star (bias corrected MLE) | | | | | 1.049 |
| 1062 | | | | | nu hat (MLE) | 342.1 | nu star (bias corrected) | | | | | 333.1 |
| 1063 | | | | | MLE Mean (bias corrected) | 1.765 | MLE Sd (bias corrected) | | | | | 1.361 |
| 1064 | | | | | | | | | | | | |
| 1065 | | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | |
| 1066 | | | | | k hat (KM) | 0.81 | nu hat (KM) | | | | | 220.2 |
| 1067 | | | | | Approximate Chi Square Value (220.22, α) | 186.9 | Adjusted Chi Square Value (220.22, β) | | | | | 186.5 |
| 1068 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 1.6 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 1.603 |
| 1069 | | | | | | | | | | | | |
| 1070 | | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | |
| 1071 | | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | |
| 1072 | | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | |
| 1073 | | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | |
| 1074 | | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | |
| 1075 | | | | | Minimum | 0.01 | Mean | | | | | 1.292 |
| 1076 | | | | | Maximum | 7.22 | Median | | | | | 0.84 |
| 1077 | | | | | SD | 1.565 | CV | | | | | 1.211 |
| 1078 | | | | | k hat (MLE) | 0.503 | k star (bias corrected MLE) | | | | | 0.497 |
| 1079 | | | | | Theta hat (MLE) | 2.569 | Theta star (bias corrected MLE) | | | | | 2.601 |
| 1080 | | | | | nu hat (MLE) | 136.8 | nu star (bias corrected) | | | | | 135.1 |
| 1081 | | | | | MLE Mean (bias corrected) | 1.292 | MLE Sd (bias corrected) | | | | | 1.833 |
| 1082 | | | | | | | Adjusted Level of Significance (β) | | | | | 0.0482 |
| 1083 | | | | | Approximate Chi Square Value (135.08, α) | 109.2 | Adjusted Chi Square Value (135.08, β) | | | | | 109 |
| 1084 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 1.597 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 1.601 |
| 1085 | | | | | | | | | | | | |
| 1086 | | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | |
| 1087 | | | | | Lilliefors Test Statistic | 0.0646 | **Lilliefors GOF Test** | | | | | |
| 1088 | | | | | 5% Lilliefors Critical Value | 0.089 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 1089 | | | | | | **Detected Data appear Approximate Lognormal at 5% Significance Level** | | | | | | |
| 1090 | | | | | | | | | | | | |
| 1091 | | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | |
| 1092 | | | | | Mean in Original Scale | 1.357 | Mean in Log Scale | | | | | -0.207 |
| 1093 | | | | | SD in Original Scale | 1.515 | SD in Log Scale | | | | | 1.038 |
| 1094 | | | | | 95% t UCL (assumes normality of ROS data) | 1.572 | 95% Percentile Bootstrap UCL | | | | | 1.571 |
| 1095 | | | | | 95% BCA Bootstrap UCL | 1.605 | 95% Bootstrap t UCL | | | | | 1.594 |
| 1096 | | | | | 95% H-UCL (Log ROS) | 1.7 | | | | | | |
| 1097 | | | | | | | | | | | | |
| 1098 | | | | | | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | |
| 1099 | | | | | KM Mean (logged) | -0.191 | 95% H-UCL (KM -Log) | | | | | 1.635 |
| 1100 | | | | | KM SD (logged) | 0.995 | 95% Critical H Value (KM-Log) | | | | | 2.191 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1101 | | | | | KM Standard Error of Mean (logged) | 0.0887 | | | | | | |
| 1102 | | | | | | | | | | | | |
| 1103 | | | | | | DL/2 Statistics | | | | | | |
| 1104 | | | | | DL/2 Normal | | | | | | DL/2 Log-Transformed | |
| 1105 | | | | | Mean in Original Scale | 1.35 | | | | | Mean in Log Scale | -0.218 |
| 1106 | | | | | SD in Original Scale | 1.52 | | | | | SD in Log Scale | 1.031 |
| 1107 | | | | | 95% t UCL (Assumes normality) | 1.566 | | | | | 95% H-Stat UCL | 1.665 |
| 1108 | | | | | DL/2 is not a recommended method, provided for comparisons and historical reasons | | | | | | | |
| 1109 | | | | | | | | | | | | |
| 1110 | | | | | Nonparametric Distribution Free UCL Statistics | | | | | | | |
| 1111 | | | | | Detected Data appear Approximate Lognormal Distributed at 5% Significance Level | | | | | | | |
| 1112 | | | | | | | | | | | | |
| 1113 | | | | | Suggested UCL to Use | | | | | | | |
| 1114 | | | | | 95% KM (BCA) UCL | 1.58 | | | | | | |
| 1115 | | | | | | | | | | | | |
| 1116 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 1117 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 1118 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 1119 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 1120 | | | | | | | | | | | | |
| 1121 | Gallium | | | | | | | | | | | |
| 1122 | | | | | | | | | | | | |
| 1123 | | | | | General Statistics | | | | | | | |
| 1124 | | | | | Total Number of Observations | 136 | | | | | Number of Distinct Observations | 4 |
| 1125 | | | | | Number of Detects | 1 | | | | | Number of Non-Detects | 135 |
| 1126 | | | | | Number of Distinct Detects | 1 | | | | | Number of Distinct Non-Detects | 3 |
| 1127 | | | | | | | | | | | | |
| 1128 | | | | | Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! | | | | | | | |
| 1129 | | | | | It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV). | | | | | | | |
| 1130 | | | | | | | | | | | | |
| 1131 | | | | | The data set for variable Gallium was not processed! | | | | | | | |
| 1132 | | | | | | | | | | | | |
| 1133 | | | | | | | | | | | | |
| 1134 | Iron | | | | | | | | | | | |
| 1135 | | | | | | | | | | | | |
| 1136 | | | | | General Statistics | | | | | | | |
| 1137 | | | | | Total Number of Observations | 135 | | | | | Number of Distinct Observations | 101 |
| 1138 | | | | | Number of Detects | 107 | | | | | Number of Non-Detects | 28 |
| 1139 | | | | | Number of Distinct Detects | 100 | | | | | Number of Distinct Non-Detects | 2 |
| 1140 | | | | | Minimum Detect | 10 | | | | | Minimum Non-Detect | 10 |
| 1141 | | | | | Maximum Detect | 85700 | | | | | Maximum Non-Detect | 30 |
| 1142 | | | | | Variance Detects | 2.102E+8 | | | | | Percent Non-Detects | 20.74% |
| 1143 | | | | | Mean Detects | 5842 | | | | | SD Detects | 14497 |
| 1144 | | | | | Median Detects | 1120 | | | | | CV Detects | 2.482 |
| 1145 | | | | | Skewness Detects | 3.918 | | | | | Kurtosis Detects | 16.34 |
| 1146 | | | | | Mean of Logged Detects | 6.617 | | | | | SD of Logged Detects | 2.305 |
| 1147 | | | | | | | | | | | | |
| 1148 | | | | | Normal GOF Test on Detects Only | | | | | | | |
| 1149 | | | | | Shapiro Wilk Test Statistic | 0.445 | | | | | Normal GOF Test on Detected Observations Only | |
| 1150 | | | | | 5% Shapiro Wilk P Value | 0 | | | | | Detected Data Not Normal at 5% Significance Level | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1151 | | | | | Lilliefors Test Statistic | 0.344 | **Lilliefors GOF Test** | | | | | |
| 1152 | | | | | 5% Lilliefors Critical Value | 0.0857 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1153 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 1154 | | | | | | | | | | | | |
| 1155 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 1156 | | | | | Mean | 4632 | | | | Standard Error of Mean | | 1129 |
| 1157 | | | | | SD | 13062 | | | | 95% KM (BCA) UCL | | 6536 |
| 1158 | | | | | 95% KM (t) UCL | 6503 | | | | 95% KM (Percentile Bootstrap) UCL | | 6606 |
| 1159 | | | | | 95% KM (z) UCL | 6490 | | | | 95% KM Bootstrap t UCL | | 7365 |
| 1160 | | | | | 90% KM Chebyshev UCL | 8021 | | | | 95% KM Chebyshev UCL | | 9556 |
| 1161 | | | | | 97.5% KM Chebyshev UCL | 11686 | | | | 99% KM Chebyshev UCL | | 15871 |
| 1162 | | | | | | | | | | | | |
| 1163 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 1164 | | | | | A-D Test Statistic | 3.247 | **Anderson-Darling GOF Test** | | | | | |
| 1165 | | | | | 5% A-D Critical Value | 0.86 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1166 | | | | | K-S Test Statistic | 0.145 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 1167 | | | | | 5% K-S Critical Value | 0.0948 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1168 | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1169 | | | | | | | | | | | | |
| 1170 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 1171 | | | | | k hat (MLE) | 0.33 | | | | k star (bias corrected MLE) | | 0.327 |
| 1172 | | | | | Theta hat (MLE) | 17691 | | | | Theta star (bias corrected MLE) | | 17854 |
| 1173 | | | | | nu hat (MLE) | 70.67 | | | | nu star (bias corrected) | | 70.02 |
| 1174 | | | | | MLE Mean (bias corrected) | 5842 | | | | MLE Sd (bias corrected) | | 10213 |
| 1175 | | | | | | | | | | | | |
| 1176 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 1177 | | | | | k hat (KM) | 0.126 | | | | nu hat (KM) | | 33.96 |
| 1178 | | | | | Approximate Chi Square Value (33.96, α) | 21.63 | | | | Adjusted Chi Square Value (33.96, β) | | 21.53 |
| 1179 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 7272 | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | 7308 |
| 1180 | | | | | | | | | | | | |
| 1181 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 1182 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 1183 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 1184 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 1185 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 1186 | | | | | Minimum | 0.01 | | | | Mean | | 4630 |
| 1187 | | | | | Maximum | 85700 | | | | Median | | 379 |
| 1188 | | | | | SD | 13111 | | | | CV | | 2.832 |
| 1189 | | | | | k hat (MLE) | 0.18 | | | | k star (bias corrected MLE) | | 0.181 |
| 1190 | | | | | Theta hat (MLE) | 25699 | | | | Theta star (bias corrected MLE) | | 25567 |
| 1191 | | | | | nu hat (MLE) | 48.65 | | | | nu star (bias corrected) | | 48.9 |
| 1192 | | | | | MLE Mean (bias corrected) | 4630 | | | | MLE Sd (bias corrected) | | 10880 |
| 1193 | | | | | | | | | | Adjusted Level of Significance (β) | | 0.0482 |
| 1194 | | | | | Approximate Chi Square Value (48.90, α) | 33.85 | | | | Adjusted Chi Square Value (48.90, β) | | 33.71 |
| 1195 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 6690 | | | | 95% Gamma Adjusted UCL (use when n<50) | | 6716 |
| 1196 | | | | | | | | | | | | |
| 1197 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 1198 | | | | | Lilliefors Test Statistic | 0.076 | **Lilliefors GOF Test** | | | | | |
| 1199 | | | | | 5% Lilliefors Critical Value | 0.0857 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 1200 | **Detected Data appear Approximate Lognormal at 5% Significance Level** | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 1201 | | | | | | | | | | | | |
| 1202 | | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | |
| 1203 | | | | | Mean in Original Scale | 4632 | | | | | Mean in Log Scale | 5.555 |
| 1204 | | | | | SD in Original Scale | 13111 | | | | | SD in Log Scale | 2.978 |
| 1205 | | | | | 95% t UCL (assumes normality of ROS data) | 6501 | | | | | 95% Percentile Bootstrap UCL | 6579 |
| 1206 | | | | | 95% BCA Bootstrap UCL | 6810 | | | | | 95% Bootstrap t UCL | 7305 |
| 1207 | | | | | 95% H-UCL (Log ROS) | 69396 | | | | | | |
| 1208 | | | | | | | | | | | | |
| 1209 | | | | | | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | |
| 1210 | | | | | KM Mean (logged) | 5.729 | | | | | 95% H-UCL (KM -Log) | 29140 |
| 1211 | | | | | KM SD (logged) | 2.682 | | | | | 95% Critical H Value (KM-Log) | 4.12 |
| 1212 | | | | | KM Standard Error of Mean (logged) | 0.232 | | | | | | |
| 1213 | | | | | | | | | | | | |
| 1214 | | | | | | **DL/2 Statistics** | | | | | | |
| 1215 | | | | | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | |
| 1216 | | | | | Mean in Original Scale | 4632 | | | | | Mean in Log Scale | 5.627 |
| 1217 | | | | | SD in Original Scale | 13111 | | | | | SD in Log Scale | 2.832 |
| 1218 | | | | | 95% t UCL (Assumes normality) | 6501 | | | | | 95% H-Stat UCL | 43982 |
| 1219 | | | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | |
| 1220 | | | | | | | | | | | | |
| 1221 | | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | |
| 1222 | | | | | | **Detected Data appear Approximate Lognormal Distributed at 5% Significance Level** | | | | | | |
| 1223 | | | | | | | | | | | | |
| 1224 | | | | | | **Suggested UCL to Use** | | | | | | |
| 1225 | | | | | 97.5% KM (Chebyshev) UCL | 11686 | | | | | | |
| 1226 | | | | | | | | | | | | |
| 1227 | | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | |
| 1228 | | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | |
| 1229 | | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | |
| 1230 | | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | |
| 1231 | | | | | | | | | | | | |
| 1232 | **Lead** | | | | | | | | | | | |
| 1233 | | | | | | | | | | | | |
| 1234 | | | | | | **General Statistics** | | | | | | |
| 1235 | | | | | Total Number of Observations | 136 | | | | | Number of Distinct Observations | 17 |
| 1236 | | | | | Number of Detects | 14 | | | | | Number of Non-Detects | 122 |
| 1237 | | | | | Number of Distinct Detects | 14 | | | | | Number of Distinct Non-Detects | 3 |
| 1238 | | | | | Minimum Detect | 0.053 | | | | | Minimum Non-Detect | 0.05 |
| 1239 | | | | | Maximum Detect | 1.63 | | | | | Maximum Non-Detect | 0.3 |
| 1240 | | | | | Variance Detects | 0.221 | | | | | Percent Non-Detects | 89.71% |
| 1241 | | | | | Mean Detects | 0.518 | | | | | SD Detects | 0.47 |
| 1242 | | | | | Median Detects | 0.475 | | | | | CV Detects | 0.906 |
| 1243 | | | | | Skewness Detects | 1.194 | | | | | Kurtosis Detects | 1.176 |
| 1244 | | | | | Mean of Logged Detects | -1.144 | | | | | SD of Logged Detects | 1.131 |
| 1245 | | | | | | | | | | | | |
| 1246 | | | | | | **Normal GOF Test on Detects Only** | | | | | | |
| 1247 | | | | | Shapiro Wilk Test Statistic | 0.872 | | | | | **Shapiro Wilk GOF Test** | |
| 1248 | | | | | 5% Shapiro Wilk Critical Value | 0.874 | | | | | Detected Data Not Normal at 5% Significance Level | |
| 1249 | | | | | Lilliefors Test Statistic | 0.161 | | | | | **Lilliefors GOF Test** | |
| 1250 | | | | | 5% Lilliefors Critical Value | 0.237 | | | | | Detected Data appear Normal at 5% Significance Level | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 1251 | **Detected Data appear Approximate Normal at 5% Significance Level** | | | | | | | | | | | |
| 1252 | | | | | | | | | | | | |
| 1253 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 1254 | | | | | Mean | 0.103 | | | Standard Error of Mean | | | 0.0183 |
| 1255 | | | | | SD | 0.203 | | | 95% KM (BCA) UCL | | | 0.134 |
| 1256 | | | | | 95% KM (t) UCL | 0.134 | | | 95% KM (Percentile Bootstrap) UCL | | | 0.134 |
| 1257 | | | | | 95% KM (z) UCL | 0.133 | | | 95% KM Bootstrap t UCL | | | 0.147 |
| 1258 | | | | | 90% KM Chebyshev UCL | 0.158 | | | 95% KM Chebyshev UCL | | | 0.183 |
| 1259 | | | | | 97.5% KM Chebyshev UCL | 0.217 | | | 99% KM Chebyshev UCL | | | 0.285 |
| 1260 | | | | | | | | | | | | |
| 1261 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 1262 | | | | | A-D Test Statistic | 0.361 | | | **Anderson-Darling GOF Test** | | | |
| 1263 | | | | | 5% A-D Critical Value | 0.757 | | | Detected data appear Gamma Distributed at 5% Significance Level | | | |
| 1264 | | | | | K-S Test Statistic | 0.173 | | | **Kolmogrov-Smirnoff GOF** | | | |
| 1265 | | | | | 5% K-S Critical Value | 0.234 | | | Detected data appear Gamma Distributed at 5% Significance Level | | | |
| 1266 | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1267 | | | | | | | | | | | | |
| 1268 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 1269 | | | | | k hat (MLE) | 1.166 | | | k star (bias corrected MLE) | | | 0.964 |
| 1270 | | | | | Theta hat (MLE) | 0.445 | | | Theta star (bias corrected MLE) | | | 0.538 |
| 1271 | | | | | nu hat (MLE) | 32.65 | | | nu star (bias corrected) | | | 26.99 |
| 1272 | | | | | MLE Mean (bias corrected) | 0.518 | | | MLE Sd (bias corrected) | | | 0.528 |
| 1273 | | | | | | | | | | | | |
| 1274 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 1275 | | | | | k hat (KM) | 0.26 | | | nu hat (KM) | | | 70.8 |
| 1276 | | | | | Approximate Chi Square Value (70.80, α) | 52.43 | | | Adjusted Chi Square Value (70.80, β) | | | 52.26 |
| 1277 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.14 | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | | 0.14 |
| 1278 | | | | | | | | | | | | |
| 1279 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 1280 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 1281 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 1282 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 1283 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 1284 | | | | | Minimum | 0.01 | | | Mean | | | 0.0731 |
| 1285 | | | | | Maximum | 1.63 | | | Median | | | 0.01 |
| 1286 | | | | | SD | 0.215 | | | CV | | | 2.947 |
| 1287 | | | | | k hat (MLE) | 0.446 | | | k star (bias corrected MLE) | | | 0.441 |
| 1288 | | | | | Theta hat (MLE) | 0.164 | | | Theta star (bias corrected MLE) | | | 0.166 |
| 1289 | | | | | nu hat (MLE) | 121.3 | | | nu star (bias corrected) | | | 120 |
| 1290 | | | | | MLE Mean (bias corrected) | 0.0731 | | | MLE Sd (bias corrected) | | | 0.11 |
| 1291 | | | | | | | | | Adjusted Level of Significance (β) | | | 0.0482 |
| 1292 | | | | | Approximate Chi Square Value (119.95, α) | 95.66 | | | Adjusted Chi Square Value (119.95, β) | | | 95.43 |
| 1293 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.0916 | | | 95% Gamma Adjusted UCL (use when n<50) | | | 0.0919 |
| 1294 | | | | | | | | | | | | |
| 1295 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 1296 | | | | | Shapiro Wilk Test Statistic | 0.922 | | | **Shapiro Wilk GOF Test** | | | |
| 1297 | | | | | 5% Shapiro Wilk Critical Value | 0.874 | | | Detected Data appear Lognormal at 5% Significance Level | | | |
| 1298 | | | | | Lilliefors Test Statistic | 0.176 | | | **Lilliefors GOF Test** | | | |
| 1299 | | | | | 5% Lilliefors Critical Value | 0.237 | | | Detected Data appear Lognormal at 5% Significance Level | | | |
| 1300 | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |

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| 1301 | | | | | | | | | | | | |
| 1302 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 1303 | | | | | Mean in Original Scale | 0.0768 | | | | Mean in Log Scale | | -4.42 |
| 1304 | | | | | SD in Original Scale | 0.213 | | | | SD in Log Scale | | 1.99 |
| 1305 | | | | | 95% t UCL (assumes normality of ROS data) | 0.107 | | | | 95% Percentile Bootstrap UCL | | 0.11 |
| 1306 | | | | | 95% BCA Bootstrap UCL | 0.118 | | | | 95% Bootstrap t UCL | | 0.125 |
| 1307 | | | | | 95% H-UCL (Log ROS) | 0.152 | | | | | | |
| 1308 | | | | | | | | | | | | |
| 1309 | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | | | | | |
| 1310 | | | | | KM Mean (logged) | -2.73 | | | | 95% H-UCL (KM -Log) | | 0.0913 |
| 1311 | | | | | KM SD (logged) | 0.67 | | | | 95% Critical H Value (KM-Log) | | 1.933 |
| 1312 | | | | | KM Standard Error of Mean (logged) | 0.0722 | | | | | | |
| 1313 | | | | | | | | | | | | |
| 1314 | **DL/2 Statistics** | | | | | | | | | | | |
| 1315 | | | | **DL/2 Normal** | | | | | **DL/2 Log-Transformed** | | | |
| 1316 | | | | | Mean in Original Scale | 0.16 | | | | Mean in Log Scale | | -2.153 |
| 1317 | | | | | SD in Original Scale | 0.196 | | | | SD in Log Scale | | 0.76 |
| 1318 | | | | | 95% t UCL (Assumes normality) | 0.188 | | | | 95% H-Stat UCL | | 0.177 |
| 1319 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 1320 | | | | | | | | | | | | |
| 1321 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1322 | **Detected Data appear Approximate Normal Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1323 | | | | | | | | | | | | |
| 1324 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1325 | | | | | 95% KM (t) UCL | 0.134 | | | | 95% KM (Percentile Bootstrap) UCL | | 0.134 |
| 1326 | | | | | | | | | | | | |
| 1327 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1328 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 1329 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 1330 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1331 | | | | | | | | | | | | |
| 1332 | **Lithium** | | | | | | | | | | | |
| 1333 | | | | | | | | | | | | |
| 1334 | **General Statistics** | | | | | | | | | | | |
| 1335 | | | | | Total Number of Observations | 136 | | | | Number of Distinct Observations | | 80 |
| 1336 | | | | | Number of Detects | 111 | | | | Number of Non-Detects | | 25 |
| 1337 | | | | | Number of Distinct Detects | 79 | | | | Number of Distinct Non-Detects | | 1 |
| 1338 | | | | | Minimum Detect | 1.44 | | | | Minimum Non-Detect | | 20 |
| 1339 | | | | | Maximum Detect | 145 | | | | Maximum Non-Detect | | 20 |
| 1340 | | | | | Variance Detects | 1017 | | | | Percent Non-Detects | | 18.38% |
| 1341 | | | | | Mean Detects | 41.6 | | | | SD Detects | | 31.88 |
| 1342 | | | | | Median Detects | 32 | | | | CV Detects | | 0.766 |
| 1343 | | | | | Skewness Detects | 1.11 | | | | Kurtosis Detects | | 0.736 |
| 1344 | | | | | Mean of Logged Detects | 3.372 | | | | SD of Logged Detects | | 0.967 |
| 1345 | | | | | | | | | | | | |
| 1346 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 1347 | | | | | Shapiro Wilk Test Statistic | 0.89 | | | | **Normal GOF Test on Detected Observations Only** | | |
| 1348 | | | | | 5% Shapiro Wilk P Value | 1.941E-11 | | | | Detected Data Not Normal at 5% Significance Level | | |
| 1349 | | | | | Lilliefors Test Statistic | 0.132 | | | | **Lilliefors GOF Test** | | |
| 1350 | | | | | 5% Lilliefors Critical Value | 0.0841 | | | | Detected Data Not Normal at 5% Significance Level | | |

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| 1351 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 1352 | | | | | | | | | | | | |
| 1353 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 1354 | | | | | Mean | 35.98 | | | Standard Error of Mean | | | 2.693 |
| 1355 | | | | | SD | 31.11 | | | 95% KM (BCA) UCL | | | 40.67 |
| 1356 | | | | | 95% KM (t) UCL | 40.44 | | | 95% KM (Percentile Bootstrap) UCL | | | 40.43 |
| 1357 | | | | | 95% KM (z) UCL | 40.41 | | | 95% KM Bootstrap t UCL | | | 41.04 |
| 1358 | | | | | 90% KM Chebyshev UCL | 44.06 | | | 95% KM Chebyshev UCL | | | 47.72 |
| 1359 | | | | | 97.5% KM Chebyshev UCL | 52.8 | | | 99% KM Chebyshev UCL | | | 62.78 |
| 1360 | | | | | | | | | | | | |
| 1361 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 1362 | | | | | A-D Test Statistic | 0.211 | | | **Anderson-Darling GOF Test** | | | |
| 1363 | | | | | 5% A-D Critical Value | 0.769 | | | Detected data appear Gamma Distributed at 5% Significance Level | | | |
| 1364 | | | | | K-S Test Statistic | 0.0343 | | | **Kolmogrov-Smirnoff GOF** | | | |
| 1365 | | | | | 5% K-S Critical Value | 0.0882 | | | Detected data appear Gamma Distributed at 5% Significance Level | | | |
| 1366 | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1367 | | | | | | | | | | | | |
| 1368 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 1369 | | | | | k hat (MLE) | 1.551 | | | k star (bias corrected MLE) | | | 1.515 |
| 1370 | | | | | Theta hat (MLE) | 26.83 | | | Theta star (bias corrected MLE) | | | 27.46 |
| 1371 | | | | | nu hat (MLE) | 344.2 | | | nu star (bias corrected) | | | 336.3 |
| 1372 | | | | | MLE Mean (bias corrected) | 41.6 | | | MLE Sd (bias corrected) | | | 33.8 |
| 1373 | | | | | | | | | | | | |
| 1374 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 1375 | | | | | k hat (KM) | 1.337 | | | nu hat (KM) | | | 363.8 |
| 1376 | | | | | Approximate Chi Square Value (363.75, α) | 320.6 | | | Adjusted Chi Square Value (363.75, β) | | | 320.1 |
| 1377 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 40.83 | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | | 40.88 |
| 1378 | | | | | | | | | | | | |
| 1379 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 1380 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 1381 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 1382 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 1383 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 1384 | | | | | Minimum | 0.01 | | | Mean | | | 35.78 |
| 1385 | | | | | Maximum | 145 | | | Median | | | 26 |
| 1386 | | | | | SD | 31.43 | | | CV | | | 0.878 |
| 1387 | | | | | k hat (MLE) | 1.054 | | | k star (bias corrected MLE) | | | 1.035 |
| 1388 | | | | | Theta hat (MLE) | 33.96 | | | Theta star (bias corrected MLE) | | | 34.56 |
| 1389 | | | | | nu hat (MLE) | 286.6 | | | nu star (bias corrected) | | | 281.6 |
| 1390 | | | | | MLE Mean (bias corrected) | 35.78 | | | MLE Sd (bias corrected) | | | 35.17 |
| 1391 | | | | | | | | | Adjusted Level of Significance (β) | | | 0.0482 |
| 1392 | | | | | Approximate Chi Square Value (281.57, α) | 243.7 | | | Adjusted Chi Square Value (281.57, β) | | | 243.3 |
| 1393 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 41.34 | | | 95% Gamma Adjusted UCL (use when n<50) | | | 41.4 |
| 1394 | | | | | | | | | | | | |
| 1395 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 1396 | | | | | Lilliefors Test Statistic | 0.0774 | | | **Lilliefors GOF Test** | | | |
| 1397 | | | | | 5% Lilliefors Critical Value | 0.0841 | | | Detected Data appear Lognormal at 5% Significance Level | | | |
| 1398 | **Detected Data appear Approximate Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1399 | | | | | | | | | | | | |
| 1400 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1401 | | | | | Mean in Original Scale | 35.87 | | | | | Mean in Log Scale | 3.162 |
| 1402 | | | | | SD in Original Scale | 31.28 | | | | | SD in Log Scale | 1.003 |
| 1403 | | | | 95% t UCL (assumes normality of ROS data) | | 40.31 | | | | | 95% Percentile Bootstrap UCL | 40.23 |
| 1404 | | | | | 95% BCA Bootstrap UCL | 40.22 | | | | | 95% Bootstrap t UCL | 40.55 |
| 1405 | | | | | 95% H-UCL (Log ROS) | 47.27 | | | | | | |
| 1406 | | | | | | | | | | | | |
| 1407 | | | | | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | |
| 1408 | | | | | KM Mean (logged) | 3.154 | | | | | 95% H-UCL (KM -Log) | 48.9 |
| 1409 | | | | | KM SD (logged) | 1.036 | | | | | 95% Critical H Value (KM-Log) | 2.228 |
| 1410 | | | | | KM Standard Error of Mean (logged) | 0.0968 | | | | | | |
| 1411 | | | | | | | | | | | | |
| 1412 | | | | | **DL/2 Statistics** | | | | | | | |
| 1413 | | | | | **DL/2 Normal** | | **DL/2 Log-Transformed** | | | | | |
| 1414 | | | | | Mean in Original Scale | 35.79 | | | | | Mean in Log Scale | 3.176 |
| 1415 | | | | | SD in Original Scale | 31.29 | | | | | SD in Log Scale | 0.967 |
| 1416 | | | | | 95% t UCL (Assumes normality) | 40.23 | | | | | 95% H-Stat UCL | 45.74 |
| 1417 | | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | |
| 1418 | | | | | | | | | | | | |
| 1419 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 1420 | | | | | **Detected Data appear Gamma Distributed at 5% Significance Level** | | | | | | | |
| 1421 | | | | | | | | | | | | |
| 1422 | | | | | **Suggested UCL to Use** | | | | | | | |
| 1423 | | | | | 95% KM (BCA) UCL | 40.67 | | | | | 95% GROS Approximate Gamma UCL | 41.34 |
| 1424 | | | | | 95% Approximate Gamma KM-UCL | 40.83 | | | | | | |
| 1425 | | | | | | | | | | | | |
| 1426 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 1427 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 1428 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 1429 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 1430 | | | | | | | | | | | | |
| 1431 | | | | | | | | | | | | |
| 1432 | **Magnesium** | | | | | | | | | | | |
| 1433 | | | | | | | | | | | | |
| 1434 | | | | | **General Statistics** | | | | | | | |
| 1435 | | | | | Total Number of Observations | 136 | | | | | Number of Distinct Observations | 123 |
| 1436 | | | | | | | | | | | Number of Missing Observations | 0 |
| 1437 | | | | | Minimum | 3490 | | | | | Mean | 331215 |
| 1438 | | | | | Maximum | 967000 | | | | | Median | 291500 |
| 1439 | | | | | SD | 231094 | | | | | Std. Error of Mean | 19816 |
| 1440 | | | | | Coefficient of Variation | 0.698 | | | | | Skewness | 0.613 |
| 1441 | | | | | | | | | | | | |
| 1442 | | | | | **Normal GOF Test** | | | | | | | |
| 1443 | | | | | Shapiro Wilk Test Statistic | 0.919 | | | | | **Shapiro Wilk GOF Test** | |
| 1444 | | | | | 5% Shapiro Wilk P Value | 1.5551E-9 | | | | | Data Not Normal at 5% Significance Level | |
| 1445 | | | | | Lilliefors Test Statistic | 0.121 | | | | | **Lilliefors GOF Test** | |
| 1446 | | | | | 5% Lilliefors Critical Value | 0.076 | | | | | Data Not Normal at 5% Significance Level | |
| 1447 | | | | | **Data Not Normal at 5% Significance Level** | | | | | | | |
| 1448 | | | | | | | | | | | | |
| 1449 | | | | | **Assuming Normal Distribution** | | | | | | | |
| 1450 | | | | | **95% Normal UCL** | | **95% UCLs (Adjusted for Skewness)** | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1451 | | | | | 95% Student's-t UCL | 364034 | | | | 95% Adjusted-CLT UCL (Chen-1995) | | 364922 |
| 1452 | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | | 364208 |
| 1453 | | | | | | | | | | | | |
| 1454 | | | | | **Gamma GOF Test** | | | | | | | |
| 1455 | | | | | A-D Test Statistic | 1.087 | | | **Anderson-Darling Gamma GOF Test** | | | |
| 1456 | | | | | 5% A-D Critical Value | 0.769 | | | Data Not Gamma Distributed at 5% Significance Level | | | |
| 1457 | | | | | K-S Test Statistic | 0.0905 | | | **Kolmogrov-Smirnoff Gamma GOF Test** | | | |
| 1458 | | | | | 5% K-S Critical Value | 0.0815 | | | Data Not Gamma Distributed at 5% Significance Level | | | |
| 1459 | | | | | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | |
| 1460 | | | | | | | | | | | | |
| 1461 | | | | | **Gamma Statistics** | | | | | | | |
| 1462 | | | | | k hat (MLE) | 1.659 | | | k star (bias corrected MLE) | | | 1.627 |
| 1463 | | | | | Theta hat (MLE) | 199659 | | | Theta star (bias corrected MLE) | | | 203547 |
| 1464 | | | | | nu hat (MLE) | 451.2 | | | nu star (bias corrected) | | | 442.6 |
| 1465 | | | | | MLE Mean (bias corrected) | 331215 | | | MLE Sd (bias corrected) | | | 259649 |
| 1466 | | | | | | | | | Approximate Chi Square Value (0.05) | | | 394.8 |
| 1467 | | | | | Adjusted Level of Significance | 0.0482 | | | Adjusted Chi Square Value | | | 394.3 |
| 1468 | | | | | | | | | | | | |
| 1469 | | | | | **Assuming Gamma Distribution** | | | | | | | |
| 1470 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 371293 | | | 95% Adjusted Gamma UCL (use when n<50) | | | 371743 |
| 1471 | | | | | | | | | | | | |
| 1472 | | | | | **Lognormal GOF Test** | | | | | | | |
| 1473 | | | | | Shapiro Wilk Test Statistic | 0.927 | | | **Shapiro Wilk Lognormal GOF Test** | | | |
| 1474 | | | | | 5% Shapiro Wilk P Value | 4.1299E-8 | | | Data Not Lognormal at 5% Significance Level | | | |
| 1475 | | | | | Lilliefors Test Statistic | 0.12 | | | **Lilliefors Lognormal GOF Test** | | | |
| 1476 | | | | | 5% Lilliefors Critical Value | 0.076 | | | Data Not Lognormal at 5% Significance Level | | | |
| 1477 | | | | | **Data Not Lognormal at 5% Significance Level** | | | | | | | |
| 1478 | | | | | | | | | | | | |
| 1479 | | | | | **Lognormal Statistics** | | | | | | | |
| 1480 | | | | | Minimum of Logged Data | 8.158 | | | Mean of logged Data | | | 12.38 |
| 1481 | | | | | Maximum of Logged Data | 13.78 | | | SD of logged Data | | | 0.939 |
| 1482 | | | | | | | | | | | | |
| 1483 | | | | | **Assuming Lognormal Distribution** | | | | | | | |
| 1484 | | | | | 95% H-UCL | 439510 | | | 90% Chebyshev (MVUE) UCL | | | 473170 |
| 1485 | | | | | 95% Chebyshev (MVUE) UCL | 520822 | | | 97.5% Chebyshev (MVUE) UCL | | | 586960 |
| 1486 | | | | | 99% Chebyshev (MVUE) UCL | 716876 | | | | | | |
| 1487 | | | | | | | | | | | | |
| 1488 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 1489 | | | | | **Data do not follow a Discernible Distribution (0.05)** | | | | | | | |
| 1490 | | | | | | | | | | | | |
| 1491 | | | | | **Nonparametric Distribution Free UCLs** | | | | | | | |
| 1492 | | | | | 95% CLT UCL | 363809 | | | 95% Jackknife UCL | | | 364034 |
| 1493 | | | | | 95% Standard Bootstrap UCL | 363684 | | | 95% Bootstrap-t UCL | | | 364314 |
| 1494 | | | | | 95% Hall's Bootstrap UCL | 366038 | | | 95% Percentile Bootstrap UCL | | | 364687 |
| 1495 | | | | | 95% BCA Bootstrap UCL | 364829 | | | | | | |
| 1496 | | | | | 90% Chebyshev(Mean, Sd) UCL | 390663 | | | 95% Chebyshev(Mean, Sd) UCL | | | 417591 |
| 1497 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 454966 | | | 99% Chebyshev(Mean, Sd) UCL | | | 528383 |
| 1498 | | | | | | | | | | | | |
| 1499 | | | | | **Suggested UCL to Use** | | | | | | | |
| 1500 | | | | | 95% Chebyshev (Mean, Sd) UCL | 417591 | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1501 | | | | | | | | | | | | |
| 1502 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1503 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 1504 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |
| 1505 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1506 | | | | | | | | | | | | |
| 1507 | | | | | | | | | | | | |
| 1508 | **Manganese** | | | | | | | | | | | |
| 1509 | | | | | | | | | | | | |
| 1510 | **General Statistics** | | | | | | | | | | | |
| 1511 | Total Number of Observations | | | | | 136 | Number of Distinct Observations | | | | | 132 |
| 1512 | | | | | | | Number of Missing Observations | | | | | 0 |
| 1513 | Minimum | | | | | 0.91 | Mean | | | | | 3063 |
| 1514 | Maximum | | | | | 21000 | Median | | | | | 1635 |
| 1515 | SD | | | | | 3701 | Std. Error of Mean | | | | | 317.4 |
| 1516 | Coefficient of Variation | | | | | 1.208 | Skewness | | | | | 1.836 |
| 1517 | | | | | | | | | | | | |
| 1518 | **Normal GOF Test** | | | | | | | | | | | |
| 1519 | Shapiro Wilk Test Statistic | | | | | 0.782 | **Shapiro Wilk GOF Test** | | | | | |
| 1520 | 5% Shapiro Wilk P Value | | | | | 0 | Data Not Normal at 5% Significance Level | | | | | |
| 1521 | Lilliefors Test Statistic | | | | | 0.204 | **Lilliefors GOF Test** | | | | | |
| 1522 | 5% Lilliefors Critical Value | | | | | 0.076 | Data Not Normal at 5% Significance Level | | | | | |
| 1523 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 1524 | | | | | | | | | | | | |
| 1525 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 1526 | **95% Normal UCL** | | | | | | **95% UCLs (Adjusted for Skewness)** | | | | | |
| 1527 | 95% Student's-t UCL | | | | | 3588 | 95% Adjusted-CLT UCL (Chen-1995) | | | | | 3638 |
| 1528 | | | | | | | 95% Modified-t UCL (Johnson-1978) | | | | | 3597 |
| 1529 | | | | | | | | | | | | |
| 1530 | **Gamma GOF Test** | | | | | | | | | | | |
| 1531 | A-D Test Statistic | | | | | 0.874 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 1532 | 5% A-D Critical Value | | | | | 0.819 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1533 | K-S Test Statistic | | | | | 0.0659 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 1534 | 5% K-S Critical Value | | | | | 0.0847 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1535 | **Detected data follow Appr. Gamma Distribution at 5% Significance Level** | | | | | | | | | | | |
| 1536 | | | | | | | | | | | | |
| 1537 | **Gamma Statistics** | | | | | | | | | | | |
| 1538 | k hat (MLE) | | | | | 0.508 | k star (bias corrected MLE) | | | | | 0.501 |
| 1539 | Theta hat (MLE) | | | | | 6034 | Theta star (bias corrected MLE) | | | | | 6110 |
| 1540 | nu hat (MLE) | | | | | 138.1 | nu star (bias corrected) | | | | | 136.3 |
| 1541 | MLE Mean (bias corrected) | | | | | 3063 | MLE Sd (bias corrected) | | | | | 4326 |
| 1542 | | | | | | | Approximate Chi Square Value (0.05) | | | | | 110.4 |
| 1543 | Adjusted Level of Significance | | | | | 0.0482 | Adjusted Chi Square Value | | | | | 110.1 |
| 1544 | | | | | | | | | | | | |
| 1545 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 1546 | 95% Approximate Gamma UCL (use when n>=50) | | | | | 3784 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 3792 |
| 1547 | | | | | | | | | | | | |
| 1548 | **Lognormal GOF Test** | | | | | | | | | | | |
| 1549 | Shapiro Wilk Test Statistic | | | | | 0.864 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 1550 | 5% Shapiro Wilk P Value | | | | | 0 | Data Not Lognormal at 5% Significance Level | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1551 | | | | | Lilliefors Test Statistic | 0.161 | **Lilliefors Lognormal GOF Test** | | | | | |
| 1552 | | | | | 5% Lilliefors Critical Value | 0.076 | Data Not Lognormal at 5% Significance Level | | | | | |
| 1553 | **Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1554 | | | | | | | | | | | | |
| 1555 | **Lognormal Statistics** | | | | | | | | | | | |
| 1556 | | | | | Minimum of Logged Data | -0.0943 | | | | Mean of logged Data | | 6.779 |
| 1557 | | | | | Maximum of Logged Data | 9.952 | | | | SD of logged Data | | 2.279 |
| 1558 | | | | | | | | | | | | |
| 1559 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 1560 | | | | | 95% H-UCL | 23977 | | | | 90% Chebyshev (MVUE) UCL | | 22220 |
| 1561 | | | | | 95% Chebyshev (MVUE) UCL | 27277 | | | | 97.5% Chebyshev (MVUE) UCL | | 34297 |
| 1562 | | | | | 99% Chebyshev (MVUE) UCL | 48085 | | | | | | |
| 1563 | | | | | | | | | | | | |
| 1564 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1565 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 1566 | | | | | | | | | | | | |
| 1567 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 1568 | | | | | 95% CLT UCL | 3585 | | | | 95% Jackknife UCL | | 3588 |
| 1569 | | | | | 95% Standard Bootstrap UCL | 3575 | | | | 95% Bootstrap-t UCL | | 3653 |
| 1570 | | | | | 95% Hall's Bootstrap UCL | 3660 | | | | 95% Percentile Bootstrap UCL | | 3578 |
| 1571 | | | | | 95% BCA Bootstrap UCL | 3668 | | | | | | |
| 1572 | | | | | 90% Chebyshev(Mean, Sd) UCL | 4015 | | | | 95% Chebyshev(Mean, Sd) UCL | | 4446 |
| 1573 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 5045 | | | | 99% Chebyshev(Mean, Sd) UCL | | 6221 |
| 1574 | | | | | | | | | | | | |
| 1575 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1576 | | | | | 95% Approximate Gamma UCL | 3784 | | | | | | |
| 1577 | | | | | | | | | | | | |
| 1578 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1579 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 1580 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |
| 1581 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1582 | | | | | | | | | | | | |
| 1583 | **Molybdenum** | | | | | | | | | | | |
| 1584 | | | | | | | | | | | | |
| 1585 | **General Statistics** | | | | | | | | | | | |
| 1586 | | | | | Total Number of Observations | 136 | | | | Number of Distinct Observations | | 86 |
| 1587 | | | | | Number of Detects | 95 | | | | Number of Non-Detects | | 41 |
| 1588 | | | | | Number of Distinct Detects | 85 | | | | Number of Distinct Non-Detects | | 3 |
| 1589 | | | | | Minimum Detect | 0.13 | | | | Minimum Non-Detect | | 0.1 |
| 1590 | | | | | Maximum Detect | 41.4 | | | | Maximum Non-Detect | | 2 |
| 1591 | | | | | Variance Detects | 60.18 | | | | Percent Non-Detects | | 30.15% |
| 1592 | | | | | Mean Detects | 6.147 | | | | SD Detects | | 7.757 |
| 1593 | | | | | Median Detects | 3.37 | | | | CV Detects | | 1.262 |
| 1594 | | | | | Skewness Detects | 2.543 | | | | Kurtosis Detects | | 7.986 |
| 1595 | | | | | Mean of Logged Detects | 1.057 | | | | SD of Logged Detects | | 1.369 |
| 1596 | | | | | | | | | | | | |
| 1597 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 1598 | | | | | Shapiro Wilk Test Statistic | 0.718 | **Normal GOF Test on Detected Observations Only** | | | | | |
| 1599 | | | | | 5% Shapiro Wilk P Value | 0 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1600 | | | | | Lilliefors Test Statistic | 0.219 | **Lilliefors GOF Test** | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1601 | | | | | 5% Lilliefors Critical Value | 0.0909 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1602 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 1603 | | | | | | | | | | | | |
| 1604 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 1605 | | | | | Mean | 4.448 | | | | Standard Error of Mean | | 0.6 |
| 1606 | | | | | SD | 6.951 | | | | 95% KM (BCA) UCL | | 5.367 |
| 1607 | | | | | 95% KM (t) UCL | 5.441 | | | | 95% KM (Percentile Bootstrap) UCL | | 5.456 |
| 1608 | | | | | 95% KM (z) UCL | 5.434 | | | | 95% KM Bootstrap t UCL | | 5.624 |
| 1609 | | | | | 90% KM Chebyshev UCL | 6.247 | | | | 95% KM Chebyshev UCL | | 7.062 |
| 1610 | | | | | 97.5% KM Chebyshev UCL | 8.193 | | | | 99% KM Chebyshev UCL | | 10.41 |
| 1611 | | | | | | | | | | | | |
| 1612 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 1613 | | | | | A-D Test Statistic | 0.763 | **Anderson-Darling GOF Test** | | | | | |
| 1614 | | | | | 5% A-D Critical Value | 0.793 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1615 | | | | | K-S Test Statistic | 0.106 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 1616 | | | | | 5% K-S Critical Value | 0.0953 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1617 | **Detected data follow Appr. Gamma Distribution at 5% Significance Level** | | | | | | | | | | | |
| 1618 | | | | | | | | | | | | |
| 1619 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 1620 | | | | | k hat (MLE) | 0.784 | | | | k star (bias corrected MLE) | | 0.766 |
| 1621 | | | | | Theta hat (MLE) | 7.839 | | | | Theta star (bias corrected MLE) | | 8.021 |
| 1622 | | | | | nu hat (MLE) | 149 | | | | nu star (bias corrected) | | 145.6 |
| 1623 | | | | | MLE Mean (bias corrected) | 6.147 | | | | MLE Sd (bias corrected) | | 7.021 |
| 1624 | | | | | | | | | | | | |
| 1625 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 1626 | | | | | k hat (KM) | 0.409 | | | | nu hat (KM) | | 111.4 |
| 1627 | | | | | Approximate Chi Square Value (111.36, α) | 88 | | | | Adjusted Chi Square Value (111.36, β) | | 87.78 |
| 1628 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 5.628 | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | 5.643 |
| 1629 | | | | | | | | | | | | |
| 1630 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 1631 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 1632 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 1633 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 1634 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 1635 | | | | | Minimum | 0.01 | | | | Mean | | 4.359 |
| 1636 | | | | | Maximum | 41.4 | | | | Median | | 1.478 |
| 1637 | | | | | SD | 7.03 | | | | CV | | 1.613 |
| 1638 | | | | | k hat (MLE) | 0.368 | | | | k star (bias corrected MLE) | | 0.365 |
| 1639 | | | | | Theta hat (MLE) | 11.85 | | | | Theta star (bias corrected MLE) | | 11.95 |
| 1640 | | | | | nu hat (MLE) | 100.1 | | | | nu star (bias corrected) | | 99.21 |
| 1641 | | | | | MLE Mean (bias corrected) | 4.359 | | | | MLE Sd (bias corrected) | | 7.218 |
| 1642 | | | | | | | | | | Adjusted Level of Significance (β) | | 0.0482 |
| 1643 | | | | | Approximate Chi Square Value (99.21, α) | 77.23 | | | | Adjusted Chi Square Value (99.21, β) | | 77.03 |
| 1644 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 5.6 | | | | 95% Gamma Adjusted UCL (use when n<50) | | 5.615 |
| 1645 | | | | | | | | | | | | |
| 1646 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 1647 | | | | | Lilliefors Test Statistic | 0.102 | **Lilliefors GOF Test** | | | | | |
| 1648 | | | | | 5% Lilliefors Critical Value | 0.0909 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 1649 | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1650 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1651 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 1652 | | | | | Mean in Original Scale | 4.476 | | | | | Mean in Log Scale | 0.463 |
| 1653 | | | | | SD in Original Scale | 6.963 | | | | | SD in Log Scale | 1.563 |
| 1654 | | | | | 95% t UCL (assumes normality of ROS data) | 5.465 | | | | | 95% Percentile Bootstrap UCL | 5.517 |
| 1655 | | | | | 95% BCA Bootstrap UCL | 5.699 | | | | | 95% Bootstrap t UCL | 5.652 |
| 1656 | | | | | 95% H-UCL (Log ROS) | 7.824 | | | | | | |
| 1657 | | | | | | | | | | | | |
| 1658 | **DL/2 Statistics** | | | | | | | | | | | |
| 1659 | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | | | | | |
| 1660 | | | | | Mean in Original Scale | 4.567 | | | | | Mean in Log Scale | 0.655 |
| 1661 | | | | | SD in Original Scale | 6.91 | | | | | SD in Log Scale | 1.377 |
| 1662 | | | | | 95% t UCL (Assumes normality) | 5.549 | | | | | 95% H-Stat UCL | 6.738 |
| 1663 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 1664 | | | | | | | | | | | | |
| 1665 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1666 | **Detected Data appear Approximate Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1667 | | | | | | | | | | | | |
| 1668 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1669 | | | | | 95% KM (BCA) UCL | 5.367 | | | | | 95% GROS Approximate Gamma UCL | 5.6 |
| 1670 | | | | | 95% Approximate Gamma KM-UCL | 5.628 | | | | | | |
| 1671 | | | | | | | | | | | | |
| 1672 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1673 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 1674 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 1675 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1676 | | | | | | | | | | | | |
| 1677 | **Nickel** | | | | | | | | | | | |
| 1678 | | | | | | | | | | | | |
| 1679 | **General Statistics** | | | | | | | | | | | |
| 1680 | | | | | Total Number of Observations | 136 | | | | | Number of Distinct Observations | 126 |
| 1681 | | | | | Number of Detects | 134 | | | | | Number of Non-Detects | 2 |
| 1682 | | | | | Number of Distinct Detects | 124 | | | | | Number of Distinct Non-Detects | 2 |
| 1683 | | | | | Minimum Detect | 0.46 | | | | | Minimum Non-Detect | 0.4 |
| 1684 | | | | | Maximum Detect | 63.2 | | | | | Maximum Non-Detect | 0.5 |
| 1685 | | | | | Variance Detects | 87.72 | | | | | Percent Non-Detects | 1.471% |
| 1686 | | | | | Mean Detects | 6.435 | | | | | SD Detects | 9.366 |
| 1687 | | | | | Median Detects | 3.37 | | | | | CV Detects | 1.455 |
| 1688 | | | | | Skewness Detects | 3.666 | | | | | Kurtosis Detects | 16.28 |
| 1689 | | | | | Mean of Logged Detects | 1.262 | | | | | SD of Logged Detects | 1.055 |
| 1690 | | | | | | | | | | | | |
| 1691 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 1692 | | | | | Shapiro Wilk Test Statistic | 0.59 | **Normal GOF Test on Detected Observations Only** | | | | | |
| 1693 | | | | | 5% Shapiro Wilk P Value | 0 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1694 | | | | | Lilliefors Test Statistic | 0.262 | **Lilliefors GOF Test** | | | | | |
| 1695 | | | | | 5% Lilliefors Critical Value | 0.0765 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1696 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 1697 | | | | | | | | | | | | |
| 1698 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 1699 | | | | | Mean | 6.347 | | | | | Standard Error of Mean | 0.8 |
| 1700 | | | | | SD | 9.29 | | | | | 95% KM (BCA) UCL | 7.643 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 1701 | | | | | 95% KM (t) UCL | 7.671 | | | | 95% KM (Percentile Bootstrap) UCL | | 7.756 |
| 1702 | | | | | 95% KM (z) UCL | 7.662 | | | | 95% KM Bootstrap t UCL | | 8.095 |
| 1703 | | | | | 90% KM Chebyshev UCL | 8.746 | | | | 95% KM Chebyshev UCL | | 9.832 |
| 1704 | | | | | 97.5% KM Chebyshev UCL | 11.34 | | | | 99% KM Chebyshev UCL | | 14.3 |
| 1705 | | | | | | | | | | | | |
| 1706 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 1707 | | | | | A-D Test Statistic | 3.471 | | | | **Anderson-Darling GOF Test** | | |
| 1708 | | | | | 5% A-D Critical Value | 0.785 | | | | Detected Data Not Gamma Distributed at 5% Significance Level | | |
| 1709 | | | | | K-S Test Statistic | 0.13 | | | | **Kolmogrov-Smirnoff GOF** | | |
| 1710 | | | | | 5% K-S Critical Value | 0.0832 | | | | Detected Data Not Gamma Distributed at 5% Significance Level | | |
| 1711 | | | | | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | |
| 1712 | | | | | | | | | | | | |
| 1713 | | | | | **Gamma Statistics on Detected Data Only** | | | | | | | |
| 1714 | | | | | k hat (MLE) | 0.967 | | | | k star (bias corrected MLE) | | 0.95 |
| 1715 | | | | | Theta hat (MLE) | 6.656 | | | | Theta star (bias corrected MLE) | | 6.773 |
| 1716 | | | | | nu hat (MLE) | 259.1 | | | | nu star (bias corrected) | | 254.6 |
| 1717 | | | | | MLE Mean (bias corrected) | 6.435 | | | | MLE Sd (bias corrected) | | 6.602 |
| 1718 | | | | | | | | | | | | |
| 1719 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 1720 | | | | | k hat (KM) | 0.467 | | | | nu hat (KM) | | 126.9 |
| 1721 | | | | | Approximate Chi Square Value (126.94, α) | 101.9 | | | | Adjusted Chi Square Value (126.94, β) | | 101.7 |
| 1722 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 7.905 | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | 7.924 |
| 1723 | | | | | | | | | | | | |
| 1724 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 1725 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 1726 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 1727 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 1728 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 1729 | | | | | Minimum | 0.01 | | | | Mean | | 6.341 |
| 1730 | | | | | Maximum | 63.2 | | | | Median | | 3.36 |
| 1731 | | | | | SD | 9.329 | | | | CV | | 1.471 |
| 1732 | | | | | k hat (MLE) | 0.874 | | | | k star (bias corrected MLE) | | 0.86 |
| 1733 | | | | | Theta hat (MLE) | 7.251 | | | | Theta star (bias corrected MLE) | | 7.372 |
| 1734 | | | | | nu hat (MLE) | 237.9 | | | | nu star (bias corrected) | | 233.9 |
| 1735 | | | | | MLE Mean (bias corrected) | 6.341 | | | | MLE Sd (bias corrected) | | 6.837 |
| 1736 | | | | | | | | | | Adjusted Level of Significance (β) | | 0.0482 |
| 1737 | | | | | Approximate Chi Square Value (233.95, α) | 199.5 | | | | Adjusted Chi Square Value (233.95, β) | | 199.2 |
| 1738 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 7.434 | | | | 95% Gamma Adjusted UCL (use when n<50) | | 7.447 |
| 1739 | | | | | | | | | | | | |
| 1740 | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | | |
| 1741 | | | | | Lilliefors Test Statistic | 0.0485 | | | | **Lilliefors GOF Test** | | |
| 1742 | | | | | 5% Lilliefors Critical Value | 0.0765 | | | | Detected Data appear Lognormal at 5% Significance Level | | |
| 1743 | | | | | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | |
| 1744 | | | | | | | | | | | | |
| 1745 | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | |
| 1746 | | | | | Mean in Original Scale | 6.344 | | | | Mean in Log Scale | | 1.223 |
| 1747 | | | | | SD in Original Scale | 9.327 | | | | SD in Log Scale | | 1.097 |
| 1748 | | | | | 95% t UCL (assumes normality of ROS data) | 7.669 | | | | 95% Percentile Bootstrap UCL | | 7.6 |
| 1749 | | | | | 95% BCA Bootstrap UCL | 8.086 | | | | 95% Bootstrap t UCL | | 8.054 |
| 1750 | | | | | 95% H-UCL (Log ROS) | 7.687 | | | | | | |

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| 1751 | | | | | | | | | | | | |
| 1752 | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | | | | | |
| 1753 | | | | | KM Mean (logged) | 1.231 | | | | 95% H-UCL (KM -Log) | | 7.514 |
| 1754 | | | | | KM SD (logged) | 1.074 | | | | 95% Critical H Value (KM-Log) | | 2.263 |
| 1755 | | | | | KM Standard Error of Mean (logged) | 0.0924 | | | | | | |
| 1756 | | | | | | | | | | | | |
| 1757 | **DL/2 Statistics** | | | | | | | | | | | |
| 1758 | | | **DL/2 Normal** | | | | **DL/2 Log-Transformed** | | | | | |
| 1759 | | | | | Mean in Original Scale | 6.344 | | | | Mean in Log Scale | | 1.222 |
| 1760 | | | | | SD in Original Scale | 9.327 | | | | SD in Log Scale | | 1.099 |
| 1761 | | | | | 95% t UCL (Assumes normality) | 7.668 | | | | 95% H-Stat UCL | | 7.702 |
| 1762 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 1763 | | | | | | | | | | | | |
| 1764 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1765 | **Detected Data appear Lognormal Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1766 | | | | | | | | | | | | |
| 1767 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1768 | | | | | 95% KM (Chebyshev) UCL | 9.832 | | | | | | |
| 1769 | | | | | | | | | | | | |
| 1770 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1771 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 1772 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 1773 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1774 | | | | | | | | | | | | |
| 1775 | **Phosphorus** | | | | | | | | | | | |
| 1776 | | | | | | | | | | | | |
| 1777 | **General Statistics** | | | | | | | | | | | |
| 1778 | | | | | Total Number of Observations | 134 | | | | Number of Distinct Observations | | 11 |
| 1779 | | | | | Number of Detects | 8 | | | | Number of Non-Detects | | 126 |
| 1780 | | | | | Number of Distinct Detects | 8 | | | | Number of Distinct Non-Detects | | 3 |
| 1781 | | | | | Minimum Detect | 380 | | | | Minimum Non-Detect | | 300 |
| 1782 | | | | | Maximum Detect | 6800 | | | | Maximum Non-Detect | | 1000 |
| 1783 | | | | | Variance Detects | 4500398 | | | | Percent Non-Detects | | 94.03% |
| 1784 | | | | | Mean Detects | 1926 | | | | SD Detects | | 2121 |
| 1785 | | | | | Median Detects | 1185 | | | | CV Detects | | 1.101 |
| 1786 | | | | | Skewness Detects | 2.129 | | | | Kurtosis Detects | | 4.88 |
| 1787 | | | | | Mean of Logged Detects | 7.14 | | | | SD of Logged Detects | | 0.954 |
| 1788 | | | | | | | | | | | | |
| 1789 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 1790 | | | | | Shapiro Wilk Test Statistic | 0.741 | **Shapiro Wilk GOF Test** | | | | | |
| 1791 | | | | | 5% Shapiro Wilk Critical Value | 0.818 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1792 | | | | | Lilliefors Test Statistic | 0.242 | **Lilliefors GOF Test** | | | | | |
| 1793 | | | | | 5% Lilliefors Critical Value | 0.313 | Detected Data appear Normal at 5% Significance Level | | | | | |
| 1794 | **Detected Data appear Approximate Normal at 5% Significance Level** | | | | | | | | | | | |
| 1795 | | | | | | | | | | | | |
| 1796 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 1797 | | | | | Mean | 418.2 | | | | Standard Error of Mean | | 59.76 |
| 1798 | | | | | SD | 623.9 | | | | 95% KM (BCA) UCL | | 522.4 |
| 1799 | | | | | 95% KM (t) UCL | 517.2 | | | | 95% KM (Percentile Bootstrap) UCL | | 523.5 |
| 1800 | | | | | 95% KM (z) UCL | 516.5 | | | | 95% KM Bootstrap t UCL | | 592.7 |

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| 1801 | | | | | 90% KM Chebyshev UCL | 597.5 | | | | | 95% KM Chebyshev UCL | 678.7 |
| 1802 | | | | | 97.5% KM Chebyshev UCL | 791.4 | | | | | 99% KM Chebyshev UCL | 1013 |
| 1803 | | | | | | | | | | | | |
| 1804 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 1805 | | | | | A-D Test Statistic | 0.324 | **Anderson-Darling GOF Test** | | | | | |
| 1806 | | | | | 5% A-D Critical Value | 0.731 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1807 | | | | | K-S Test Statistic | 0.156 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 1808 | | | | | 5% K-S Critical Value | 0.3 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1809 | | | | | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | |
| 1810 | | | | | | | | | | | | |
| 1811 | | | | | **Gamma Statistics on Detected Data Only** | | | | | | | |
| 1812 | | | | | k hat (MLE) | 1.322 | k star (bias corrected MLE) | | | | | 0.91 |
| 1813 | | | | | Theta hat (MLE) | 1457 | Theta star (bias corrected MLE) | | | | | 2117 |
| 1814 | | | | | nu hat (MLE) | 21.16 | nu star (bias corrected) | | | | | 14.56 |
| 1815 | | | | | MLE Mean (bias corrected) | 1926 | MLE Sd (bias corrected) | | | | | 2019 |
| 1816 | | | | | | | | | | | | |
| 1817 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 1818 | | | | | k hat (KM) | 0.449 | nu hat (KM) | | | | | 120.4 |
| 1819 | | | | | Approximate Chi Square Value (120.42, α) | 96.08 | Adjusted Chi Square Value (120.42, β) | | | | | 95.85 |
| 1820 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 524.1 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 525.4 |
| 1821 | | | | | | | | | | | | |
| 1822 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 1823 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 1824 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 1825 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 1826 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 1827 | | | | | Minimum | 0.01 | Mean | | | | | 141.4 |
| 1828 | | | | | Maximum | 6800 | Median | | | | | 0.01 |
| 1829 | | | | | SD | 683.4 | CV | | | | | 4.834 |
| 1830 | | | | | k hat (MLE) | 0.0965 | k star (bias corrected MLE) | | | | | 0.0993 |
| 1831 | | | | | Theta hat (MLE) | 1465 | Theta star (bias corrected MLE) | | | | | 1423 |
| 1832 | | | | | nu hat (MLE) | 25.87 | nu star (bias corrected) | | | | | 26.62 |
| 1833 | | | | | MLE Mean (bias corrected) | 141.4 | MLE Sd (bias corrected) | | | | | 448.6 |
| 1834 | | | | | | | Adjusted Level of Significance (β) | | | | | 0.0482 |
| 1835 | | | | | Approximate Chi Square Value (26.62, α) | 15.86 | Adjusted Chi Square Value (26.62, β) | | | | | 15.77 |
| 1836 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 237.4 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 238.7 |
| 1837 | | | | | | | | | | | | |
| 1838 | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | | |
| 1839 | | | | | Shapiro Wilk Test Statistic | 0.97 | **Shapiro Wilk GOF Test** | | | | | |
| 1840 | | | | | 5% Shapiro Wilk Critical Value | 0.818 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 1841 | | | | | Lilliefors Test Statistic | 0.108 | **Lilliefors GOF Test** | | | | | |
| 1842 | | | | | 5% Lilliefors Critical Value | 0.313 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 1843 | | | | | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | |
| 1844 | | | | | | | | | | | | |
| 1845 | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | |
| 1846 | | | | | Mean in Original Scale | 193.4 | Mean in Log Scale | | | | | 3.346 |
| 1847 | | | | | SD in Original Scale | 672.7 | SD in Log Scale | | | | | 1.998 |
| 1848 | | | | | 95% t UCL (assumes normality of ROS data) | 289.6 | 95% Percentile Bootstrap UCL | | | | | 296.9 |
| 1849 | | | | | 95% BCA Bootstrap UCL | 336.6 | 95% Bootstrap t UCL | | | | | 417.2 |
| 1850 | | | | | 95% H-UCL (Log ROS) | 368.4 | | | | | | |

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| 1851 | | | | | | | | | | | | |
| 1852 | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | | | | | |
| 1853 | | | | | KM Mean (logged) | 5.833 | | | 95% H-UCL (KM -Log) | | | 402.1 |
| 1854 | | | | | KM SD (logged) | 0.438 | | | 95% Critical H Value (KM-Log) | | | 1.792 |
| 1855 | | | | | KM Standard Error of Mean (logged) | 0.0505 | | | | | | |
| 1856 | | | | | | | | | | | | |
| 1857 | **DL/2 Statistics** | | | | | | | | | | | |
| 1858 | | | **DL/2 Normal** | | | | **DL/2 Log-Transformed** | | | | | |
| 1859 | | | | | Mean in Original Scale | 487 | | | Mean in Log Scale | | | 5.934 |
| 1860 | | | | | SD in Original Scale | 627.2 | | | SD in Log Scale | | | 0.652 |
| 1861 | | | | | 95% t UCL (Assumes normality) | 576.8 | | | 95% H-Stat UCL | | | 520.4 |
| 1862 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 1863 | | | | | | | | | | | | |
| 1864 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1865 | **Detected Data appear Approximate Normal Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1866 | | | | | | | | | | | | |
| 1867 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1868 | | | | | 95% KM (t) UCL | 517.2 | | | 95% KM (Percentile Bootstrap) UCL | | | 523.5 |
| 1869 | | | | | | | | | | | | |
| 1870 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1871 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 1872 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 1873 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1874 | | | | | | | | | | | | |
| 1875 | | | | | | | | | | | | |
| 1876 | **Potassium** | | | | | | | | | | | |
| 1877 | | | | | | | | | | | | |
| 1878 | **General Statistics** | | | | | | | | | | | |
| 1879 | | | | | Total Number of Observations | 136 | | | Number of Distinct Observations | | | 118 |
| 1880 | | | | | | | | | Number of Missing Observations | | | 0 |
| 1881 | | | | | Minimum | 4400 | | | Mean | | | 79486 |
| 1882 | | | | | Maximum | 258000 | | | Median | | | 62300 |
| 1883 | | | | | SD | 63478 | | | Std. Error of Mean | | | 5443 |
| 1884 | | | | | Coefficient of Variation | 0.799 | | | Skewness | | | 0.691 |
| 1885 | | | | | | | | | | | | |
| 1886 | **Normal GOF Test** | | | | | | | | | | | |
| 1887 | | | | | Shapiro Wilk Test Statistic | 0.893 | | | **Shapiro Wilk GOF Test** | | | |
| 1888 | | | | | 5% Shapiro Wilk P Value | 1.721E-14 | | | Data Not Normal at 5% Significance Level | | | |
| 1889 | | | | | Lilliefors Test Statistic | 0.129 | | | **Lilliefors GOF Test** | | | |
| 1890 | | | | | 5% Lilliefors Critical Value | 0.076 | | | Data Not Normal at 5% Significance Level | | | |
| 1891 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 1892 | | | | | | | | | | | | |
| 1893 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 1894 | | | **95% Normal UCL** | | | | **95% UCLs (Adjusted for Skewness)** | | | | | |
| 1895 | | | | | 95% Student's-t UCL | 88501 | | | 95% Adjusted-CLT UCL (Chen-1995) | | | 88784 |
| 1896 | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | | | 88555 |
| 1897 | | | | | | | | | | | | |
| 1898 | **Gamma GOF Test** | | | | | | | | | | | |
| 1899 | | | | | A-D Test Statistic | 2.021 | | | **Anderson-Darling Gamma GOF Test** | | | |
| 1900 | | | | | 5% A-D Critical Value | 0.776 | | | Data Not Gamma Distributed at 5% Significance Level | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1901 | | | | | K-S Test Statistic | 0.111 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 1902 | | | | | 5% K-S Critical Value | 0.0821 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1903 | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1904 | | | | | | | | | | | | |
| 1905 | **Gamma Statistics** | | | | | | | | | | | |
| 1906 | | | | | k hat (MLE) | 1.275 | k star (bias corrected MLE) | | | | | 1.252 |
| 1907 | | | | | Theta hat (MLE) | 62337 | Theta star (bias corrected MLE) | | | | | 63494 |
| 1908 | | | | | nu hat (MLE) | 346.8 | nu star (bias corrected) | | | | | 340.5 |
| 1909 | | | | | MLE Mean (bias corrected) | 79486 | MLE Sd (bias corrected) | | | | | 71041 |
| 1910 | | | | | | | Approximate Chi Square Value (0.05) | | | | | 298.8 |
| 1911 | | | | | Adjusted Level of Significance | 0.0482 | Adjusted Chi Square Value | | | | | 298.3 |
| 1912 | | | | | | | | | | | | |
| 1913 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 1914 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 90596 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 90722 |
| 1915 | | | | | | | | | | | | |
| 1916 | **Lognormal GOF Test** | | | | | | | | | | | |
| 1917 | | | | | Shapiro Wilk Test Statistic | 0.913 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 1918 | | | | | 5% Shapiro Wilk P Value | 1.013E-10 | Data Not Lognormal at 5% Significance Level | | | | | |
| 1919 | | | | | Lilliefors Test Statistic | 0.131 | **Lilliefors Lognormal GOF Test** | | | | | |
| 1920 | | | | | 5% Lilliefors Critical Value | 0.076 | Data Not Lognormal at 5% Significance Level | | | | | |
| 1921 | **Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1922 | | | | | | | | | | | | |
| 1923 | **Lognormal Statistics** | | | | | | | | | | | |
| 1924 | | | | | Minimum of Logged Data | 8.389 | Mean of logged Data | | | | | 10.84 |
| 1925 | | | | | Maximum of Logged Data | 12.46 | SD of logged Data | | | | | 1.057 |
| 1926 | | | | | | | | | | | | |
| 1927 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 1928 | | | | | 95% H-UCL | 109698 | 90% Chebyshev (MVUE) UCL | | | | | 118483 |
| 1929 | | | | | 95% Chebyshev (MVUE) UCL | 131905 | 97.5% Chebyshev (MVUE) UCL | | | | | 150535 |
| 1930 | | | | | 99% Chebyshev (MVUE) UCL | 187129 | | | | | | |
| 1931 | | | | | | | | | | | | |
| 1932 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1933 | **Data do not follow a Discernible Distribution (0.05)** | | | | | | | | | | | |
| 1934 | | | | | | | | | | | | |
| 1935 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 1936 | | | | | 95% CLT UCL | 88439 | 95% Jackknife UCL | | | | | 88501 |
| 1937 | | | | | 95% Standard Bootstrap UCL | 88532 | 95% Bootstrap-t UCL | | | | | 88648 |
| 1938 | | | | | 95% Hall's Bootstrap UCL | 89038 | 95% Percentile Bootstrap UCL | | | | | 88760 |
| 1939 | | | | | 95% BCA Bootstrap UCL | 88597 | | | | | | |
| 1940 | | | | | 90% Chebyshev(Mean, Sd) UCL | 95815 | 95% Chebyshev(Mean, Sd) UCL | | | | | 103212 |
| 1941 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 113479 | 99% Chebyshev(Mean, Sd) UCL | | | | | 133645 |
| 1942 | | | | | | | | | | | | |
| 1943 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1944 | | | | | 95% Chebyshev (Mean, Sd) UCL | 103212 | | | | | | |
| 1945 | | | | | | | | | | | | |
| 1946 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1947 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 1948 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |
| 1949 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1950 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1951 | Rhenium | | | | | | | | | | | |
| 1952 | | | | | | | | | | | | |
| 1953 | General Statistics | | | | | | | | | | | |
| 1954 | Total Number of Observations | | | | | 136 | Number of Distinct Observations | | | | | 27 |
| 1955 | Number of Detects | | | | | 28 | Number of Non-Detects | | | | | 108 |
| 1956 | Number of Distinct Detects | | | | | 25 | Number of Distinct Non-Detects | | | | | 3 |
| 1957 | Minimum Detect | | | | | 0.0058 | Minimum Non-Detect | | | | | 0.005 |
| 1958 | Maximum Detect | | | | | 0.109 | Maximum Non-Detect | | | | | 0.5 |
| 1959 | Variance Detects | | | | | 0.00136 | Percent Non-Detects | | | | | 79.41% |
| 1960 | Mean Detects | | | | | 0.0362 | SD Detects | | | | | 0.0369 |
| 1961 | Median Detects | | | | | 0.0148 | CV Detects | | | | | 1.019 |
| 1962 | Skewness Detects | | | | | 1.067 | Kurtosis Detects | | | | | -0.667 |
| 1963 | Mean of Logged Detects | | | | | -3.785 | SD of Logged Detects | | | | | 0.948 |
| 1964 | | | | | | | | | | | | |
| 1965 | Normal GOF Test on Detects Only | | | | | | | | | | | |
| 1966 | Shapiro Wilk Test Statistic | | | | | 0.704 | Shapiro Wilk GOF Test | | | | | |
| 1967 | 5% Shapiro Wilk Critical Value | | | | | 0.924 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1968 | Lilliefors Test Statistic | | | | | 0.339 | Lilliefors GOF Test | | | | | |
| 1969 | 5% Lilliefors Critical Value | | | | | 0.167 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1970 | Detected Data Not Normal at 5% Significance Level | | | | | | | | | | | |
| 1971 | | | | | | | | | | | | |
| 1972 | Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs | | | | | | | | | | | |
| 1973 | Mean | | | | | 0.0259 | Standard Error of Mean | | | | | 0.00507 |
| 1974 | SD | | | | | 0.0325 | 95% KM (BCA) UCL | | | | | 0.0347 |
| 1975 | 95% KM (t) UCL | | | | | 0.0343 | 95% KM (Percentile Bootstrap) UCL | | | | | 0.0346 |
| 1976 | 95% KM (z) UCL | | | | | 0.0342 | 95% KM Bootstrap t UCL | | | | | 0.0362 |
| 1977 | 90% KM Chebyshev UCL | | | | | 0.0411 | 95% KM Chebyshev UCL | | | | | 0.048 |
| 1978 | 97.5% KM Chebyshev UCL | | | | | 0.0575 | 99% KM Chebyshev UCL | | | | | 0.0763 |
| 1979 | | | | | | | | | | | | |
| 1980 | Gamma GOF Tests on Detected Observations Only | | | | | | | | | | | |
| 1981 | A-D Test Statistic | | | | | 2.914 | Anderson-Darling GOF Test | | | | | |
| 1982 | 5% A-D Critical Value | | | | | 0.769 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1983 | K-S Test Statistic | | | | | 0.271 | Kolmogrov-Smirnoff GOF | | | | | |
| 1984 | 5% K-S Critical Value | | | | | 0.169 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1985 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | | | | | | | |
| 1986 | | | | | | | | | | | | |
| 1987 | Gamma Statistics on Detected Data Only | | | | | | | | | | | |
| 1988 | k hat (MLE) | | | | | 1.21 | k star (bias corrected MLE) | | | | | 1.104 |
| 1989 | Theta hat (MLE) | | | | | 0.03 | Theta star (bias corrected MLE) | | | | | 0.0328 |
| 1990 | nu hat (MLE) | | | | | 67.73 | nu star (bias corrected) | | | | | 61.81 |
| 1991 | MLE Mean (bias corrected) | | | | | 0.0362 | MLE Sd (bias corrected) | | | | | 0.0345 |
| 1992 | | | | | | | | | | | | |
| 1993 | Gamma Kaplan-Meier (KM) Statistics | | | | | | | | | | | |
| 1994 | k hat (KM) | | | | | 0.635 | nu hat (KM) | | | | | 172.7 |
| 1995 | Approximate Chi Square Value (172.75, α) | | | | | 143.4 | Adjusted Chi Square Value (172.75, β) | | | | | 143.1 |
| 1996 | 95% Gamma Approximate KM-UCL (use when n>=50) | | | | | 0.0312 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 0.0313 |
| 1997 | | | | | | | | | | | | |
| 1998 | Gamma ROS Statistics using Imputed Non-Detects | | | | | | | | | | | |
| 1999 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 2000 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2001 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 2002 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 2003 | | | | | Minimum | 0.0058 | | | | | Mean | 0.0282 |
| 2004 | | | | | Maximum | 0.159 | | | | | Median | 0.0108 |
| 2005 | | | | | SD | 0.0311 | | | | | CV | 1.102 |
| 2006 | | | | | k hat (MLE) | 1.333 | | | | | k star (bias corrected MLE) | 1.308 |
| 2007 | | | | | Theta hat (MLE) | 0.0212 | | | | | Theta star (bias corrected MLE) | 0.0216 |
| 2008 | | | | | nu hat (MLE) | 362.6 | | | | | nu star (bias corrected) | 355.9 |
| 2009 | | | | | MLE Mean (bias corrected) | 0.0282 | | | | | MLE Sd (bias corrected) | 0.0247 |
| 2010 | | | | | | | | | | | Adjusted Level of Significance (β) | 0.0482 |
| 2011 | | | | | Approximate Chi Square Value (355.90, α) | 313.2 | | | | | Adjusted Chi Square Value (355.90, β) | 312.8 |
| 2012 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.0321 | | | | | 95% Gamma Adjusted UCL (use when n<50) | 0.0321 |
| 2013 | | | | | | | | | | | | |
| 2014 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 2015 | | | | | Shapiro Wilk Test Statistic | 0.817 | **Shapiro Wilk GOF Test** | | | | | |
| 2016 | | | | | 5% Shapiro Wilk Critical Value | 0.924 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 2017 | | | | | Lilliefors Test Statistic | 0.227 | **Lilliefors GOF Test** | | | | | |
| 2018 | | | | | 5% Lilliefors Critical Value | 0.167 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 2019 | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 2020 | | | | | | | | | | | | |
| 2021 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 2022 | | | | | Mean in Original Scale | 0.0246 | | | | | Mean in Log Scale | -4.484 |
| 2023 | | | | | SD in Original Scale | 0.036 | | | | | SD in Log Scale | 1.279 |
| 2024 | | | | | 95% t UCL (assumes normality of ROS data) | 0.0297 | | | | | 95% Percentile Bootstrap UCL | 0.0299 |
| 2025 | | | | | 95% BCA Bootstrap UCL | 0.0308 | | | | | 95% Bootstrap t UCL | 0.0308 |
| 2026 | | | | | 95% H-UCL (Log ROS) | 0.0335 | | | | | | |
| 2027 | | | | | | | | | | | | |
| 2028 | **DL/2 Statistics** | | | | | | | | | | | |
| 2029 | | | | | **DL/2 Normal** | | **DL/2 Log-Transformed** | | | | | |
| 2030 | | | | | Mean in Original Scale | 0.179 | | | | | Mean in Log Scale | -2.317 |
| 2031 | | | | | SD in Original Scale | 0.107 | | | | | SD in Log Scale | 1.498 |
| 2032 | | | | | 95% t UCL (Assumes normality) | 0.194 | | | | | 95% H-Stat UCL | 0.429 |
| 2033 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 2034 | | | | | | | | | | | | |
| 2035 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 2036 | **Data do not follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 2037 | | | | | | | | | | | | |
| 2038 | **Suggested UCL to Use** | | | | | | | | | | | |
| 2039 | | | | | 95% KM (t) UCL | 0.0343 | | | | | 95% KM (% Bootstrap) UCL | 0.0346 |
| 2040 | | | | | | | | | | | | |
| 2041 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 2042 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 2043 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 2044 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 2045 | | | | | | | | | | | | |
| 2046 | **Rubidium** | | | | | | | | | | | |
| 2047 | | | | | | | | | | | | |
| 2048 | **General Statistics** | | | | | | | | | | | |
| 2049 | | | | | Total Number of Observations | 136 | | | | | Number of Distinct Observations | 125 |
| 2050 | | | | | Number of Detects | 127 | | | | | Number of Non-Detects | 9 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2051 | | | | | Number of Distinct Detects | 125 | | | | | Number of Distinct Non-Detects | 1 |
| 2052 | | | | | Minimum Detect | 1.69 | | | | | Minimum Non-Detect | 5 |
| 2053 | | | | | Maximum Detect | 74.9 | | | | | Maximum Non-Detect | 5 |
| 2054 | | | | | Variance Detects | 328.5 | | | | | Percent Non-Detects | 6.618% |
| 2055 | | | | | Mean Detects | 22.4 | | | | | SD Detects | 18.12 |
| 2056 | | | | | Median Detects | 18.2 | | | | | CV Detects | 0.809 |
| 2057 | | | | | Skewness Detects | 0.809 | | | | | Kurtosis Detects | -0.0326 |
| 2058 | | | | | Mean of Logged Detects | 2.668 | | | | | SD of Logged Detects | 1.052 |
| 2059 | | | | | | | | | | | | |
| 2060 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 2061 | | | | | Shapiro Wilk Test Statistic | 0.892 | **Normal GOF Test on Detected Observations Only** | | | | | |
| 2062 | | | | | 5% Shapiro Wilk P Value | 1.701E-13 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 2063 | | | | | Lilliefors Test Statistic | 0.127 | **Lilliefors GOF Test** | | | | | |
| 2064 | | | | | 5% Lilliefors Critical Value | 0.0786 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 2065 | | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | | |
| 2066 | | | | | | | | | | | | |
| 2067 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |
| 2068 | | | | | Mean | 21.13 | | | | | Standard Error of Mean | 1.558 |
| 2069 | | | | | SD | 18.09 | | | | | 95% KM (BCA) UCL | 23.78 |
| 2070 | | | | | 95% KM (t) UCL | 23.71 | | | | | 95% KM (Percentile Bootstrap) UCL | 23.74 |
| 2071 | | | | | 95% KM (z) UCL | 23.69 | | | | | 95% KM Bootstrap t UCL | 23.88 |
| 2072 | | | | | 90% KM Chebyshev UCL | 25.8 | | | | | 95% KM Chebyshev UCL | 27.92 |
| 2073 | | | | | 97.5% KM Chebyshev UCL | 30.85 | | | | | 99% KM Chebyshev UCL | 36.63 |
| 2074 | | | | | | | | | | | | |
| 2075 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 2076 | | | | | A-D Test Statistic | 1.878 | **Anderson-Darling GOF Test** | | | | | |
| 2077 | | | | | 5% A-D Critical Value | 0.776 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 2078 | | | | | K-S Test Statistic | 0.101 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 2079 | | | | | 5% K-S Critical Value | 0.0844 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 2080 | | | | | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | |
| 2081 | | | | | | | | | | | | |
| 2082 | | | | | **Gamma Statistics on Detected Data Only** | | | | | | | |
| 2083 | | | | | k hat (MLE) | 1.275 | | | | | k star (bias corrected MLE) | 1.25 |
| 2084 | | | | | Theta hat (MLE) | 17.57 | | | | | Theta star (bias corrected MLE) | 17.92 |
| 2085 | | | | | nu hat (MLE) | 323.8 | | | | | nu star (bias corrected) | 317.5 |
| 2086 | | | | | MLE Mean (bias corrected) | 22.4 | | | | | MLE Sd (bias corrected) | 20.04 |
| 2087 | | | | | | | | | | | | |
| 2088 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 2089 | | | | | k hat (KM) | 1.363 | | | | | nu hat (KM) | 370.8 |
| 2090 | | | | | Approximate Chi Square Value (370.75, α) | 327.1 | | | | | Adjusted Chi Square Value (370.75, β) | 326.7 |
| 2091 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 23.94 | | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | 23.97 |
| 2092 | | | | | | | | | | | | |
| 2093 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 2094 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 2095 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 2096 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 2097 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 2098 | | | | | Minimum | 1.428 | | | | | Mean | 21.22 |
| 2099 | | | | | Maximum | 74.9 | | | | | Median | 16.75 |
| 2100 | | | | | SD | 18.08 | | | | | CV | 0.852 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2101 | | | | | k hat (MLE) | 1.201 | | | | k star (bias corrected MLE) | | 1.179 |
| 2102 | | | | | Theta hat (MLE) | 17.67 | | | | Theta star (bias corrected MLE) | | 18 |
| 2103 | | | | | nu hat (MLE) | 326.6 | | | | nu star (bias corrected) | | 320.7 |
| 2104 | | | | | MLE Mean (bias corrected) | 21.22 | | | | MLE Sd (bias corrected) | | 19.54 |
| 2105 | | | | | | | | | | Adjusted Level of Significance (β) | | 0.0482 |
| 2106 | | | | | Approximate Chi Square Value (320.73, α) | 280.2 | | | | Adjusted Chi Square Value (320.73, β) | | 279.8 |
| 2107 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 24.29 | | | | 95% Gamma Adjusted UCL (use when n<50) | | 24.32 |
| 2108 | | | | | | | | | | | | |
| 2109 | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | | |
| 2110 | | | | | Lilliefors Test Statistic | 0.128 | | | | **Lilliefors GOF Test** | | |
| 2111 | | | | | 5% Lilliefors Critical Value | 0.0786 | | | | Detected Data Not Lognormal at 5% Significance Level | | |
| 2112 | | | | | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | |
| 2113 | | | | | | | | | | | | |
| 2114 | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | |
| 2115 | | | | | Mean in Original Scale | 21.18 | | | | Mean in Log Scale | | 2.577 |
| 2116 | | | | | SD in Original Scale | 18.11 | | | | SD in Log Scale | | 1.078 |
| 2117 | | | | | 95% t UCL (assumes normality of ROS data) | 23.75 | | | | 95% Percentile Bootstrap UCL | | 23.64 |
| 2118 | | | | | 95% BCA Bootstrap UCL | 24.03 | | | | 95% Bootstrap t UCL | | 23.9 |
| 2119 | | | | | 95% H-UCL (Log ROS) | 29.04 | | | | | | |
| 2120 | | | | | | | | | | | | |
| 2121 | | | | | **DL/2 Statistics** | | | | | | | |
| 2122 | | | | | **DL/2 Normal** | | | | | **DL/2 Log-Transformed** | | |
| 2123 | | | | | Mean in Original Scale | 21.08 | | | | Mean in Log Scale | | 2.552 |
| 2124 | | | | | SD in Original Scale | 18.2 | | | | SD in Log Scale | | 1.106 |
| 2125 | | | | | 95% t UCL (Assumes normality) | 23.67 | | | | 95% H-Stat UCL | | 29.45 |
| 2126 | | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | |
| 2127 | | | | | | | | | | | | |
| 2128 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 2129 | | | | | **Data do not follow a Discernible Distribution at 5% Significance Level** | | | | | | | |
| 2130 | | | | | | | | | | | | |
| 2131 | | | | | **Suggested UCL to Use** | | | | | | | |
| 2132 | | | | | 95% KM (Chebyshev) UCL | 27.92 | | | | | | |
| 2133 | | | | | | | | | | | | |
| 2134 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 2135 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 2136 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 2137 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 2138 | | | | | | | | | | | | |
| 2139 | **Selenium** | | | | | | | | | | | |
| 2140 | | | | | | | | | | | | |
| 2141 | | | | | **General Statistics** | | | | | | | |
| 2142 | | | | | Total Number of Observations | 136 | | | | Number of Distinct Observations | | 20 |
| 2143 | | | | | Number of Detects | 14 | | | | Number of Non-Detects | | 122 |
| 2144 | | | | | Number of Distinct Detects | 14 | | | | Number of Distinct Non-Detects | | 6 |
| 2145 | | | | | Minimum Detect | 0.24 | | | | Minimum Non-Detect | | 0.2 |
| 2146 | | | | | Maximum Detect | 8.3 | | | | Maximum Non-Detect | | 8 |
| 2147 | | | | | Variance Detects | 4.367 | | | | Percent Non-Detects | | 89.71% |
| 2148 | | | | | Mean Detects | 1.163 | | | | SD Detects | | 2.09 |
| 2149 | | | | | Median Detects | 0.565 | | | | CV Detects | | 1.797 |
| 2150 | | | | | Skewness Detects | 3.533 | | | | Kurtosis Detects | | 12.83 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2151 | | | | | Mean of Logged Detects | -0.459 | | | | | SD of Logged Detects | 0.935 |
| 2152 | | | | | | | | | | | | |
| 2153 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 2154 | | | | | Shapiro Wilk Test Statistic | 0.448 | **Shapiro Wilk GOF Test** | | | | | |
| 2155 | | | | | 5% Shapiro Wilk Critical Value | 0.874 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 2156 | | | | | Lilliefors Test Statistic | 0.365 | **Lilliefors GOF Test** | | | | | |
| 2157 | | | | | 5% Lilliefors Critical Value | 0.237 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 2158 | | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | | |
| 2159 | | | | | | | | | | | | |
| 2160 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |
| 2161 | | | | | Mean | 0.39 | Standard Error of Mean | | | | | 0.0752 |
| 2162 | | | | | SD | 0.736 | 95% KM (BCA) UCL | | | | | 0.539 |
| 2163 | | | | | 95% KM (t) UCL | 0.515 | 95% KM (Percentile Bootstrap) UCL | | | | | 0.518 |
| 2164 | | | | | 95% KM (z) UCL | 0.514 | 95% KM Bootstrap t UCL | | | | | 0.641 |
| 2165 | | | | | 90% KM Chebyshev UCL | 0.616 | 95% KM Chebyshev UCL | | | | | 0.718 |
| 2166 | | | | | 97.5% KM Chebyshev UCL | 0.86 | 99% KM Chebyshev UCL | | | | | 1.138 |
| 2167 | | | | | | | | | | | | |
| 2168 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 2169 | | | | | A-D Test Statistic | 1.562 | **Anderson-Darling GOF Test** | | | | | |
| 2170 | | | | | 5% A-D Critical Value | 0.762 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 2171 | | | | | K-S Test Statistic | 0.268 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 2172 | | | | | 5% K-S Critical Value | 0.236 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 2173 | | | | | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | |
| 2174 | | | | | | | | | | | | |
| 2175 | | | | | **Gamma Statistics on Detected Data Only** | | | | | | | |
| 2176 | | | | | k hat (MLE) | 0.952 | k star (bias corrected MLE) | | | | | 0.796 |
| 2177 | | | | | Theta hat (MLE) | 1.221 | Theta star (bias corrected MLE) | | | | | 1.461 |
| 2178 | | | | | nu hat (MLE) | 26.67 | nu star (bias corrected) | | | | | 22.29 |
| 2179 | | | | | MLE Mean (bias corrected) | 1.163 | MLE Sd (bias corrected) | | | | | 1.303 |
| 2180 | | | | | | | | | | | | |
| 2181 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 2182 | | | | | k hat (KM) | 0.281 | nu hat (KM) | | | | | 76.38 |
| 2183 | | | | | Approximate Chi Square Value (76.38, α) | 57.25 | Adjusted Chi Square Value (76.38, β) | | | | | 57.07 |
| 2184 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.521 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 0.522 |
| 2185 | | | | | | | | | | | | |
| 2186 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 2187 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 2188 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 2189 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 2190 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 2191 | | | | | Minimum | 0.01 | Mean | | | | | 0.302 |
| 2192 | | | | | Maximum | 8.3 | Median | | | | | 0.01 |
| 2193 | | | | | SD | 0.917 | CV | | | | | 3.035 |
| 2194 | | | | | k hat (MLE) | 0.292 | k star (bias corrected MLE) | | | | | 0.29 |
| 2195 | | | | | Theta hat (MLE) | 1.036 | Theta star (bias corrected MLE) | | | | | 1.041 |
| 2196 | | | | | nu hat (MLE) | 79.35 | nu star (bias corrected) | | | | | 78.94 |
| 2197 | | | | | MLE Mean (bias corrected) | 0.302 | MLE Sd (bias corrected) | | | | | 0.561 |
| 2198 | | | | | | | Adjusted Level of Significance (β) | | | | | 0.0482 |
| 2199 | | | | | Approximate Chi Square Value (78.94, α) | 59.47 | Adjusted Chi Square Value (78.94, β) | | | | | 59.29 |
| 2200 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.401 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 0.402 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2201 | | | | | | | | | | | | |
| 2202 | | | | | | Lognormal GOF Test on Detected Observations Only | | | | | | |
| 2203 | | | | | Shapiro Wilk Test Statistic | 0.846 | Shapiro Wilk GOF Test | | | | | |
| 2204 | | | | | 5% Shapiro Wilk Critical Value | 0.874 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 2205 | | | | | Lilliefors Test Statistic | 0.189 | Lilliefors GOF Test | | | | | |
| 2206 | | | | | 5% Lilliefors Critical Value | 0.237 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 2207 | | | | | Detected Data appear Approximate Lognormal at 5% Significance Level | | | | | | | |
| 2208 | | | | | | | | | | | | |
| 2209 | | | | | Lognormal ROS Statistics Using Imputed Non-Detects | | | | | | | |
| 2210 | | | | | Mean in Original Scale | 0.316 | Mean in Log Scale | | | | | -2.119 |
| 2211 | | | | | SD in Original Scale | 0.784 | SD in Log Scale | | | | | 1.359 |
| 2212 | | | | | 95% t UCL (assumes normality of ROS data) | 0.428 | 95% Percentile Bootstrap UCL | | | | | 0.436 |
| 2213 | | | | | 95% BCA Bootstrap UCL | 0.5 | 95% Bootstrap t UCL | | | | | 0.551 |
| 2214 | | | | | 95% H-UCL (Log ROS) | 0.408 | | | | | | |
| 2215 | | | | | | | | | | | | |
| 2216 | | | | | UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed | | | | | | | |
| 2217 | | | | | KM Mean (logged) | -1.268 | 95% H-UCL (KM -Log) | | | | | 0.372 |
| 2218 | | | | | KM SD (logged) | 0.603 | 95% Critical H Value (KM-Log) | | | | | 1.888 |
| 2219 | | | | | KM Standard Error of Mean (logged) | 0.0889 | | | | | | |
| 2220 | | | | | | | | | | | | |
| 2221 | | | | | DL/2 Statistics | | | | | | | |
| 2222 | | | | | DL/2 Normal | | DL/2 Log-Transformed | | | | | |
| 2223 | | | | | Mean in Original Scale | 0.89 | Mean in Log Scale | | | | | -0.43 |
| 2224 | | | | | SD in Original Scale | 0.827 | SD in Log Scale | | | | | 0.878 |
| 2225 | | | | | 95% t UCL (Assumes normality) | 1.008 | 95% H-Stat UCL | | | | | 1.12 |
| 2226 | | | | | DL/2 is not a recommended method, provided for comparisons and historical reasons | | | | | | | |
| 2227 | | | | | | | | | | | | |
| 2228 | | | | | Nonparametric Distribution Free UCL Statistics | | | | | | | |
| 2229 | | | | | Detected Data appear Approximate Lognormal Distributed at 5% Significance Level | | | | | | | |
| 2230 | | | | | | | | | | | | |
| 2231 | | | | | Suggested UCL to Use | | | | | | | |
| 2232 | | | | | 95% KM (t) UCL | 0.515 | | | | | 95% KM (% Bootstrap) UCL | 0.518 |
| 2233 | | | | | | | | | | | | |
| 2234 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 2235 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 2236 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 2237 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 2238 | | | | | | | | | | | | |
| 2239 | | | | | | | | | | | | |
| 2240 | Silicon | | | | | | | | | | | |
| 2241 | | | | | | | | | | | | |
| 2242 | | | | | General Statistics | | | | | | | |
| 2243 | | | | | Total Number of Observations | 136 | Number of Distinct Observations | | | | | 122 |
| 2244 | | | | | | | Number of Missing Observations | | | | | 0 |
| 2245 | | | | | Minimum | 1670 | Mean | | | | | 5107 |
| 2246 | | | | | Maximum | 9850 | Median | | | | | 4390 |
| 2247 | | | | | SD | 2344 | Std. Error of Mean | | | | | 201 |
| 2248 | | | | | Coefficient of Variation | 0.459 | Skewness | | | | | 0.491 |
| 2249 | | | | | | | | | | | | |
| 2250 | | | | | Normal GOF Test | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2251 | | | | | Shapiro Wilk Test Statistic | 0.905 | **Shapiro Wilk GOF Test** | | | | | |
| 2252 | | | | | 5% Shapiro Wilk P Value | 3.666E-12 | Data Not Normal at 5% Significance Level | | | | | |
| 2253 | | | | | Lilliefors Test Statistic | 0.127 | **Lilliefors GOF Test** | | | | | |
| 2254 | | | | | 5% Lilliefors Critical Value | 0.076 | Data Not Normal at 5% Significance Level | | | | | |
| 2255 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 2256 | | | | | | | | | | | | |
| 2257 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 2258 | **95% Normal UCL** | | | | | | **95% UCLs (Adjusted for Skewness)** | | | | | |
| 2259 | | | | | 95% Student's-t UCL | 5440 | | | | 95% Adjusted-CLT UCL (Chen-1995) | | 5446 |
| 2260 | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | | 5441 |
| 2261 | | | | | | | | | | | | |
| 2262 | **Gamma GOF Test** | | | | | | | | | | | |
| 2263 | | | | | A-D Test Statistic | 1.65 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 2264 | | | | | 5% A-D Critical Value | 0.755 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 2265 | | | | | K-S Test Statistic | 0.0765 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 2266 | | | | | 5% K-S Critical Value | 0.0803 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 2267 | **Detected data follow Appr. Gamma Distribution at 5% Significance Level** | | | | | | | | | | | |
| 2268 | | | | | | | | | | | | |
| 2269 | **Gamma Statistics** | | | | | | | | | | | |
| 2270 | | | | | k hat (MLE) | 4.739 | | | | k star (bias corrected MLE) | | 4.639 |
| 2271 | | | | | Theta hat (MLE) | 1078 | | | | Theta star (bias corrected MLE) | | 1101 |
| 2272 | | | | | nu hat (MLE) | 1289 | | | | nu star (bias corrected) | | 1262 |
| 2273 | | | | | MLE Mean (bias corrected) | 5107 | | | | MLE Sd (bias corrected) | | 2371 |
| 2274 | | | | | | | | | | Approximate Chi Square Value (0.05) | | 1180 |
| 2275 | | | | | Adjusted Level of Significance | 0.0482 | | | | Adjusted Chi Square Value | | 1180 |
| 2276 | | | | | | | | | | | | |
| 2277 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 2278 | | | | | 95% Approximate Gamma UCL (use when n>=50) | 5459 | | | | 95% Adjusted Gamma UCL (use when n<50) | | 5463 |
| 2279 | | | | | | | | | | | | |
| 2280 | **Lognormal GOF Test** | | | | | | | | | | | |
| 2281 | | | | | Shapiro Wilk Test Statistic | 0.937 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 2282 | | | | | 5% Shapiro Wilk P Value | 2.2891E-6 | Data Not Lognormal at 5% Significance Level | | | | | |
| 2283 | | | | | Lilliefors Test Statistic | 0.0788 | **Lilliefors Lognormal GOF Test** | | | | | |
| 2284 | | | | | 5% Lilliefors Critical Value | 0.076 | Data Not Lognormal at 5% Significance Level | | | | | |
| 2285 | **Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 2286 | | | | | | | | | | | | |
| 2287 | **Lognormal Statistics** | | | | | | | | | | | |
| 2288 | | | | | Minimum of Logged Data | 7.421 | | | | Mean of logged Data | | 8.429 |
| 2289 | | | | | Maximum of Logged Data | 9.195 | | | | SD of logged Data | | 0.477 |
| 2290 | | | | | | | | | | | | |
| 2291 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 2292 | | | | | 95% H-UCL | 5528 | | | | 90% Chebyshev (MVUE) UCL | | 5789 |
| 2293 | | | | | 95% Chebyshev (MVUE) UCL | 6089 | | | | 97.5% Chebyshev (MVUE) UCL | | 6505 |
| 2294 | | | | | 99% Chebyshev (MVUE) UCL | 7323 | | | | | | |
| 2295 | | | | | | | | | | | | |
| 2296 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 2297 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 2298 | | | | | | | | | | | | |
| 2299 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 2300 | | | | | 95% CLT UCL | 5437 | | | | 95% Jackknife UCL | | 5440 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2301 | | | | | 95% Standard Bootstrap UCL | 5441 | | | | | 95% Bootstrap-t UCL | 5442 |
| 2302 | | | | | 95% Hall's Bootstrap UCL | 5430 | | | | | 95% Percentile Bootstrap UCL | 5432 |
| 2303 | | | | | 95% BCA Bootstrap UCL | 5441 | | | | | | |
| 2304 | | | | | 90% Chebyshev(Mean, Sd) UCL | 5710 | | | | | 95% Chebyshev(Mean, Sd) UCL | 5983 |
| 2305 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 6362 | | | | | 99% Chebyshev(Mean, Sd) UCL | 7106 |
| 2306 | | | | | | | | | | | | |
| 2307 | | | | | **Suggested UCL to Use** | | | | | | | |
| 2308 | | | | | 95% Approximate Gamma UCL | 5459 | | | | | | |
| 2309 | | | | | | | | | | | | |
| 2310 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 2311 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | |
| 2312 | | | | | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | |
| 2313 | | | | | For additional insight the user may want to consult a statistician. | | | | | | | |
| 2314 | | | | | | | | | | | | |
| 2315 | **Silver** | | | | | | | | | | | |
| 2316 | | | | | | | | | | | | |
| 2317 | | | | | **General Statistics** | | | | | | | |
| 2318 | | | | | Total Number of Observations | 136 | | | | | Number of Distinct Observations | 5 |
| 2319 | | | | | Number of Detects | 1 | | | | | Number of Non-Detects | 135 |
| 2320 | | | | | Number of Distinct Detects | 1 | | | | | Number of Distinct Non-Detects | 4 |
| 2321 | | | | | | | | | | | | |
| 2322 | | | | | **Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!** | | | | | | | |
| 2323 | | | | | **It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).** | | | | | | | |
| 2324 | | | | | | | | | | | | |
| 2325 | | | | | **The data set for variable Silver was not processed!** | | | | | | | |
| 2326 | | | | | | | | | | | | |
| 2327 | | | | | | | | | | | | |
| 2328 | | | | | | | | | | | | |
| 2329 | **Sodium** | | | | | | | | | | | |
| 2330 | | | | | | | | | | | | |
| 2331 | | | | | **General Statistics** | | | | | | | |
| 2332 | | | | | Total Number of Observations | 136 | | | | | Number of Distinct Observations | 128 |
| 2333 | | | | | | | | | | | Number of Missing Observations | 0 |
| 2334 | | | | | Minimum | 142000 | | | | | Mean | 2332449 |
| 2335 | | | | | Maximum | 7390000 | | | | | Median | 1745000 |
| 2336 | | | | | SD | 1849757 | | | | | Std. Error of Mean | 158615 |
| 2337 | | | | | Coefficient of Variation | 0.793 | | | | | Skewness | 0.62 |
| 2338 | | | | | | | | | | | | |
| 2339 | | | | | **Normal GOF Test** | | | | | | | |
| 2340 | | | | | Shapiro Wilk Test Statistic | 0.883 | | | | | **Shapiro Wilk GOF Test** | |
| 2341 | | | | | 5% Shapiro Wilk P Value | 1.110E-16 | | | | | Data Not Normal at 5% Significance Level | |
| 2342 | | | | | Lilliefors Test Statistic | 0.164 | | | | | **Lilliefors GOF Test** | |
| 2343 | | | | | 5% Lilliefors Critical Value | 0.076 | | | | | Data Not Normal at 5% Significance Level | |
| 2344 | | | | | **Data Not Normal at 5% Significance Level** | | | | | | | |
| 2345 | | | | | | | | | | | | |
| 2346 | | | | | **Assuming Normal Distribution** | | | | | | | |
| 2347 | | | | | **95% Normal UCL** | | | | | | **95% UCLs (Adjusted for Skewness)** | |
| 2348 | | | | | 95% Student's-t UCL | 2595150 | | | | | 95% Adjusted-CLT UCL (Chen-1995) | 2602365 |
| 2349 | | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | 2596557 |
| 2350 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2351 | **Gamma GOF Test** | | | | | | | | | | | |
| 2352 | | | | | A-D Test Statistic | 2.203 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 2353 | | | | | 5% A-D Critical Value | 0.775 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 2354 | | | | | K-S Test Statistic | 0.111 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 2355 | | | | | 5% K-S Critical Value | 0.082 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 2356 | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 2357 | | | | | | | | | | | | |
| 2358 | **Gamma Statistics** | | | | | | | | | | | |
| 2359 | | | | | k hat (MLE) | 1.328 | k star (bias corrected MLE) | | | | | 1.304 |
| 2360 | | | | | Theta hat (MLE) | 1756239 | Theta star (bias corrected MLE) | | | | | 1789101 |
| 2361 | | | | | nu hat (MLE) | 361.2 | nu star (bias corrected) | | | | | 354.6 |
| 2362 | | | | | MLE Mean (bias corrected) | 2332449 | MLE Sd (bias corrected) | | | | | 2042789 |
| 2363 | | | | | | | Approximate Chi Square Value (0.05) | | | | | 312 |
| 2364 | | | | | Adjusted Level of Significance | 0.0482 | Adjusted Chi Square Value | | | | | 311.5 |
| 2365 | | | | | | | | | | | | |
| 2366 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 2367 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 2651234 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 2654843 |
| 2368 | | | | | | | | | | | | |
| 2369 | **Lognormal GOF Test** | | | | | | | | | | | |
| 2370 | | | | | Shapiro Wilk Test Statistic | 0.921 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 2371 | | | | | 5% Shapiro Wilk P Value | 3.7539E-9 | Data Not Lognormal at 5% Significance Level | | | | | |
| 2372 | | | | | Lilliefors Test Statistic | 0.115 | **Lilliefors Lognormal GOF Test** | | | | | |
| 2373 | | | | | 5% Lilliefors Critical Value | 0.076 | Data Not Lognormal at 5% Significance Level | | | | | |
| 2374 | **Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 2375 | | | | | | | | | | | | |
| 2376 | **Lognormal Statistics** | | | | | | | | | | | |
| 2377 | | | | | Minimum of Logged Data | 11.86 | Mean of logged Data | | | | | 14.24 |
| 2378 | | | | | Maximum of Logged Data | 15.82 | SD of logged Data | | | | | 1.021 |
| 2379 | | | | | | | | | | | | |
| 2380 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 2381 | | | | | 95% H-UCL | 3130692 | 90% Chebyshev (MVUE) UCL | | | | | 3378761 |
| 2382 | | | | | 95% Chebyshev (MVUE) UCL | 3748631 | 97.5% Chebyshev (MVUE) UCL | | | | | 4261997 |
| 2383 | | | | | 99% Chebyshev (MVUE) UCL | 5270406 | | | | | | |
| 2384 | | | | | | | | | | | | |
| 2385 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 2386 | **Data do not follow a Discernible Distribution (0.05)** | | | | | | | | | | | |
| 2387 | | | | | | | | | | | | |
| 2388 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 2389 | | | | | 95% CLT UCL | 2593348 | 95% Jackknife UCL | | | | | 2595150 |
| 2390 | | | | | 95% Standard Bootstrap UCL | 2591405 | 95% Bootstrap-t UCL | | | | | 2607860 |
| 2391 | | | | | 95% Hall's Bootstrap UCL | 2610455 | 95% Percentile Bootstrap UCL | | | | | 2595838 |
| 2392 | | | | | 95% BCA Bootstrap UCL | 2606691 | | | | | | |
| 2393 | | | | | 90% Chebyshev(Mean, Sd) UCL | 2808295 | 95% Chebyshev(Mean, Sd) UCL | | | | | 3023837 |
| 2394 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 3323001 | 99% Chebyshev(Mean, Sd) UCL | | | | | 3910651 |
| 2395 | | | | | | | | | | | | |
| 2396 | **Suggested UCL to Use** | | | | | | | | | | | |
| 2397 | | | | | 95% Chebyshev (Mean, Sd) UCL | 3023837 | | | | | | |
| 2398 | | | | | | | | | | | | |
| 2399 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 2400 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2401 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |
| 2402 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 2403 | | | | | | | | | | | | |
| 2404 | | | | | | | | | | | | |
| 2405 | **Strontium** | | | | | | | | | | | |
| 2406 | | | | | | | | | | | | |
| 2407 | **General Statistics** | | | | | | | | | | | |
| 2408 | Total Number of Observations | | | | | 136 | Number of Distinct Observations | | | | | 123 |
| 2409 | | | | | | | Number of Missing Observations | | | | | 0 |
| 2410 | Minimum | | | | | 23 | Mean | | | | | 2830 |
| 2411 | Maximum | | | | | 6780 | Median | | | | | 2740 |
| 2412 | SD | | | | | 1671 | Std. Error of Mean | | | | | 143.3 |
| 2413 | Coefficient of Variation | | | | | 0.59 | Skewness | | | | | 0.366 |
| 2414 | | | | | | | | | | | | |
| 2415 | **Normal GOF Test** | | | | | | | | | | | |
| 2416 | Shapiro Wilk Test Statistic | | | | | 0.942 | **Shapiro Wilk GOF Test** | | | | | |
| 2417 | 5% Shapiro Wilk P Value | | | | | 1.0984E-5 | Data Not Normal at 5% Significance Level | | | | | |
| 2418 | Lilliefors Test Statistic | | | | | 0.105 | **Lilliefors GOF Test** | | | | | |
| 2419 | 5% Lilliefors Critical Value | | | | | 0.076 | Data Not Normal at 5% Significance Level | | | | | |
| 2420 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 2421 | | | | | | | | | | | | |
| 2422 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 2423 | **95% Normal UCL** | | | | | | **95% UCLs (Adjusted for Skewness)** | | | | | |
| 2424 | 95% Student's-t UCL | | | | | 3067 | 95% Adjusted-CLT UCL (Chen-1995) | | | | | 3070 |
| 2425 | | | | | | | 95% Modified-t UCL (Johnson-1978) | | | | | 3068 |
| 2426 | | | | | | | | | | | | |
| 2427 | **Gamma GOF Test** | | | | | | | | | | | |
| 2428 | A-D Test Statistic | | | | | 1.365 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 2429 | 5% A-D Critical Value | | | | | 0.765 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 2430 | K-S Test Statistic | | | | | 0.127 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 2431 | 5% K-S Critical Value | | | | | 0.0811 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 2432 | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 2433 | | | | | | | | | | | | |
| 2434 | **Gamma Statistics** | | | | | | | | | | | |
| 2435 | k hat (MLE) | | | | | 2.148 | k star (bias corrected MLE) | | | | | 2.106 |
| 2436 | Theta hat (MLE) | | | | | 1317 | Theta star (bias corrected MLE) | | | | | 1344 |
| 2437 | nu hat (MLE) | | | | | 584.4 | nu star (bias corrected) | | | | | 572.8 |
| 2438 | MLE Mean (bias corrected) | | | | | 2830 | MLE Sd (bias corrected) | | | | | 1950 |
| 2439 | | | | | | | Approximate Chi Square Value (0.05) | | | | | 518.3 |
| 2440 | Adjusted Level of Significance | | | | | 0.0482 | Adjusted Chi Square Value | | | | | 517.8 |
| 2441 | | | | | | | | | | | | |
| 2442 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 2443 | 95% Approximate Gamma UCL (use when n>=50)) | | | | | 3127 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 3131 |
| 2444 | | | | | | | | | | | | |
| 2445 | **Lognormal GOF Test** | | | | | | | | | | | |
| 2446 | Shapiro Wilk Test Statistic | | | | | 0.885 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 2447 | 5% Shapiro Wilk P Value | | | | | 4.441E-16 | Data Not Lognormal at 5% Significance Level | | | | | |
| 2448 | Lilliefors Test Statistic | | | | | 0.134 | **Lilliefors Lognormal GOF Test** | | | | | |
| 2449 | 5% Lilliefors Critical Value | | | | | 0.076 | Data Not Lognormal at 5% Significance Level | | | | | |
| 2450 | **Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 2451 | | | | | | | | | | | | |
| 2452 | | | | | | **Lognormal Statistics** | | | | | | |
| 2453 | | | | | Minimum of Logged Data | 3.135 | | | | Mean of logged Data | | 7.697 |
| 2454 | | | | | Maximum of Logged Data | 8.822 | | | | SD of logged Data | | 0.844 |
| 2455 | | | | | | | | | | | | |
| 2456 | | | | | | **Assuming Lognormal Distribution** | | | | | | |
| 2457 | | | | | 95% H-UCL | 3653 | | | | 90% Chebyshev (MVUE) UCL | | 3918 |
| 2458 | | | | | 95% Chebyshev (MVUE) UCL | 4273 | | | | 97.5% Chebyshev (MVUE) UCL | | 4765 |
| 2459 | | | | | 99% Chebyshev (MVUE) UCL | 5733 | | | | | | |
| 2460 | | | | | | | | | | | | |
| 2461 | | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | |
| 2462 | | | | | | **Data do not follow a Discernible Distribution (0.05)** | | | | | | |
| 2463 | | | | | | | | | | | | |
| 2464 | | | | | | **Nonparametric Distribution Free UCLs** | | | | | | |
| 2465 | | | | | 95% CLT UCL | 3065 | | | | 95% Jackknife UCL | | 3067 |
| 2466 | | | | | 95% Standard Bootstrap UCL | 3064 | | | | 95% Bootstrap-t UCL | | 3073 |
| 2467 | | | | | 95% Hall's Bootstrap UCL | 3073 | | | | 95% Percentile Bootstrap UCL | | 3066 |
| 2468 | | | | | 95% BCA Bootstrap UCL | 3057 | | | | | | |
| 2469 | | | | | 90% Chebyshev(Mean, Sd) UCL | 3259 | | | | 95% Chebyshev(Mean, Sd) UCL | | 3454 |
| 2470 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 3724 | | | | 99% Chebyshev(Mean, Sd) UCL | | 4255 |
| 2471 | | | | | | | | | | | | |
| 2472 | | | | | | **Suggested UCL to Use** | | | | | | |
| 2473 | | | | | 95% Chebyshev (Mean, Sd) UCL | 3454 | | | | | | |
| 2474 | | | | | | | | | | | | |
| 2475 | | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | |
| 2476 | | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | |
| 2477 | | | | | | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | |
| 2478 | | | | | | For additional insight the user may want to consult a statistician. | | | | | | |
| 2479 | | | | | | | | | | | | |
| 2480 | **Tellurium** | | | | | | | | | | | |
| 2481 | | | | | | | | | | | | |
| 2482 | | | | | | **General Statistics** | | | | | | |
| 2483 | | | | | Total Number of Observations | 136 | | | | Number of Distinct Observations | | 15 |
| 2484 | | | | | Number of Detects | 14 | | | | Number of Non-Detects | | 122 |
| 2485 | | | | | Number of Distinct Detects | 13 | | | | Number of Distinct Non-Detects | | 3 |
| 2486 | | | | | Minimum Detect | 0.015 | | | | Minimum Non-Detect | | 0.01 |
| 2487 | | | | | Maximum Detect | 0.041 | | | | Maximum Non-Detect | | 0.5 |
| 2488 | | | | | Variance Detects | 8.6879E-5 | | | | Percent Non-Detects | | 89.71% |
| 2489 | | | | | Mean Detects | 0.0274 | | | | SD Detects | | 0.00932 |
| 2490 | | | | | Median Detects | 0.0235 | | | | CV Detects | | 0.34 |
| 2491 | | | | | Skewness Detects | 0.278 | | | | Kurtosis Detects | | -1.609 |
| 2492 | | | | | Mean of Logged Detects | -3.651 | | | | SD of Logged Detects | | 0.347 |
| 2493 | | | | | | | | | | | | |
| 2494 | | | | | | **Normal GOF Test on Detects Only** | | | | | | |
| 2495 | | | | | Shapiro Wilk Test Statistic | 0.891 | | | | **Shapiro Wilk GOF Test** | | |
| 2496 | | | | | 5% Shapiro Wilk Critical Value | 0.874 | | | | Detected Data appear Normal at 5% Significance Level | | |
| 2497 | | | | | Lilliefors Test Statistic | 0.215 | | | | **Lilliefors GOF Test** | | |
| 2498 | | | | | 5% Lilliefors Critical Value | 0.237 | | | | Detected Data appear Normal at 5% Significance Level | | |
| 2499 | | | | | | **Detected Data appear Normal at 5% Significance Level** | | | | | | |
| 2500 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 2501 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 2502 | | | | | Mean | 0.016 | | | | | Standard Error of Mean | 0.00154 |
| 2503 | | | | | SD | 0.00954 | | | | | 95% KM (BCA) UCL | 0.0186 |
| 2504 | | | | | 95% KM (t) UCL | 0.0185 | | | | | 95% KM (Percentile Bootstrap) UCL | 0.0185 |
| 2505 | | | | | 95% KM (z) UCL | 0.0185 | | | | | 95% KM Bootstrap t UCL | 0.0191 |
| 2506 | | | | | 90% KM Chebyshev UCL | 0.0206 | | | | | 95% KM Chebyshev UCL | 0.0227 |
| 2507 | | | | | 97.5% KM Chebyshev UCL | 0.0256 | | | | | 99% KM Chebyshev UCL | 0.0313 |
| 2508 | | | | | | | | | | | | |
| 2509 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 2510 | | | | | A-D Test Statistic | 0.592 | **Anderson-Darling GOF Test** | | | | | |
| 2511 | | | | | 5% A-D Critical Value | 0.735 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 2512 | | | | | K-S Test Statistic | 0.184 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 2513 | | | | | 5% K-S Critical Value | 0.229 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 2514 | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 2515 | | | | | | | | | | | | |
| 2516 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 2517 | | | | | k hat (MLE) | 9.231 | | | | | k star (bias corrected MLE) | 7.301 |
| 2518 | | | | | Theta hat (MLE) | 0.00297 | | | | | Theta star (bias corrected MLE) | 0.00376 |
| 2519 | | | | | nu hat (MLE) | 258.5 | | | | | nu star (bias corrected) | 204.4 |
| 2520 | | | | | MLE Mean (bias corrected) | 0.0274 | | | | | MLE Sd (bias corrected) | 0.0102 |
| 2521 | | | | | | | | | | | | |
| 2522 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 2523 | | | | | k hat (KM) | 2.806 | | | | | nu hat (KM) | 763.2 |
| 2524 | | | | | Approximate Chi Square Value (763.22, α) | 700.1 | | | | | Adjusted Chi Square Value (763.22, β) | 699.5 |
| 2525 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.0174 | | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | 0.0174 |
| 2526 | | | | | | | | | | | | |
| 2527 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 2528 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 2529 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 2530 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 2531 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 2532 | | | | | Minimum | 0.01 | | | | | Mean | 0.0162 |
| 2533 | | | | | Maximum | 0.0527 | | | | | Median | 0.01 |
| 2534 | | | | | SD | 0.00957 | | | | | CV | 0.591 |
| 2535 | | | | | k hat (MLE) | 4.039 | | | | | k star (bias corrected MLE) | 3.955 |
| 2536 | | | | | Theta hat (MLE) | 0.00401 | | | | | Theta star (bias corrected MLE) | 0.0041 |
| 2537 | | | | | nu hat (MLE) | 1099 | | | | | nu star (bias corrected) | 1076 |
| 2538 | | | | | MLE Mean (bias corrected) | 0.0162 | | | | | MLE Sd (bias corrected) | 0.00814 |
| 2539 | | | | | | | | | | | Adjusted Level of Significance (β) | 0.0482 |
| 2540 | | | | | Approximate Chi Square Value (N/A, α) | 1001 | | | | | Adjusted Chi Square Value (N/A, β) | 999.9 |
| 2541 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.0174 | | | | | 95% Gamma Adjusted UCL (use when n<50) | 0.0174 |
| 2542 | | | | | | | | | | | | |
| 2543 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 2544 | | | | | Shapiro Wilk Test Statistic | 0.911 | **Shapiro Wilk GOF Test** | | | | | |
| 2545 | | | | | 5% Shapiro Wilk Critical Value | 0.874 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 2546 | | | | | Lilliefors Test Statistic | 0.161 | **Lilliefors GOF Test** | | | | | |
| 2547 | | | | | 5% Lilliefors Critical Value | 0.237 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 2548 | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 2549 | | | | | | | | | | | | |
| 2550 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 2551 | | | | | Mean in Original Scale | 0.0153 | | | | | Mean in Log Scale | -4.396 |
| 2552 | | | | | SD in Original Scale | 0.0108 | | | | | SD in Log Scale | 0.667 |
| 2553 | | | | 95% t UCL (assumes normality of ROS data) | | 0.0169 | | | | | 95% Percentile Bootstrap UCL | 0.0169 |
| 2554 | | | | | 95% BCA Bootstrap UCL | 0.017 | | | | | 95% Bootstrap t UCL | 0.017 |
| 2555 | | | | | 95% H-UCL (Log ROS) | 0.0172 | | | | | | |
| 2556 | | | | | | | | | | | | |
| 2557 | | | | | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | |
| 2558 | | | | | KM Mean (logged) | -4.27 | | | | | 95% H-UCL (KM -Log) | 0.0169 |
| 2559 | | | | | KM SD (logged) | 0.481 | | | | | 95% Critical H Value (KM-Log) | 1.816 |
| 2560 | | | | | KM Standard Error of Mean (logged) | 0.0794 | | | | | | |
| 2561 | | | | | | | | | | | | |
| 2562 | | | | | **DL/2 Statistics** | | | | | | | |
| 2563 | | | | | **DL/2 Normal** | | | | **DL/2 Log-Transformed** | | | |
| 2564 | | | | | Mean in Original Scale | 0.175 | | | | | Mean in Log Scale | -2.367 |
| 2565 | | | | | SD in Original Scale | 0.11 | | | | | SD in Log Scale | 1.497 |
| 2566 | | | | | 95% t UCL (Assumes normality) | 0.191 | | | | | 95% H-Stat UCL | 0.407 |
| 2567 | | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | |
| 2568 | | | | | | | | | | | | |
| 2569 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 2570 | | | | | **Detected Data appear Normal Distributed at 5% Significance Level** | | | | | | | |
| 2571 | | | | | | | | | | | | |
| 2572 | | | | | **Suggested UCL to Use** | | | | | | | |
| 2573 | | | | | 95% KM (t) UCL | 0.0185 | | | | | 95% KM (Percentile Bootstrap) UCL | 0.0185 |
| 2574 | | | | | | | | | | | | |
| 2575 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 2576 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 2577 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 2578 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 2579 | | | | | | | | | | | | |
| 2580 | **Thallium** | | | | | | | | | | | |
| 2581 | | | | | | | | | | | | |
| 2582 | | | | | **General Statistics** | | | | | | | |
| 2583 | | | | | Total Number of Observations | 136 | | | | | Number of Distinct Observations | 46 |
| 2584 | | | | | Number of Detects | 48 | | | | | Number of Non-Detects | 88 |
| 2585 | | | | | Number of Distinct Detects | 43 | | | | | Number of Distinct Non-Detects | 3 |
| 2586 | | | | | Minimum Detect | 0.0034 | | | | | Minimum Non-Detect | 0.002 |
| 2587 | | | | | Maximum Detect | 0.28 | | | | | Maximum Non-Detect | 0.05 |
| 2588 | | | | | Variance Detects | 0.00357 | | | | | Percent Non-Detects | 64.71% |
| 2589 | | | | | Mean Detects | 0.0608 | | | | | SD Detects | 0.0598 |
| 2590 | | | | | Median Detects | 0.051 | | | | | CV Detects | 0.984 |
| 2591 | | | | | Skewness Detects | 1.699 | | | | | Kurtosis Detects | 3.565 |
| 2592 | | | | | Mean of Logged Detects | -3.365 | | | | | SD of Logged Detects | 1.199 |
| 2593 | | | | | | | | | | | | |
| 2594 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 2595 | | | | | Shapiro Wilk Test Statistic | 0.83 | | | **Shapiro Wilk GOF Test** | | | |
| 2596 | | | | | 5% Shapiro Wilk Critical Value | 0.947 | | | Detected Data Not Normal at 5% Significance Level | | | |
| 2597 | | | | | Lilliefors Test Statistic | 0.169 | | | **Lilliefors GOF Test** | | | |
| 2598 | | | | | 5% Lilliefors Critical Value | 0.128 | | | Detected Data Not Normal at 5% Significance Level | | | |
| 2599 | | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | | |
| 2600 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 2601 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 2602 | | | | | Mean | 0.0263 | | | | | Standard Error of Mean | 0.00398 |
| 2603 | | | | | SD | 0.0442 | | | | | 95% KM (BCA) UCL | 0.033 |
| 2604 | | | | | 95% KM (t) UCL | 0.0329 | | | | | 95% KM (Percentile Bootstrap) UCL | 0.0328 |
| 2605 | | | | | 95% KM (z) UCL | 0.0329 | | | | | 95% KM Bootstrap t UCL | 0.0345 |
| 2606 | | | | | 90% KM Chebyshev UCL | 0.0383 | | | | | 95% KM Chebyshev UCL | 0.0437 |
| 2607 | | | | | 97.5% KM Chebyshev UCL | 0.0512 | | | | | 99% KM Chebyshev UCL | 0.0659 |
| 2608 | | | | | | | | | | | | |
| 2609 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 2610 | | | | | A-D Test Statistic | 0.798 | **Anderson-Darling GOF Test** | | | | | |
| 2611 | | | | | 5% A-D Critical Value | 0.778 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 2612 | | | | | K-S Test Statistic | 0.154 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 2613 | | | | | 5% K-S Critical Value | 0.132 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 2614 | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 2615 | | | | | | | | | | | | |
| 2616 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 2617 | | | | | k hat (MLE) | 1.02 | | | | | k star (bias corrected MLE) | 0.97 |
| 2618 | | | | | Theta hat (MLE) | 0.0596 | | | | | Theta star (bias corrected MLE) | 0.0626 |
| 2619 | | | | | nu hat (MLE) | 97.95 | | | | | nu star (bias corrected) | 93.16 |
| 2620 | | | | | MLE Mean (bias corrected) | 0.0608 | | | | | MLE Sd (bias corrected) | 0.0617 |
| 2621 | | | | | | | | | | | | |
| 2622 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 2623 | | | | | k hat (KM) | 0.355 | | | | | nu hat (KM) | 96.46 |
| 2624 | | | | | Approximate Chi Square Value (96.46, α) | 74.81 | | | | | Adjusted Chi Square Value (96.46, β) | 74.6 |
| 2625 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.0339 | | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | 0.034 |
| 2626 | | | | | | | | | | | | |
| 2627 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 2628 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 2629 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 2630 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 2631 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 2632 | | | | | Minimum | 0.0034 | | | | | Mean | 0.03 |
| 2633 | | | | | Maximum | 0.28 | | | | | Median | 0.01 |
| 2634 | | | | | SD | 0.0425 | | | | | CV | 1.416 |
| 2635 | | | | | k hat (MLE) | 1.044 | | | | | k star (bias corrected MLE) | 1.026 |
| 2636 | | | | | Theta hat (MLE) | 0.0288 | | | | | Theta star (bias corrected MLE) | 0.0293 |
| 2637 | | | | | nu hat (MLE) | 284 | | | | | nu star (bias corrected) | 279.1 |
| 2638 | | | | | MLE Mean (bias corrected) | 0.03 | | | | | MLE Sd (bias corrected) | 0.0297 |
| 2639 | | | | | | | | | | | Adjusted Level of Significance (β) | 0.0482 |
| 2640 | | | | | Approximate Chi Square Value (279.07, α) | 241.4 | | | | | Adjusted Chi Square Value (279.07, β) | 241 |
| 2641 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.0347 | | | | | 95% Gamma Adjusted UCL (use when n<50) | 0.0348 |
| 2642 | | | | | | | | | | | | |
| 2643 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 2644 | | | | | Shapiro Wilk Test Statistic | 0.922 | **Shapiro Wilk GOF Test** | | | | | |
| 2645 | | | | | 5% Shapiro Wilk Critical Value | 0.947 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 2646 | | | | | Lilliefors Test Statistic | 0.169 | **Lilliefors GOF Test** | | | | | |
| 2647 | | | | | 5% Lilliefors Critical Value | 0.128 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 2648 | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 2649 | | | | | | | | | | | | |
| 2650 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2651 | | | | | Mean in Original Scale | 0.0258 | | | | | Mean in Log Scale | -4.85 |
| 2652 | | | | | SD in Original Scale | 0.0442 | | | | | SD in Log Scale | 1.649 |
| 2653 | | | | 95% t UCL (assumes normality of ROS data) | | 0.0321 | | | | | 95% Percentile Bootstrap UCL | 0.0323 |
| 2654 | | | | | 95% BCA Bootstrap UCL | 0.0335 | | | | | 95% Bootstrap t UCL | 0.0333 |
| 2655 | | | | | 95% H-UCL (Log ROS) | 0.0457 | | | | | | |
| 2656 | | | | | | | | | | | | |
| 2657 | | | | | DL/2 Statistics | | | | | | | |
| 2658 | | | | DL/2 Normal | | | | | DL/2 Log-Transformed | | | |
| 2659 | | | | | Mean in Original Scale | 0.0342 | | | | | Mean in Log Scale | -3.977 |
| 2660 | | | | | SD in Original Scale | 0.0412 | | | | | SD in Log Scale | 1.256 |
| 2661 | | | | | 95% t UCL (Assumes normality) | 0.04 | | | | | 95% H-Stat UCL | 0.0537 |
| 2662 | | | | | DL/2 is not a recommended method, provided for comparisons and historical reasons | | | | | | | |
| 2663 | | | | | | | | | | | | |
| 2664 | | | | | Nonparametric Distribution Free UCL Statistics | | | | | | | |
| 2665 | | | | | Data do not follow a Discernible Distribution at 5% Significance Level | | | | | | | |
| 2666 | | | | | | | | | | | | |
| 2667 | | | | | Suggested UCL to Use | | | | | | | |
| 2668 | | | | | 95% KM (BCA) UCL | 0.033 | | | | | | |
| 2669 | | | | | | | | | | | | |
| 2670 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 2671 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 2672 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 2673 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 2674 | | | | | | | | | | | | |
| 2675 | Thorium | | | | | | | | | | | |
| 2676 | | | | | | | | | | | | |
| 2677 | | | | | General Statistics | | | | | | | |
| 2678 | | | | | Total Number of Observations | 136 | | | | | Number of Distinct Observations | 7 |
| 2679 | | | | | Number of Detects | 4 | | | | | Number of Non-Detects | 132 |
| 2680 | | | | | Number of Distinct Detects | 4 | | | | | Number of Distinct Non-Detects | 3 |
| 2681 | | | | | Minimum Detect | 0.0084 | | | | | Minimum Non-Detect | 0.005 |
| 2682 | | | | | Maximum Detect | 0.0656 | | | | | Maximum Non-Detect | 0.5 |
| 2683 | | | | | Variance Detects | 7.9092E-4 | | | | | Percent Non-Detects | 97.06% |
| 2684 | | | | | Mean Detects | 0.0235 | | | | | SD Detects | 0.0281 |
| 2685 | | | | | Median Detects | 0.0099 | | | | | CV Detects | 1.199 |
| 2686 | | | | | Skewness Detects | 1.99 | | | | | Kurtosis Detects | 3.966 |
| 2687 | | | | | Mean of Logged Detects | -4.187 | | | | | SD of Logged Detects | 0.982 |
| 2688 | | | | | | | | | | | | |
| 2689 | | | | | Normal GOF Test on Detects Only | | | | | | | |
| 2690 | | | | | Shapiro Wilk Test Statistic | 0.663 | | | Shapiro Wilk GOF Test | | | |
| 2691 | | | | | 5% Shapiro Wilk Critical Value | 0.748 | | | Detected Data Not Normal at 5% Significance Level | | | |
| 2692 | | | | | Lilliefors Test Statistic | 0.421 | | | Lilliefors GOF Test | | | |
| 2693 | | | | | 5% Lilliefors Critical Value | 0.443 | | | Detected Data appear Normal at 5% Significance Level | | | |
| 2694 | | | | | Detected Data appear Approximate Normal at 5% Significance Level | | | | | | | |
| 2695 | | | | | | | | | | | | |
| 2696 | | | | | Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs | | | | | | | |
| 2697 | | | | | Mean | 0.00695 | | | | | Standard Error of Mean | 0.00163 |
| 2698 | | | | | SD | 0.00916 | | | | | 95% KM (BCA) UCL | N/A |
| 2699 | | | | | 95% KM (t) UCL | 0.00965 | | | | | 95% KM (Percentile Bootstrap) UCL | N/A |
| 2700 | | | | | 95% KM (z) UCL | 0.00963 | | | | | 95% KM Bootstrap t UCL | N/A |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2701 | | | | | 90% KM Chebyshev UCL | 0.0118 | | | | 95% KM Chebyshev UCL | | 0.0141 |
| 2702 | | | | | 97.5% KM Chebyshev UCL | 0.0171 | | | | 99% KM Chebyshev UCL | | 0.0232 |
| 2703 | | | | | | | | | | | | |
| 2704 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 2705 | | | | | A-D Test Statistic | 0.785 | **Anderson-Darling GOF Test** | | | | | |
| 2706 | | | | | 5% A-D Critical Value | 0.664 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 2707 | | | | | K-S Test Statistic | 0.425 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 2708 | | | | | 5% K-S Critical Value | 0.401 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 2709 | | | | | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | |
| 2710 | | | | | | | | | | | | |
| 2711 | | | | | **Gamma Statistics on Detected Data Only** | | | | | | | |
| 2712 | | | | | k hat (MLE) | 1.294 | k star (bias corrected MLE) | | | | | 0.49 |
| 2713 | | | | | Theta hat (MLE) | 0.0181 | Theta star (bias corrected MLE) | | | | | 0.0478 |
| 2714 | | | | | nu hat (MLE) | 10.35 | nu star (bias corrected) | | | | | 3.921 |
| 2715 | | | | | MLE Mean (bias corrected) | 0.0235 | MLE Sd (bias corrected) | | | | | 0.0335 |
| 2716 | | | | | | | | | | | | |
| 2717 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 2718 | | | | | k hat (KM) | 0.576 | nu hat (KM) | | | | | 156.7 |
| 2719 | | | | | Approximate Chi Square Value (156.74, α) | 128.8 | Adjusted Chi Square Value (156.74, β) | | | | | 128.5 |
| 2720 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.00846 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 0.00848 |
| 2721 | | | | | | | | | | | | |
| 2722 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 2723 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 2724 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 2725 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 2726 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 2727 | | | | | Minimum | 0.0084 | Mean | | | | | 0.0114 |
| 2728 | | | | | Maximum | 0.0656 | Median | | | | | 0.01 |
| 2729 | | | | | SD | 0.00734 | CV | | | | | 0.642 |
| 2730 | | | | | k hat (MLE) | 7.197 | k star (bias corrected MLE) | | | | | 7.043 |
| 2731 | | | | | Theta hat (MLE) | 0.00159 | Theta star (bias corrected MLE) | | | | | 0.00162 |
| 2732 | | | | | nu hat (MLE) | 1958 | nu star (bias corrected) | | | | | 1916 |
| 2733 | | | | | MLE Mean (bias corrected) | 0.0114 | MLE Sd (bias corrected) | | | | | 0.00431 |
| 2734 | | | | | | | Adjusted Level of Significance (β) | | | | | 0.0482 |
| 2735 | | | | | Approximate Chi Square Value (N/A, α) | 1815 | Adjusted Chi Square Value (N/A, β) | | | | | 1814 |
| 2736 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.0121 | 95% Gamma Adjusted UCL (use when n<50) | | | | | N/A |
| 2737 | | | | | | | | | | | | |
| 2738 | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | | |
| 2739 | | | | | Shapiro Wilk Test Statistic | 0.727 | **Shapiro Wilk GOF Test** | | | | | |
| 2740 | | | | | 5% Shapiro Wilk Critical Value | 0.748 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 2741 | | | | | Lilliefors Test Statistic | 0.379 | **Lilliefors GOF Test** | | | | | |
| 2742 | | | | | 5% Lilliefors Critical Value | 0.443 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 2743 | | | | | **Detected Data appear Approximate Lognormal at 5% Significance Level** | | | | | | | |
| 2744 | | | | | | | | | | | | |
| 2745 | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | |
| 2746 | | | | | Mean in Original Scale | 0.00319 | Mean in Log Scale | | | | | -7.161 |
| 2747 | | | | | SD in Original Scale | 0.00802 | SD in Log Scale | | | | | 1.722 |
| 2748 | | | | | 95% t UCL (assumes normality of ROS data) | 0.00433 | 95% Percentile Bootstrap UCL | | | | | 0.00443 |
| 2749 | | | | | 95% BCA Bootstrap UCL | 0.00475 | 95% Bootstrap t UCL | | | | | 0.00517 |
| 2750 | | | | | 95% H-UCL (Log ROS) | 0.00528 | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2751 | | | | | | | | | | | | |
| 2752 | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | | | | | |
| 2753 | | | | | KM Mean (logged) | -5.159 | | | | 95% H-UCL (KM -Log) | | 0.00672 |
| 2754 | | | | | KM SD (logged) | 0.427 | | | | 95% Critical H Value (KM-Log) | | 1.787 |
| 2755 | | | | | KM Standard Error of Mean (logged) | 0.0832 | | | | | | |
| 2756 | | | | | | | | | | | | |
| 2757 | **DL/2 Statistics** | | | | | | | | | | | |
| 2758 | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | | | | | |
| 2759 | | | | | Mean in Original Scale | 0.173 | | | | Mean in Log Scale | | -2.667 |
| 2760 | | | | | SD in Original Scale | 0.114 | | | | SD in Log Scale | | 1.918 |
| 2761 | | | | | 95% t UCL (Assumes normality) | 0.189 | | | | 95% H-Stat UCL | | 0.738 |
| 2762 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 2763 | | | | | | | | | | | | |
| 2764 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 2765 | **Detected Data appear Approximate Normal Distributed at 5% Significance Level** | | | | | | | | | | | |
| 2766 | | | | | | | | | | | | |
| 2767 | **Suggested UCL to Use** | | | | | | | | | | | |
| 2768 | | | | | 95% KM (t) UCL | 0.00965 | | | | 95% KM (Percentile Bootstrap) UCL | | N/A |
| 2769 | **Warning: One or more Recommended UCL(s) not available!** | | | | | | | | | | | |
| 2770 | | | | | | | | | | | | |
| 2771 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 2772 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 2773 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 2774 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 2775 | | | | | | | | | | | | |
| 2776 | **Tin** | | | | | | | | | | | |
| 2777 | | | | | | | | | | | | |
| 2778 | **General Statistics** | | | | | | | | | | | |
| 2779 | | | | | Total Number of Observations | 136 | | | | Number of Distinct Observations | | 4 |
| 2780 | | | | | Number of Detects | 1 | | | | Number of Non-Detects | | 135 |
| 2781 | | | | | Number of Distinct Detects | 1 | | | | Number of Distinct Non-Detects | | 3 |
| 2782 | | | | | | | | | | | | |
| 2783 | **Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!** | | | | | | | | | | | |
| 2784 | **It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).** | | | | | | | | | | | |
| 2785 | | | | | | | | | | | | |
| 2786 | **The data set for variable Tin was not processed!** | | | | | | | | | | | |
| 2787 | | | | | | | | | | | | |
| 2788 | | | | | | | | | | | | |
| 2789 | **Titanium** | | | | | | | | | | | |
| 2790 | | | | | | | | | | | | |
| 2791 | **General Statistics** | | | | | | | | | | | |
| 2792 | | | | | Total Number of Observations | 136 | | | | Number of Distinct Observations | | 19 |
| 2793 | | | | | Number of Detects | 16 | | | | Number of Non-Detects | | 120 |
| 2794 | | | | | Number of Distinct Detects | 16 | | | | Number of Distinct Non-Detects | | 3 |
| 2795 | | | | | Minimum Detect | 0.22 | | | | Minimum Non-Detect | | 0.2 |
| 2796 | | | | | Maximum Detect | 12.4 | | | | Maximum Non-Detect | | 5 |
| 2797 | | | | | Variance Detects | 11.02 | | | | Percent Non-Detects | | 88.24% |
| 2798 | | | | | Mean Detects | 1.836 | | | | SD Detects | | 3.32 |
| 2799 | | | | | Median Detects | 0.645 | | | | CV Detects | | 1.809 |
| 2800 | | | | | Skewness Detects | 2.771 | | | | Kurtosis Detects | | 7.383 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2801 | | | | | Mean of Logged Detects | -0.225 | | | | | SD of Logged Detects | 1.143 |
| 2802 | | | | | | | | | | | | |
| 2803 | | | | | Normal GOF Test on Detects Only | | | | | | | |
| 2804 | | | | | Shapiro Wilk Test Statistic | 0.516 | Shapiro Wilk GOF Test | | | | | |
| 2805 | | | | | 5% Shapiro Wilk Critical Value | 0.887 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 2806 | | | | | Lilliefors Test Statistic | 0.414 | Lilliefors GOF Test | | | | | |
| 2807 | | | | | 5% Lilliefors Critical Value | 0.222 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 2808 | | | | | Detected Data Not Normal at 5% Significance Level | | | | | | | |
| 2809 | | | | | | | | | | | | |
| 2810 | | | | | Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs | | | | | | | |
| 2811 | | | | | Mean | 0.506 | Standard Error of Mean | | | | | 0.118 |
| 2812 | | | | | SD | 1.239 | 95% KM (BCA) UCL | | | | | 0.727 |
| 2813 | | | | | 95% KM (t) UCL | 0.702 | 95% KM (Percentile Bootstrap) UCL | | | | | 0.715 |
| 2814 | | | | | 95% KM (z) UCL | 0.701 | 95% KM Bootstrap t UCL | | | | | 0.863 |
| 2815 | | | | | 90% KM Chebyshev UCL | 0.861 | 95% KM Chebyshev UCL | | | | | 1.022 |
| 2816 | | | | | 97.5% KM Chebyshev UCL | 1.246 | 99% KM Chebyshev UCL | | | | | 1.684 |
| 2817 | | | | | | | | | | | | |
| 2818 | | | | | Gamma GOF Tests on Detected Observations Only | | | | | | | |
| 2819 | | | | | A-D Test Statistic | 1.867 | Anderson-Darling GOF Test | | | | | |
| 2820 | | | | | 5% A-D Critical Value | 0.777 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 2821 | | | | | K-S Test Statistic | 0.341 | Kolmogrov-Smirnoff GOF | | | | | |
| 2822 | | | | | 5% K-S Critical Value | 0.224 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 2823 | | | | | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | | | |
| 2824 | | | | | | | | | | | | |
| 2825 | | | | | Gamma Statistics on Detected Data Only | | | | | | | |
| 2826 | | | | | k hat (MLE) | 0.723 | k star (bias corrected MLE) | | | | | 0.629 |
| 2827 | | | | | Theta hat (MLE) | 2.54 | Theta star (bias corrected MLE) | | | | | 2.919 |
| 2828 | | | | | nu hat (MLE) | 23.13 | nu star (bias corrected) | | | | | 20.13 |
| 2829 | | | | | MLE Mean (bias corrected) | 1.836 | MLE Sd (bias corrected) | | | | | 2.315 |
| 2830 | | | | | | | | | | | | |
| 2831 | | | | | Gamma Kaplan-Meier (KM) Statistics | | | | | | | |
| 2832 | | | | | k hat (KM) | 0.167 | nu hat (KM) | | | | | 45.33 |
| 2833 | | | | | Approximate Chi Square Value (45.33, α) | 30.88 | Adjusted Chi Square Value (45.33, β) | | | | | 30.76 |
| 2834 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.742 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 0.745 |
| 2835 | | | | | | | | | | | | |
| 2836 | | | | | Gamma ROS Statistics using Imputed Non-Detects | | | | | | | |
| 2837 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 2838 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 2839 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 2840 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 2841 | | | | | Minimum | 0.01 | Mean | | | | | 0.484 |
| 2842 | | | | | Maximum | 12.4 | Median | | | | | 0.01 |
| 2843 | | | | | SD | 1.47 | CV | | | | | 3.039 |
| 2844 | | | | | k hat (MLE) | 0.263 | k star (bias corrected MLE) | | | | | 0.263 |
| 2845 | | | | | Theta hat (MLE) | 1.835 | Theta star (bias corrected MLE) | | | | | 1.841 |
| 2846 | | | | | nu hat (MLE) | 71.67 | nu star (bias corrected) | | | | | 71.42 |
| 2847 | | | | | MLE Mean (bias corrected) | 0.484 | MLE Sd (bias corrected) | | | | | 0.944 |
| 2848 | | | | | | | Adjusted Level of Significance (β) | | | | | 0.0482 |
| 2849 | | | | | Approximate Chi Square Value (71.42, α) | 52.96 | Adjusted Chi Square Value (71.42, β) | | | | | 52.79 |
| 2850 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.652 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 0.654 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2851 | | | | | | | | | | | | |
| 2852 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 2853 | | | | | Shapiro Wilk Test Statistic | 0.856 | **Shapiro Wilk GOF Test** | | | | | |
| 2854 | | | | | 5% Shapiro Wilk Critical Value | 0.887 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 2855 | | | | | Lilliefors Test Statistic | 0.241 | **Lilliefors GOF Test** | | | | | |
| 2856 | | | | | 5% Lilliefors Critical Value | 0.222 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 2857 | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 2858 | | | | | | | | | | | | |
| 2859 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 2860 | | | | | Mean in Original Scale | 0.449 | | | Mean in Log Scale | | | -2.095 |
| 2861 | | | | | SD in Original Scale | 1.295 | | | SD in Log Scale | | | 1.585 |
| 2862 | | | | | 95% t UCL (assumes normality of ROS data) | 0.633 | | | 95% Percentile Bootstrap UCL | | | 0.649 |
| 2863 | | | | | 95% BCA Bootstrap UCL | 0.747 | | | 95% Bootstrap t UCL | | | 0.93 |
| 2864 | | | | | 95% H-UCL (Log ROS) | 0.632 | | | | | | |
| 2865 | | | | | | | | | | | | |
| 2866 | **DL/2 Statistics** | | | | | | | | | | | |
| 2867 | | | | **DL/2 Normal** | | | **DL/2 Log-Transformed** | | | | | |
| 2868 | | | | | Mean in Original Scale | 1.94 | | | Mean in Log Scale | | | 0.206 |
| 2869 | | | | | SD in Original Scale | 1.448 | | | SD in Log Scale | | | 1.199 |
| 2870 | | | | | 95% t UCL (Assumes normality) | 2.146 | | | 95% H-Stat UCL | | | 3.226 |
| 2871 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 2872 | | | | | | | | | | | | |
| 2873 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 2874 | **Data do not follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 2875 | | | | | | | | | | | | |
| 2876 | **Suggested UCL to Use** | | | | | | | | | | | |
| 2877 | | | | | 95% KM (BCA) UCL | 0.727 | | | | | | |
| 2878 | | | | | | | | | | | | |
| 2879 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 2880 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 2881 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 2882 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 2883 | | | | | | | | | | | | |
| 2884 | **Tungsten** | | | | | | | | | | | |
| 2885 | | | | | | | | | | | | |
| 2886 | **General Statistics** | | | | | | | | | | | |
| 2887 | | | | | Total Number of Observations | 136 | | | Number of Distinct Observations | | | 22 |
| 2888 | | | | | Number of Detects | 22 | | | Number of Non-Detects | | | 114 |
| 2889 | | | | | Number of Distinct Detects | 19 | | | Number of Distinct Non-Detects | | | 3 |
| 2890 | | | | | Minimum Detect | 0.011 | | | Minimum Non-Detect | | | 0.01 |
| 2891 | | | | | Maximum Detect | 1.2 | | | Maximum Non-Detect | | | 1 |
| 2892 | | | | | Variance Detects | 0.116 | | | Percent Non-Detects | | | 83.82% |
| 2893 | | | | | Mean Detects | 0.154 | | | SD Detects | | | 0.34 |
| 2894 | | | | | Median Detects | 0.0445 | | | CV Detects | | | 2.204 |
| 2895 | | | | | Skewness Detects | 3.004 | | | Kurtosis Detects | | | 7.855 |
| 2896 | | | | | Mean of Logged Detects | -2.888 | | | SD of Logged Detects | | | 1.158 |
| 2897 | | | | | | | | | | | | |
| 2898 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 2899 | | | | | Shapiro Wilk Test Statistic | 0.408 | **Shapiro Wilk GOF Test** | | | | | |
| 2900 | | | | | 5% Shapiro Wilk Critical Value | 0.911 | Detected Data Not Normal at 5% Significance Level | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2901 | | | | | Lilliefors Test Statistic | 0.417 | **Lilliefors GOF Test** | | | | | |
| 2902 | | | | | 5% Lilliefors Critical Value | 0.189 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 2903 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 2904 | | | | | | | | | | | | |
| 2905 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 2906 | | | | | Mean | 0.046 | | | | Standard Error of Mean | | 0.0133 |
| 2907 | | | | | SD | 0.144 | | | | 95% KM (BCA) UCL | | 0.0735 |
| 2908 | | | | | 95% KM (t) UCL | 0.068 | | | | 95% KM (Percentile Bootstrap) UCL | | 0.0685 |
| 2909 | | | | | 95% KM (z) UCL | 0.0678 | | | | 95% KM Bootstrap t UCL | | 0.106 |
| 2910 | | | | | 90% KM Chebyshev UCL | 0.0858 | | | | 95% KM Chebyshev UCL | | 0.104 |
| 2911 | | | | | 97.5% KM Chebyshev UCL | 0.129 | | | | 99% KM Chebyshev UCL | | 0.178 |
| 2912 | | | | | | | | | | | | |
| 2913 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 2914 | | | | | A-D Test Statistic | 3.443 | **Anderson-Darling GOF Test** | | | | | |
| 2915 | | | | | 5% A-D Critical Value | 0.795 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 2916 | | | | | K-S Test Statistic | 0.327 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 2917 | | | | | 5% K-S Critical Value | 0.195 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 2918 | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 2919 | | | | | | | | | | | | |
| 2920 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 2921 | | | | | k hat (MLE) | 0.605 | | | | k star (bias corrected MLE) | | 0.553 |
| 2922 | | | | | Theta hat (MLE) | 0.255 | | | | Theta star (bias corrected MLE) | | 0.279 |
| 2923 | | | | | nu hat (MLE) | 26.64 | | | | nu star (bias corrected) | | 24.34 |
| 2924 | | | | | MLE Mean (bias corrected) | 0.154 | | | | MLE Sd (bias corrected) | | 0.208 |
| 2925 | | | | | | | | | | | | |
| 2926 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 2927 | | | | | k hat (KM) | 0.102 | | | | nu hat (KM) | | 27.64 |
| 2928 | | | | | Approximate Chi Square Value (27.64, α) | 16.65 | | | | Adjusted Chi Square Value (27.64, β) | | 16.55 |
| 2929 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.0764 | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | 0.0768 |
| 2930 | | | | | | | | | | | | |
| 2931 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 2932 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 2933 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 2934 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 2935 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 2936 | | | | | Minimum | 0.01 | | | | Mean | | 0.0649 |
| 2937 | | | | | Maximum | 1.2 | | | | Median | | 0.01 |
| 2938 | | | | | SD | 0.169 | | | | CV | | 2.604 |
| 2939 | | | | | k hat (MLE) | 0.542 | | | | k star (bias corrected MLE) | | 0.535 |
| 2940 | | | | | Theta hat (MLE) | 0.12 | | | | Theta star (bias corrected MLE) | | 0.121 |
| 2941 | | | | | nu hat (MLE) | 147.3 | | | | nu star (bias corrected) | | 145.4 |
| 2942 | | | | | MLE Mean (bias corrected) | 0.0649 | | | | MLE Sd (bias corrected) | | 0.0887 |
| 2943 | | | | | | | | | | Adjusted Level of Significance (β) | | 0.0482 |
| 2944 | | | | | Approximate Chi Square Value (145.41, α) | 118.5 | | | | Adjusted Chi Square Value (145.41, β) | | 118.3 |
| 2945 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.0796 | | | | 95% Gamma Adjusted UCL (use when n<50) | | 0.0798 |
| 2946 | | | | | | | | | | | | |
| 2947 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 2948 | | | | | Shapiro Wilk Test Statistic | 0.807 | **Shapiro Wilk GOF Test** | | | | | |
| 2949 | | | | | 5% Shapiro Wilk Critical Value | 0.911 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 2950 | | | | | Lilliefors Test Statistic | 0.2 | **Lilliefors GOF Test** | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2951 | | | | | 5% Lilliefors Critical Value | 0.189 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 2952 | | | | | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | |
| 2953 | | | | | | | | | | | | |
| 2954 | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | |
| 2955 | | | | | Mean in Original Scale | 0.0472 | | | | Mean in Log Scale | | -4.379 |
| 2956 | | | | | SD in Original Scale | 0.149 | | | | SD in Log Scale | | 1.569 |
| 2957 | | | | | 95% t UCL (assumes normality of ROS data) | 0.0683 | | | | 95% Percentile Bootstrap UCL | | 0.0704 |
| 2958 | | | | | 95% BCA Bootstrap UCL | 0.0827 | | | | 95% Bootstrap t UCL | | 0.109 |
| 2959 | | | | | 95% H-UCL (Log ROS) | 0.0624 | | | | | | |
| 2960 | | | | | | | | | | | | |
| 2961 | | | | | **DL/2 Statistics** | | | | | | | |
| 2962 | | | | **DL/2 Normal** | | | **DL/2 Log-Transformed** | | | | | |
| 2963 | | | | | Mean in Original Scale | 0.361 | | | | Mean in Log Scale | | -1.756 |
| 2964 | | | | | SD in Original Scale | 0.243 | | | | SD in Log Scale | | 1.69 |
| 2965 | | | | | 95% t UCL (Assumes normality) | 0.395 | | | | 95% H-Stat UCL | | 1.101 |
| 2966 | | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | |
| 2967 | | | | | | | | | | | | |
| 2968 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 2969 | | | | | **Data do not follow a Discernible Distribution at 5% Significance Level** | | | | | | | |
| 2970 | | | | | | | | | | | | |
| 2971 | | | | | **Suggested UCL to Use** | | | | | | | |
| 2972 | | | | | 95% KM (BCA) UCL | 0.0735 | | | | | | |
| 2973 | | | | | | | | | | | | |
| 2974 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 2975 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 2976 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 2977 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 2978 | | | | | | | | | | | | |
| 2979 | **Uranium** | | | | | | | | | | | |
| 2980 | | | | | | | | | | | | |
| 2981 | | | | | **General Statistics** | | | | | | | |
| 2982 | | | | | Total Number of Observations | 136 | | | | Number of Distinct Observations | | 127 |
| 2983 | | | | | Number of Detects | 132 | | | | Number of Non-Detects | | 4 |
| 2984 | | | | | Number of Distinct Detects | 126 | | | | Number of Distinct Non-Detects | | 1 |
| 2985 | | | | | Minimum Detect | 0.0409 | | | | Minimum Non-Detect | | 0.05 |
| 2986 | | | | | Maximum Detect | 31.7 | | | | Maximum Non-Detect | | 0.05 |
| 2987 | | | | | Variance Detects | 38.86 | | | | Percent Non-Detects | | 2.941% |
| 2988 | | | | | Mean Detects | 4.004 | | | | SD Detects | | 6.234 |
| 2989 | | | | | Median Detects | 1.165 | | | | CV Detects | | 1.557 |
| 2990 | | | | | Skewness Detects | 2.187 | | | | Kurtosis Detects | | 4.781 |
| 2991 | | | | | Mean of Logged Detects | 0.00932 | | | | SD of Logged Detects | | 1.89 |
| 2992 | | | | | | | | | | | | |
| 2993 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 2994 | | | | | Shapiro Wilk Test Statistic | 0.671 | **Normal GOF Test on Detected Observations Only** | | | | | |
| 2995 | | | | | 5% Shapiro Wilk P Value | 0 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 2996 | | | | | Lilliefors Test Statistic | 0.263 | **Lilliefors GOF Test** | | | | | |
| 2997 | | | | | 5% Lilliefors Critical Value | 0.0771 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 2998 | | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | | |
| 2999 | | | | | | | | | | | | |
| 3000 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3001 | | | | | Mean | 3.888 | | | | Standard Error of Mean | | 0.53 |
| 3002 | | | | | SD | 6.155 | | | | 95% KM (BCA) UCL | | 4.681 |
| 3003 | | | | | 95% KM (t) UCL | 4.765 | | | | 95% KM (Percentile Bootstrap) UCL | | 4.788 |
| 3004 | | | | | 95% KM (z) UCL | 4.759 | | | | 95% KM Bootstrap t UCL | | 4.932 |
| 3005 | | | | | 90% KM Chebyshev UCL | 5.477 | | | | 95% KM Chebyshev UCL | | 6.197 |
| 3006 | | | | | 97.5% KM Chebyshev UCL | 7.196 | | | | 99% KM Chebyshev UCL | | 9.159 |
| 3007 | | | | | | | | | | | | |
| 3008 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 3009 | | | | | A-D Test Statistic | 2.874 | **Anderson-Darling GOF Test** | | | | | |
| 3010 | | | | | 5% A-D Critical Value | 0.828 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 3011 | | | | | K-S Test Statistic | 0.113 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 3012 | | | | | 5% K-S Critical Value | 0.0863 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 3013 | | | | | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | |
| 3014 | | | | | | | | | | | | |
| 3015 | | | | | **Gamma Statistics on Detected Data Only** | | | | | | | |
| 3016 | | | | | k hat (MLE) | 0.466 | | | | k star (bias corrected MLE) | | 0.461 |
| 3017 | | | | | Theta hat (MLE) | 8.592 | | | | Theta star (bias corrected MLE) | | 8.695 |
| 3018 | | | | | nu hat (MLE) | 123 | | | | nu star (bias corrected) | | 121.6 |
| 3019 | | | | | MLE Mean (bias corrected) | 4.004 | | | | MLE Sd (bias corrected) | | 5.9 |
| 3020 | | | | | | | | | | | | |
| 3021 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 3022 | | | | | k hat (KM) | 0.399 | | | | nu hat (KM) | | 108.5 |
| 3023 | | | | | Approximate Chi Square Value (108.52, α) | 85.48 | | | | Adjusted Chi Square Value (108.52, β) | | 85.26 |
| 3024 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 4.936 | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | 4.948 |
| 3025 | | | | | | | | | | | | |
| 3026 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 3027 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 3028 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 3029 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 3030 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 3031 | | | | | Minimum | 0.01 | | | | Mean | | 3.887 |
| 3032 | | | | | Maximum | 31.7 | | | | Median | | 1.11 |
| 3033 | | | | | SD | 6.178 | | | | CV | | 1.59 |
| 3034 | | | | | k hat (MLE) | 0.437 | | | | k star (bias corrected MLE) | | 0.432 |
| 3035 | | | | | Theta hat (MLE) | 8.89 | | | | Theta star (bias corrected MLE) | | 8.988 |
| 3036 | | | | | nu hat (MLE) | 118.9 | | | | nu star (bias corrected) | | 117.6 |
| 3037 | | | | | MLE Mean (bias corrected) | 3.887 | | | | MLE Sd (bias corrected) | | 5.91 |
| 3038 | | | | | | | | | | Adjusted Level of Significance (β) | | 0.0482 |
| 3039 | | | | | Approximate Chi Square Value (117.62, α) | 93.58 | | | | Adjusted Chi Square Value (117.62, β) | | 93.35 |
| 3040 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 4.885 | | | | 95% Gamma Adjusted UCL (use when n<50) | | 4.897 |
| 3041 | | | | | | | | | | | | |
| 3042 | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | | |
| 3043 | | | | | Lilliefors Test Statistic | 0.0888 | **Lilliefors GOF Test** | | | | | |
| 3044 | | | | | 5% Lilliefors Critical Value | 0.0771 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 3045 | | | | | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | |
| 3046 | | | | | | | | | | | | |
| 3047 | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | |
| 3048 | | | | | Mean in Original Scale | 3.887 | | | | Mean in Log Scale | | -0.116 |
| 3049 | | | | | SD in Original Scale | 6.178 | | | | SD in Log Scale | | 1.999 |
| 3050 | | | | | 95% t UCL (assumes normality of ROS data) | 4.764 | | | | 95% Percentile Bootstrap UCL | | 4.818 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3051 | | | | | 95% BCA Bootstrap UCL | 4.864 | | | | | 95% Bootstrap t UCL | 4.899 |
| 3052 | | | | | 95% H-UCL (Log ROS) | 11.52 | | | | | | |
| 3053 | | | | | | | | | | | | |
| 3054 | | | | | **DL/2 Statistics** | | | | | | | |
| 3055 | | | | | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | |
| 3056 | | | | | Mean in Original Scale | 3.887 | | | | | Mean in Log Scale | -0.0995 |
| 3057 | | | | | SD in Original Scale | 6.178 | | | | | SD in Log Scale | 1.965 |
| 3058 | | | | | 95% t UCL (Assumes normality) | 4.764 | | | | | 95% H-Stat UCL | 10.77 |
| 3059 | | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | |
| 3060 | | | | | | | | | | | | |
| 3061 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 3062 | | | | | **Data do not follow a Discernible Distribution at 5% Significance Level** | | | | | | | |
| 3063 | | | | | | | | | | | | |
| 3064 | | | | | **Suggested UCL to Use** | | | | | | | |
| 3065 | | | | | 97.5% KM (Chebyshev) UCL | 7.196 | | | | | | |
| 3066 | | | | | | | | | | | | |
| 3067 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 3068 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 3069 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 3070 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 3071 | | | | | | | | | | | | |
| 3072 | **Vanadium** | | | | | | | | | | | |
| 3073 | | | | | | | | | | | | |
| 3074 | | | | | **General Statistics** | | | | | | | |
| 3075 | | | | | Total Number of Observations | 136 | | | | | Number of Distinct Observations | 76 |
| 3076 | | | | | Number of Detects | 88 | | | | | Number of Non-Detects | 48 |
| 3077 | | | | | Number of Distinct Detects | 74 | | | | | Number of Distinct Non-Detects | 3 |
| 3078 | | | | | Minimum Detect | 0.055 | | | | | Minimum Non-Detect | 0.05 |
| 3079 | | | | | Maximum Detect | 8.18 | | | | | Maximum Non-Detect | 0.5 |
| 3080 | | | | | Variance Detects | 1.054 | | | | | Percent Non-Detects | 35.29% |
| 3081 | | | | | Mean Detects | 0.93 | | | | | SD Detects | 1.026 |
| 3082 | | | | | Median Detects | 0.661 | | | | | CV Detects | 1.104 |
| 3083 | | | | | Skewness Detects | 4.577 | | | | | Kurtosis Detects | 29.12 |
| 3084 | | | | | Mean of Logged Detects | -0.443 | | | | | SD of Logged Detects | 0.881 |
| 3085 | | | | | | | | | | | | |
| 3086 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 3087 | | | | | Shapiro Wilk Test Statistic | 0.632 | | | | | **Normal GOF Test on Detected Observations Only** | |
| 3088 | | | | | 5% Shapiro Wilk P Value | 0 | | | | | Detected Data Not Normal at 5% Significance Level | |
| 3089 | | | | | Lilliefors Test Statistic | 0.197 | | | | | **Lilliefors GOF Test** | |
| 3090 | | | | | 5% Lilliefors Critical Value | 0.0944 | | | | | Detected Data Not Normal at 5% Significance Level | |
| 3091 | | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | | |
| 3092 | | | | | | | | | | | | |
| 3093 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |
| 3094 | | | | | Mean | 0.674 | | | | | Standard Error of Mean | 0.0776 |
| 3095 | | | | | SD | 0.894 | | | | | 95% KM (BCA) UCL | 0.824 |
| 3096 | | | | | 95% KM (t) UCL | 0.802 | | | | | 95% KM (Percentile Bootstrap) UCL | 0.808 |
| 3097 | | | | | 95% KM (z) UCL | 0.801 | | | | | 95% KM Bootstrap t UCL | 0.863 |
| 3098 | | | | | 90% KM Chebyshev UCL | 0.906 | | | | | 95% KM Chebyshev UCL | 1.012 |
| 3099 | | | | | 97.5% KM Chebyshev UCL | 1.158 | | | | | 99% KM Chebyshev UCL | 1.446 |
| 3100 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3101 | Gamma GOF Tests on Detected Observations Only | | | | | | | | | | | |
| 3102 | | | | | A-D Test Statistic | 0.581 | Anderson-Darling GOF Test | | | | | |
| 3103 | | | | | 5% A-D Critical Value | 0.771 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 3104 | | | | | K-S Test Statistic | 0.0671 | Kolmogrov-Smirnoff GOF | | | | | |
| 3105 | | | | | 5% K-S Critical Value | 0.0971 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 3106 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | | | | | | | |
| 3107 | | | | | | | | | | | | |
| 3108 | Gamma Statistics on Detected Data Only | | | | | | | | | | | |
| 3109 | | | | | k hat (MLE) | 1.494 | k star (bias corrected MLE) | | | | | 1.451 |
| 3110 | | | | | Theta hat (MLE) | 0.623 | Theta star (bias corrected MLE) | | | | | 0.641 |
| 3111 | | | | | nu hat (MLE) | 262.9 | nu star (bias corrected) | | | | | 255.3 |
| 3112 | | | | | MLE Mean (bias corrected) | 0.93 | MLE Sd (bias corrected) | | | | | 0.772 |
| 3113 | | | | | | | | | | | | |
| 3114 | Gamma Kaplan-Meier (KM) Statistics | | | | | | | | | | | |
| 3115 | | | | | k hat (KM) | 0.567 | nu hat (KM) | | | | | 154.3 |
| 3116 | | | | | Approximate Chi Square Value (154.32, α) | 126.6 | Adjusted Chi Square Value (154.32, β) | | | | | 126.3 |
| 3117 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.821 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 0.823 |
| 3118 | | | | | | | | | | | | |
| 3119 | Gamma ROS Statistics using Imputed Non-Detects | | | | | | | | | | | |
| 3120 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 3121 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 3122 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 3123 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 3124 | | | | | Minimum | 0.01 | Mean | | | | | 0.635 |
| 3125 | | | | | Maximum | 8.18 | Median | | | | | 0.365 |
| 3126 | | | | | SD | 0.92 | CV | | | | | 1.45 |
| 3127 | | | | | k hat (MLE) | 0.585 | k star (bias corrected MLE) | | | | | 0.577 |
| 3128 | | | | | Theta hat (MLE) | 1.084 | Theta star (bias corrected MLE) | | | | | 1.099 |
| 3129 | | | | | nu hat (MLE) | 159.2 | nu star (bias corrected) | | | | | 157.1 |
| 3130 | | | | | MLE Mean (bias corrected) | 0.635 | MLE Sd (bias corrected) | | | | | 0.835 |
| 3131 | | | | | | | Adjusted Level of Significance (β) | | | | | 0.0482 |
| 3132 | | | | | Approximate Chi Square Value (157.05, α) | 129.1 | Adjusted Chi Square Value (157.05, β) | | | | | 128.8 |
| 3133 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.772 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 0.774 |
| 3134 | | | | | | | | | | | | |
| 3135 | Lognormal GOF Test on Detected Observations Only | | | | | | | | | | | |
| 3136 | | | | | Lilliefors Test Statistic | 0.0873 | Lilliefors GOF Test | | | | | |
| 3137 | | | | | 5% Lilliefors Critical Value | 0.0944 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 3138 | Detected Data appear Lognormal at 5% Significance Level | | | | | | | | | | | |
| 3139 | | | | | | | | | | | | |
| 3140 | Lognormal ROS Statistics Using Imputed Non-Detects | | | | | | | | | | | |
| 3141 | | | | | Mean in Original Scale | 0.675 | Mean in Log Scale | | | | | -0.911 |
| 3142 | | | | | SD in Original Scale | 0.897 | SD in Log Scale | | | | | 1.033 |
| 3143 | | | | | 95% t UCL (assumes normality of ROS data) | 0.802 | 95% Percentile Bootstrap UCL | | | | | 0.811 |
| 3144 | | | | | 95% BCA Bootstrap UCL | 0.835 | 95% Bootstrap t UCL | | | | | 0.859 |
| 3145 | | | | | 95% H-UCL (Log ROS) | 0.835 | | | | | | |
| 3146 | | | | | | | | | | | | |
| 3147 | UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed | | | | | | | | | | | |
| 3148 | | | | | KM Mean (logged) | -0.933 | 95% H-UCL (KM -Log) | | | | | 0.854 |
| 3149 | | | | | KM SD (logged) | 1.066 | 95% Critical H Value (KM-Log) | | | | | 2.255 |
| 3150 | | | | | KM Standard Error of Mean (logged) | 0.106 | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3151 | | | | | | | | | | | | |
| 3152 | **DL/2 Statistics** | | | | | | | | | | | |
| 3153 | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | | | | | |
| 3154 | Mean in Original Scale | | | | | 0.682 | Mean in Log Scale | | | | | -0.851 |
| 3155 | SD in Original Scale | | | | | 0.891 | SD in Log Scale | | | | | 0.973 |
| 3156 | 95% t UCL (Assumes normality) | | | | | 0.809 | 95% H-Stat UCL | | | | | 0.823 |
| 3157 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 3158 | | | | | | | | | | | | |
| 3159 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 3160 | **Detected Data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 3161 | | | | | | | | | | | | |
| 3162 | **Suggested UCL to Use** | | | | | | | | | | | |
| 3163 | 95% KM (Percentile Bootstrap) UCL | | | | | 0.808 | 95% GROS Approximate Gamma UCL | | | | | 0.772 |
| 3164 | 95% Approximate Gamma KM-UCL | | | | | 0.821 | | | | | | |
| 3165 | | | | | | | | | | | | |
| 3166 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 3167 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 3168 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 3169 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 3170 | | | | | | | | | | | | |
| 3171 | **Yttrium** | | | | | | | | | | | |
| 3172 | | | | | | | | | | | | |
| 3173 | **General Statistics** | | | | | | | | | | | |
| 3174 | Total Number of Observations | | | | | 136 | Number of Distinct Observations | | | | | 53 |
| 3175 | Number of Detects | | | | | 52 | Number of Non-Detects | | | | | 84 |
| 3176 | Number of Distinct Detects | | | | | 52 | Number of Distinct Non-Detects | | | | | 1 |
| 3177 | Minimum Detect | | | | | 0.0307 | Minimum Non-Detect | | | | | 0.5 |
| 3178 | Maximum Detect | | | | | 2.74 | Maximum Non-Detect | | | | | 0.5 |
| 3179 | Variance Detects | | | | | 0.355 | Percent Non-Detects | | | | | 61.76% |
| 3180 | Mean Detects | | | | | 0.357 | SD Detects | | | | | 0.596 |
| 3181 | Median Detects | | | | | 0.104 | CV Detects | | | | | 1.668 |
| 3182 | Skewness Detects | | | | | 2.9 | Kurtosis Detects | | | | | 8.812 |
| 3183 | Mean of Logged Detects | | | | | -1.893 | SD of Logged Detects | | | | | 1.231 |
| 3184 | | | | | | | | | | | | |
| 3185 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 3186 | Shapiro Wilk Test Statistic | | | | | 0.578 | **Normal GOF Test on Detected Observations Only** | | | | | |
| 3187 | 5% Shapiro Wilk P Value | | | | | 0 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 3188 | Lilliefors Test Statistic | | | | | 0.299 | **Lilliefors GOF Test** | | | | | |
| 3189 | 5% Lilliefors Critical Value | | | | | 0.123 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 3190 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 3191 | | | | | | | | | | | | |
| 3192 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 3193 | Mean | | | | | 0.214 | Standard Error of Mean | | | | | 0.0363 |
| 3194 | SD | | | | | 0.391 | 95% KM (BCA) UCL | | | | | 0.274 |
| 3195 | 95% KM (t) UCL | | | | | 0.274 | 95% KM (Percentile Bootstrap) UCL | | | | | 0.279 |
| 3196 | 95% KM (z) UCL | | | | | 0.274 | 95% KM Bootstrap t UCL | | | | | 0.298 |
| 3197 | 90% KM Chebyshev UCL | | | | | 0.323 | 95% KM Chebyshev UCL | | | | | 0.373 |
| 3198 | 97.5% KM Chebyshev UCL | | | | | 0.441 | 99% KM Chebyshev UCL | | | | | 0.576 |
| 3199 | | | | | | | | | | | | |
| 3200 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3201 | | | | | A-D Test Statistic | 3.281 | Anderson-Darling GOF Test | | | | | |
| 3202 | | | | | 5% A-D Critical Value | 0.797 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 3203 | | | | | K-S Test Statistic | 0.223 | Kolmogrov-Smirnoff GOF | | | | | |
| 3204 | | | | | 5% K-S Critical Value | 0.129 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 3205 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | | | | | | | |
| 3206 | | | | | | | | | | | | |
| 3207 | Gamma Statistics on Detected Data Only | | | | | | | | | | | |
| 3208 | | | | | k hat (MLE) | 0.7 | k star (bias corrected MLE) | | | | | 0.672 |
| 3209 | | | | | Theta hat (MLE) | 0.51 | Theta star (bias corrected MLE) | | | | | 0.531 |
| 3210 | | | | | nu hat (MLE) | 72.78 | nu star (bias corrected) | | | | | 69.91 |
| 3211 | | | | | MLE Mean (bias corrected) | 0.357 | MLE Sd (bias corrected) | | | | | 0.436 |
| 3212 | | | | | | | | | | | | |
| 3213 | Gamma Kaplan-Meier (KM) Statistics | | | | | | | | | | | |
| 3214 | | | | | k hat (KM) | 0.3 | nu hat (KM) | | | | | 81.49 |
| 3215 | | | | | Approximate Chi Square Value (81.49, α) | 61.69 | Adjusted Chi Square Value (81.49, β) | | | | | 61.5 |
| 3216 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.283 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 0.284 |
| 3217 | | | | | | | | | | | | |
| 3218 | Gamma ROS Statistics using Imputed Non-Detects | | | | | | | | | | | |
| 3219 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 3220 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 3221 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 3222 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 3223 | | | | | Minimum | 0.01 | Mean | | | | | 0.24 |
| 3224 | | | | | Maximum | 2.74 | Median | | | | | 0.0859 |
| 3225 | | | | | SD | 0.415 | CV | | | | | 1.728 |
| 3226 | | | | | k hat (MLE) | 0.562 | k star (bias corrected MLE) | | | | | 0.554 |
| 3227 | | | | | Theta hat (MLE) | 0.428 | Theta star (bias corrected MLE) | | | | | 0.434 |
| 3228 | | | | | nu hat (MLE) | 152.7 | nu star (bias corrected) | | | | | 150.7 |
| 3229 | | | | | MLE Mean (bias corrected) | 0.24 | MLE Sd (bias corrected) | | | | | 0.323 |
| 3230 | | | | | | | Adjusted Level of Significance (β) | | | | | 0.0482 |
| 3231 | | | | | Approximate Chi Square Value (150.70, α) | 123.3 | Adjusted Chi Square Value (150.70, β) | | | | | 123.1 |
| 3232 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.294 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 0.294 |
| 3233 | | | | | | | | | | | | |
| 3234 | Lognormal GOF Test on Detected Observations Only | | | | | | | | | | | |
| 3235 | | | | | Lilliefors Test Statistic | 0.148 | Lilliefors GOF Test | | | | | |
| 3236 | | | | | 5% Lilliefors Critical Value | 0.123 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 3237 | Detected Data Not Lognormal at 5% Significance Level | | | | | | | | | | | |
| 3238 | | | | | | | | | | | | |
| 3239 | Lognormal ROS Statistics Using Imputed Non-Detects | | | | | | | | | | | |
| 3240 | | | | | Mean in Original Scale | 0.225 | Mean in Log Scale | | | | | -2.156 |
| 3241 | | | | | SD in Original Scale | 0.392 | SD in Log Scale | | | | | 1.068 |
| 3242 | | | | | 95% t UCL (assumes normality of ROS data) | 0.28 | 95% Percentile Bootstrap UCL | | | | | 0.283 |
| 3243 | | | | | 95% BCA Bootstrap UCL | 0.297 | 95% Bootstrap t UCL | | | | | 0.309 |
| 3244 | | | | | 95% H-UCL (Log ROS) | 0.252 | | | | | | |
| 3245 | | | | | | | | | | | | |
| 3246 | DL/2 Statistics | | | | | | | | | | | |
| 3247 | DL/2 Normal | | | | | | DL/2 Log-Transformed | | | | | |
| 3248 | | | | | Mean in Original Scale | 0.291 | Mean in Log Scale | | | | | -1.58 |
| 3249 | | | | | SD in Original Scale | 0.37 | SD in Log Scale | | | | | 0.796 |
| 3250 | | | | | 95% t UCL (Assumes normality) | 0.343 | 95% H-Stat UCL | | | | | 0.325 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3251 | DL/2 is not a recommended method, provided for comparisons and historical reasons | | | | | | | | | | | |
| 3252 | | | | | | | | | | | | |
| 3253 | Nonparametric Distribution Free UCL Statistics | | | | | | | | | | | |
| 3254 | Data do not follow a Discernible Distribution at 5% Significance Level | | | | | | | | | | | |
| 3255 | | | | | | | | | | | | |
| 3256 | Suggested UCL to Use | | | | | | | | | | | |
| 3257 | | | | | 95% KM (BCA) UCL | 0.274 | | | | | | |
| 3258 | | | | | | | | | | | | |
| 3259 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 3260 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 3261 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 3262 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 3263 | | | | | | | | | | | | |
| 3264 | Zinc | | | | | | | | | | | |
| 3265 | | | | | | | | | | | | |
| 3266 | General Statistics | | | | | | | | | | | |
| 3267 | | | | | Total Number of Observations | 136 | Number of Distinct Observations | | | | 115 | |
| 3268 | | | | | Number of Detects | 129 | Number of Non-Detects | | | | 7 | |
| 3269 | | | | | Number of Distinct Detects | 113 | Number of Distinct Non-Detects | | | | 2 | |
| 3270 | | | | | Minimum Detect | 2.3 | Minimum Non-Detect | | | | 2 | |
| 3271 | | | | | Maximum Detect | 440 | Maximum Non-Detect | | | | 3 | |
| 3272 | | | | | Variance Detects | 4747 | Percent Non-Detects | | | | 5.147% | |
| 3273 | | | | | Mean Detects | 40.51 | SD Detects | | | | 68.9 | |
| 3274 | | | | | Median Detects | 15.7 | CV Detects | | | | 1.701 | |
| 3275 | | | | | Skewness Detects | 3.613 | Kurtosis Detects | | | | 14.5 | |
| 3276 | | | | | Mean of Logged Detects | 2.95 | SD of Logged Detects | | | | 1.15 | |
| 3277 | | | | | | | | | | | | |
| 3278 | Normal GOF Test on Detects Only | | | | | | | | | | | |
| 3279 | | | | | Shapiro Wilk Test Statistic | 0.541 | Normal GOF Test on Detected Observations Only | | | | | |
| 3280 | | | | | 5% Shapiro Wilk P Value | 0 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 3281 | | | | | Lilliefors Test Statistic | 0.29 | Lilliefors GOF Test | | | | | |
| 3282 | | | | | 5% Lilliefors Critical Value | 0.078 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 3283 | Detected Data Not Normal at 5% Significance Level | | | | | | | | | | | |
| 3284 | | | | | | | | | | | | |
| 3285 | Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs | | | | | | | | | | | |
| 3286 | | | | | Mean | 38.54 | Standard Error of Mean | | | | 5.8 | |
| 3287 | | | | | SD | 67.38 | 95% KM (BCA) UCL | | | | 49.32 | |
| 3288 | | | | | 95% KM (t) UCL | 48.15 | 95% KM (Percentile Bootstrap) UCL | | | | 47.59 | |
| 3289 | | | | | 95% KM (z) UCL | 48.08 | 95% KM Bootstrap t UCL | | | | 50.85 | |
| 3290 | | | | | 90% KM Chebyshev UCL | 55.94 | 95% KM Chebyshev UCL | | | | 63.82 | |
| 3291 | | | | | 97.5% KM Chebyshev UCL | 74.76 | 99% KM Chebyshev UCL | | | | 96.25 | |
| 3292 | | | | | | | | | | | | |
| 3293 | Gamma GOF Tests on Detected Observations Only | | | | | | | | | | | |
| 3294 | | | | | A-D Test Statistic | 5.279 | Anderson-Darling GOF Test | | | | | |
| 3295 | | | | | 5% A-D Critical Value | 0.793 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 3296 | | | | | K-S Test Statistic | 0.158 | Kolmogrov-Smirnoff GOF | | | | | |
| 3297 | | | | | 5% K-S Critical Value | 0.0851 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 3298 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | | | | | | | |
| 3299 | | | | | | | | | | | | |
| 3300 | Gamma Statistics on Detected Data Only | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3301 | | | | | k hat (MLE) | 0.791 | | | | | k star (bias corrected MLE) | 0.777 |
| 3302 | | | | | Theta hat (MLE) | 51.24 | | | | | Theta star (bias corrected MLE) | 52.11 |
| 3303 | | | | | nu hat (MLE) | 204 | | | | | nu star (bias corrected) | 200.6 |
| 3304 | | | | | MLE Mean (bias corrected) | 40.51 | | | | | MLE Sd (bias corrected) | 45.95 |
| 3305 | | | | | | | | | | | | |
| 3306 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 3307 | | | | | k hat (KM) | 0.327 | | | | | nu hat (KM) | 88.99 |
| 3308 | | | | | Approximate Chi Square Value (88.99, α) | 68.24 | | | | | Adjusted Chi Square Value (88.99, β) | 68.04 |
| 3309 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 50.26 | | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | 50.4 |
| 3310 | | | | | | | | | | | | |
| 3311 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 3312 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 3313 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 3314 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 3315 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 3316 | | | | | Minimum | 0.01 | | | | | Mean | 38.43 |
| 3317 | | | | | Maximum | 440 | | | | | Median | 14.3 |
| 3318 | | | | | SD | 67.69 | | | | | CV | 1.761 |
| 3319 | | | | | k hat (MLE) | 0.572 | | | | | k star (bias corrected MLE) | 0.564 |
| 3320 | | | | | Theta hat (MLE) | 67.18 | | | | | Theta star (bias corrected MLE) | 68.1 |
| 3321 | | | | | nu hat (MLE) | 155.6 | | | | | nu star (bias corrected) | 153.5 |
| 3322 | | | | | MLE Mean (bias corrected) | 38.43 | | | | | MLE Sd (bias corrected) | 51.16 |
| 3323 | | | | | | | | | | | Adjusted Level of Significance (β) | 0.0482 |
| 3324 | | | | | Approximate Chi Square Value (153.49, α) | 125.9 | | | | | Adjusted Chi Square Value (153.49, β) | 125.6 |
| 3325 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 46.87 | | | | | 95% Gamma Adjusted UCL (use when n<50) | 46.97 |
| 3326 | | | | | | | | | | | | |
| 3327 | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | | |
| 3328 | | | | | Lilliefors Test Statistic | 0.0854 | **Lilliefors GOF Test** | | | | | |
| 3329 | | | | | 5% Lilliefors Critical Value | 0.078 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 3330 | | | | | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | |
| 3331 | | | | | | | | | | | | |
| 3332 | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | |
| 3333 | | | | | Mean in Original Scale | 38.5 | | | | | Mean in Log Scale | 2.814 |
| 3334 | | | | | SD in Original Scale | 67.65 | | | | | SD in Log Scale | 1.266 |
| 3335 | | | | | 95% t UCL (assumes normality of ROS data) | 48.11 | | | | | 95% Percentile Bootstrap UCL | 48.08 |
| 3336 | | | | | 95% BCA Bootstrap UCL | 50.16 | | | | | 95% Bootstrap t UCL | 50.87 |
| 3337 | | | | | 95% H-UCL (Log ROS) | 48.56 | | | | | | |
| 3338 | | | | | | | | | | | | |
| 3339 | | | | | **DL/2 Statistics** | | | | | | | |
| 3340 | | | | | **DL/2 Normal** | | **DL/2 Log-Transformed** | | | | | |
| 3341 | | | | | Mean in Original Scale | 38.49 | | | | | Mean in Log Scale | 2.81 |
| 3342 | | | | | SD in Original Scale | 67.65 | | | | | SD in Log Scale | 1.272 |
| 3343 | | | | | 95% t UCL (Assumes normality) | 48.1 | | | | | 95% H-Stat UCL | 48.84 |
| 3344 | | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | |
| 3345 | | | | | | | | | | | | |
| 3346 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 3347 | | | | | **Data do not follow a Discernible Distribution at 5% Significance Level** | | | | | | | |
| 3348 | | | | | | | | | | | | |
| 3349 | | | | | **Suggested UCL to Use** | | | | | | | |
| 3350 | | | | | 95% KM (Chebyshev) UCL | 63.82 | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3351 | | | | | | | | | | | | |
| 3352 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 3353 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 3354 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 3355 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 3356 | | | | | | | | | | | | |

From File: PAH Input.wst

## Summary Statistics for Raw Full Data Sets

| Variable | NumObs | Minimum | Maximum | Mean | Median | Variance | SD | MAD/0.675 | Skewness | Kurtosis | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_Acenaphthene | 1 | 0.745 | 0.745 | 0.745 | 0.745 | N/A | N/A | 0 | N/A | N/A | N/A |
| LnROS_Acenaphthylene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Acridine | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Anthracene | 1 | 0.104 | 0.104 | 0.104 | 0.104 | N/A | N/A | 0 | N/A | N/A | N/A |
| ROS_Benz(a)anthracene | 1 | 0.098 | 0.098 | 0.098 | 0.098 | N/A | N/A | 0 | N/A | N/A | N/A |
| LnROS_Benzo(a)pyrene | 32 | 0.0000301 | 0.025 | 0.00221 | 0.0006727 | 2.221E-05 | 0.00471 | 0.0008284 | 4.092 | 18.6 | 2.133 |
| S_Benzo(b)fluoranthene | 1 | 0.062 | 0.062 | 0.062 | 0.062 | N/A | N/A | 0 | N/A | N/A | N/A |
| OS_Benzo(g,h,i)perylene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| S_Benzo(k)fluoranthene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Chrysene | 1 | 0.057 | 0.057 | 0.057 | 0.057 | N/A | N/A | 0 | N/A | N/A | N/A |
| _Dibenz(a,h)anthracene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Fluoranthene | 1 | 0.703 | 0.703 | 0.703 | 0.703 | N/A | N/A | 0 | N/A | N/A | N/A |
| LnROS_Fluorene | 1 | 0.499 | 0.499 | 0.499 | 0.499 | N/A | N/A | 0 | N/A | N/A | N/A |
| _Indeno(1,2,3-c,d)pyrene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Naphthalene | 32 | 0.0005327 | 0.121 | 0.0145 | 0.00642 | 0.0005519 | 0.0235 | 0.0068 | 3.486 | 14 | 1.615 |
| LnROS_Phenanthrene | 32 | 2.879E-19 | 1.78 | 0.0576 | 3.138E-10 | 0.0989 | 0.314 | 4.653E-10 | 5.646 | 31.92 | 5.464 |
| LnROS_Pyrene | 1 | 0.534 | 0.534 | 0.534 | 0.534 | N/A | N/A | 0 | N/A | N/A | N/A |
| LnROS_Quinoline | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Total PAHs | 1 | 4.72 | 4.72 | 4.72 | 4.72 | N/A | N/A | 0 | N/A | N/A | N/A |

## Percentiles for Raw Full Data Sets

| Variable | NumObs | 5%ile | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | 99%ile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_Acenaphthene | 1 | 0.745 | 0.745 | 0.745 | 0.745 | 0.745 | 0.745 | 0.745 | 0.745 | 0.745 | 0.745 |
| LnROS_Acenaphthylene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Acridine | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Anthracene | 1 | 0.104 | 0.104 | 0.104 | 0.104 | 0.104 | 0.104 | 0.104 | 0.104 | 0.104 | 0.104 |
| ROS_Benz(a)anthracene | 1 | 0.098 | 0.098 | 0.098 | 0.098 | 0.098 | 0.098 | 0.098 | 0.098 | 0.098 | 0.098 |
| LnROS_Benzo(a)pyrene | 32 | 6.519E-05 | 0.0001032 | 0.0001968 | 0.0002555 | 0.0006727 | 0.00177 | 0.0023 | 0.00439 | 0.00822 | 0.0207 |
| S_Benzo(b)fluoranthene | 1 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 |
| OS_Benzo(g,h,i)perylene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| S_Benzo(k)fluoranthene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Chrysene | 1 | 0.057 | 0.057 | 0.057 | 0.057 | 0.057 | 0.057 | 0.057 | 0.057 | 0.057 | 0.057 |
| _Dibenz(a,h)anthracene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Fluoranthene | 1 | 0.703 | 0.703 | 0.703 | 0.703 | 0.703 | 0.703 | 0.703 | 0.703 | 0.703 | 0.703 |
| LnROS_Fluorene | 1 | 0.499 | 0.499 | 0.499 | 0.499 | 0.499 | 0.499 | 0.499 | 0.499 | 0.499 | 0.499 |
| _Indeno(1,2,3-c,d)pyrene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Naphthalene | 32 | 0.000985 | 0.00142 | 0.00238 | 0.00292 | 0.00642 | 0.0149 | 0.0183 | 0.0305 | 0.0497 | 0.103 |
| LnROS_Phenanthrene | 32 | 6.741E-17 | 9.747E-16 | 5.981E-14 | 3.054E-13 | 3.138E-10 | 3.276E-07 | 1.658E-06 | 0.0001015 | 0.0278 | 1.247 |
| LnROS_Pyrene | 1 | 0.534 | 0.534 | 0.534 | 0.534 | 0.534 | 0.534 | 0.534 | 0.534 | 0.534 | 0.534 |
| LnROS_Quinoline | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Total PAHs | 1 | 4.72 | 4.72 | 4.72 | 4.72 | 4.72 | 4.72 | 4.72 | 4.72 | 4.72 | 4.72 |

## General UCL Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| From File | PAH Input.wst |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

### Acenaphthene

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 1 |
| Number of Distinct Detected Data | 1 | Number of Non-Detect Data | 31 |
| | | Percent Non-Detects | 96.88% |

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 Acenaphthene was not processed!

### Acenaphthylene

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 32 |
| | | 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 Acenaphthylene was not processed!

### Acridine

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 32 |
| | | 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 Acridine was not processed!

### Anthracene

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 1 |
| Number of Distinct Detected Data | 1 | Number of Non-Detect Data | 31 |

| | |
|---|---|
| Percent Non-Detects | 96.88% |

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 Anthracene was not processed!

Benz(a)anthracene

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 1 |
| Number of Distinct Detected Data | 1 | Number of Non-Detect Data | 31 |
| | | Percent Non-Detects | 96.88% |

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 Benz(a)anthracene was not processed!

Benzo(a)pyrene

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 2 |
| Number of Distinct Detected Data | 2 | Number of Non-Detect Data | 30 |
| | | Percent Non-Detects | 93.75% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.011 | Minimum Detected | -4.51 |
| Maximum Detected | 0.025 | Maximum Detected | -3.689 |
| Mean of Detected | 0.018 | Mean of Detected | -4.099 |
| SD of Detected | 0.0099 | SD of Detected | 0.581 |
| Minimum Non-Detect | 0.01 | Minimum Non-Detect | -4.605 |
| Maximum Non-Detect | 0.02 | Maximum Non-Detect | -3.912 |

| | | |
|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | Number treated as Non-Detect | 31 |
| For all methods (except KM, DL/2, and ROS Methods), | Number treated as Detected | 1 |
| Observations < Largest ND are treated as NDs | Single DL Non-Detect Percentage | 96.88% |

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

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 | |
|---|---|
| Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A |
| Data not Normal at 5% Significance Level | |

| Lognormal Distribution Test with Detected Values Only | |
|---|---|
| Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A |
| Data not Lognormal at 5% Significance Level | |

| Assuming Normal Distribution | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.00613 |
| SD | 0.00379 |
| 95% DL/2 (t) UCL | 0.00726 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |
| MLE method failed to converge properly | |

| Assuming Lognormal Distribution | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -5.18 |
| SD | 0.347 |
| 95% H-Stat (DL/2) UCL | 0.00669 |
| | |
| Log ROS Method | |
| Mean in Log Scale | N/A |
| SD in Log Scale | N/A |
| Mean in Original Scale | N/A |
| SD in Original Scale | N/A |
| 95% t UCL | N/A |
| 95% Percentile Bootstrap UCL | N/A |
| 95% BCA Bootstrap UCL | N/A |
| 95% H-UCL | N/A |

| Gamma Distribution Test with Detected Values Only | |
|---|---|
| k star (bias corrected) | N/A |
| Theta Star | N/A |
| nu star | N/A |
| | |
| A-D Test Statistic | N/A |
| 5% A-D Critical Value | N/A |
| K-S Test Statistic | N/A |
| 5% K-S Critical Value | N/A |
| Data not Gamma Distributed at 5% Significance Level | |

| Assuming Gamma Distribution | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | N/A |
| Maximum | N/A |
| Mean | N/A |
| Median | N/A |
| SD | N/A |
| k star | N/A |
| Theta star | N/A |
| Nu star | N/A |
| AppChi2 | N/A |
| 95% Gamma Approximate UCL (Use when n >= 40) | N/A |
| 95% Adjusted Gamma UCL (Use when n < 40) | N/A |

Note: DL/2 is not a recommended method.

| Data Distribution Test with Detected Values Only |
|---|
| Data do not follow a Discernable Distribution (0.05) |

| Nonparametric Statistics | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.0114 |
| SD | 0.00244 |
| SE of Mean | 0.000609 |
| 95% KM (t) UCL | 0.0125 |
| 95% KM (z) UCL | 0.0124 |
| 95% KM (jackknife) UCL | 0.0206 |
| 95% KM (bootstrap t) UCL | N/A |
| 95% KM (BCA) UCL | N/A |
| 95% KM (Percentile Bootstrap) UCL | 0.025 |
| 95% KM (Chebyshev) UCL | 0.0141 |
| 97.5% KM (Chebyshev) UCL | 0.0152 |
| 99% KM (Chebyshev) UCL | 0.0175 |
| | |
| Potential UCLs to Use | |
| 95% KM (t) UCL | 0.0125 |
| 95% KM (% Bootstrap) UCL | 0.025 |

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 | 32 | Number of Detected Data | 1 |
| Number of Distinct Detected Data | 1 | Number of Non-Detect Data | 31 |

| | |
|---|---|
| Percent Non-Detects | 96.88% |

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 Benzo(b)fluoranthene was not processed!

**Benzo(g,h,i)perylene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 32 |
| | | 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 Benzo(g,h,i)perylene was not processed!

**Benzo(k)fluoranthene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 32 |
| | | 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 Benzo(k)fluoranthene was not processed!

**Chrysene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 1 |
| Number of Distinct Detected Data | 1 | Number of Non-Detect Data | 31 |
| | | Percent Non-Detects | 96.88% |

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 Chrysene was not processed!

**Dibenz(a,h)anthracene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 0 |

| | | | |
|---|---|---|---|
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 32 |
| | | 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 Dibenz(a,h)anthracene was not processed!

**Fluoranthene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 1 |
| Number of Distinct Detected Data | 1 | Number of Non-Detect Data | 31 |
| | | Percent Non-Detects | 96.88% |

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 Fluoranthene was not processed!

**Fluorene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 1 |
| Number of Distinct Detected Data | 1 | Number of Non-Detect Data | 31 |
| | | Percent Non-Detects | 96.88% |

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 Fluorene was not processed!

**Indeno(1,2,3-c,d)pyrene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 32 |
| | | 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 Indeno(1,2,3-c,d)pyrene was not processed!

**Naphthalene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 2 |
| Number of Distinct Detected Data | 2 | Number of Non-Detect Data | 30 |
| | | Percent Non-Detects | 93.75% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.063 | Minimum Detected | -2.765 |
| Maximum Detected | 0.121 | Maximum Detected | -2.112 |
| Mean of Detected | 0.092 | Mean of Detected | -2.438 |
| SD of Detected | 0.041 | SD of Detected | 0.461 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.1 | Maximum Non-Detect | -2.303 |

| | | |
|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | Number treated as Non-Detect | 31 |
| For all methods (except KM, DL/2, and ROS Methods), | Number treated as Detected | 1 |
| Observations < Largest ND are treated as NDs | Single DL Non-Detect Percentage | 96.88% |

**Warning: Data set has only 2 Distinct Detected Values.**

**This may not be adequate enough to compute meaningful and reliable test statistics and estimates.**

**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**

**Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.**

**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 | N/A | Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A | 5% Shapiro Wilk Critical Value | N/A |
| **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 | 0.03 | Mean | -3.589 |
| SD | 0.0184 | SD | 0.336 |
| 95% DL/2 (t) UCL | 0.0355 | 95% H-Stat (DL/2) UCL | 0.0326 |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| **MLE method failed to converge properly** | | Mean in Log Scale | N/A |
| | | SD in Log Scale | N/A |
| | | Mean in Original Scale | N/A |
| | | SD in Original Scale | N/A |
| | | 95% t UCL | N/A |
| | | 95% Percentile Bootstrap UCL | N/A |
| | | 95% BCA Bootstrap UCL | N/A |
| | | 95% H-UCL | N/A |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | N/A | **Data do not follow a Discernable Distribution (0.05)** |
| Theta Star | N/A | |
| nu star | N/A | |

| | |
|---|---|
| A-D Test Statistic | N/A |
| 5% A-D Critical Value | N/A |
| K-S Test Statistic | N/A |
| 5% K-S Critical Value | N/A |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | N/A |
| Maximum | N/A |
| Mean | N/A |
| Median | N/A |
| SD | N/A |
| k star | N/A |
| Theta star | N/A |
| Nu star | N/A |
| AppChi2 | N/A |
| 95% Gamma Approximate UCL (Use when n >= 40) | N/A |
| 95% Adjusted Gamma UCL (Use when n < 40) | N/A |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

Kaplan-Meier (KM) Method

| | |
|---|---|
| Mean | 0.0648 |
| SD | 0.0101 |
| SE of Mean | 0.00252 |
| 95% KM (t) UCL | 0.0691 |
| 95% KM (z) UCL | 0.069 |
| 95% KM (jackknife) UCL | 0.103 |
| 95% KM (bootstrap t) UCL | 0.0648 |
| 95% KM (BCA) UCL | N/A |
| 95% KM (Percentile Bootstrap) UCL | 0.121 |
| 95% KM (Chebyshev) UCL | 0.0758 |
| 97.5% KM (Chebyshev) UCL | 0.0806 |
| 99% KM (Chebyshev) UCL | 0.0899 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.0691 |
| 95% KM (% Bootstrap) UCL | 0.121 |

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.

**Phenanthrene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 2 |
| Number of Distinct Detected Data | 2 | Number of Non-Detect Data | 30 |
| | | Percent Non-Detects | 93.75% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.061 | Minimum Detected | -2.797 |
| Maximum Detected | 1.78 | Maximum Detected | 0.577 |
| Mean of Detected | 0.921 | Mean of Detected | -1.11 |
| SD of Detected | 1.216 | SD of Detected | 2.385 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.05 | Maximum Non-Detect | -2.996 |

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

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**

| | |
|---|---|
| Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A |

Data not Normal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.081 |
| SD | 0.31 |
| 95% DL/2 (t) UCL | 0.174 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE method failed to converge properly**

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A |

Data not Lognormal at 5% Significance Level

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -3.528 |
| SD | 0.765 |
| 95% H-Stat (DL/2) UCL | 0.0531 |
| | |
| Log ROS Method | |
| Mean in Log Scale | N/A |
| SD in Log Scale | N/A |
| Mean in Original Scale | N/A |
| SD in Original Scale | N/A |
| 95% t UCL | N/A |
| 95% Percentile Bootstrap UCL | N/A |
| 95% BCA Bootstrap UCL | N/A |
| 95% H-UCL | N/A |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | N/A |
| Theta Star | N/A |
| nu star | N/A |
| | |
| A-D Test Statistic | N/A |
| 5% A-D Critical Value | N/A |
| K-S Test Statistic | N/A |
| 5% K-S Critical Value | N/A |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | N/A |
| Maximum | N/A |
| Mean | N/A |
| Median | N/A |
| SD | N/A |
| k star | N/A |
| Theta star | N/A |
| Nu star | N/A |
| AppChi2 | N/A |
| 95% Gamma Approximate UCL (Use when n >= 40) | N/A |
| 95% Adjusted Gamma UCL (Use when n < 40) | N/A |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.115 |
| SD | 0.299 |
| SE of Mean | 0.0748 |
| 95% KM (t) UCL | 0.241 |
| 95% KM (z) UCL | 0.238 |
| 95% KM (jackknife) UCL | N/A |
| 95% KM (bootstrap t) UCL | N/A |
| 95% KM (BCA) UCL | N/A |
| 95% KM (Percentile Bootstrap) UCL | N/A |
| 95% KM (Chebyshev) UCL | 0.441 |
| 97.5% KM (Chebyshev) UCL | 0.582 |
| 99% KM (Chebyshev) UCL | 0.859 |
| | |
| **Potential UCLs to Use** | |
| 99% KM (Chebyshev) UCL | 0.859 |

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.

**Pyrene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 1 |
| Number of Distinct Detected Data | 1 | Number of Non-Detect Data | 31 |

| | |
|---|---|
| Percent Non-Detects | 96.88% |

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 Pyrene was not processed!

**Quinoline**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 32 |
| | | 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 Quinoline was not processed!

**Total PAHs**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 1 |
| Number of Distinct Detected Data | 1 | Number of Non-Detect Data | 31 |
| | | Percent Non-Detects | 96.88% |

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 Total PAHs was not processed!

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General Statistics on Uncensored Full Data | | | | | | | | |
| 2 | | Date/Time of Computation | | 9/24/2015 10:53:30 AM | | | | | | | | |
| 3 | | User Selected Options | | | | | | | | | | |
| 4 | | | From File | PW_WB_Current_Rec_Metals_Input.xls | | | | | | | | |
| 5 | | | Full Precision | OFF | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | From File: PW_WB_Current_Rec_Metals_Input.xls | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 9 | General Statistics for Uncensored Data Sets | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 11 | Variable | NumObs | # Missing | Minimum | Maximum | Mean | SD | SEM | MAD/0.675 | Skewness | Kurtosis | |
| 12 | LnROS_Aluminum | 20 | 0 | 1.531 | 16 | 5.783 | 3.676 | 0.822 | 3.112 | 1.295 | 1.756 | |
| 13 | LnROS_Antimony | 20 | 0 | 1.000E-10 | 0.132 | 0.0066 | 0.0295 | 0.0066 | 0 | 4.472 | 20 | |
| 14 | LnROS_Arsenic | 20 | 0 | 1.000E-10 | 0.6 | 0.03 | 0.134 | 0.03 | 0 | 4.472 | 20 | |
| 15 | LnROS_Barium | 20 | 0 | 2.14 | 223 | 81.2 | 71.69 | 16.03 | 47.96 | 0.743 | -1.007 | |
| 16 | LnROS_Boron | 20 | 0 | 664 | 3090 | 2015 | 525.9 | 117.6 | 289.1 | -0.318 | 1.651 | |
| 17 | LnROS_Cadmium | 20 | 0 | 0.0154 | 0.291 | 0.104 | 0.082 | 0.0183 | 0.0567 | 0.841 | -0.325 | |
| 18 | LnROS_Calcium | 20 | 0 | 15700 | 323000 | 212435 | 73370 | 16406 | 53373 | -1.062 | 1.536 | |
| 19 | LnROS_Cesium | 20 | 0 | 1.000E-10 | 0.014 | 7.0000E-4 | 0.00313 | 7.0000E-4 | 0 | 4.472 | 20 | |
| 20 | LnROS_Chromium | 20 | 0 | 1.000E-10 | 0.99 | 0.0495 | 0.221 | 0.0495 | 0 | 4.472 | 20 | |
| 21 | LnROS_Cobalt | 20 | 0 | 0.00227 | 11.5 | 1.605 | 2.849 | 0.637 | 0.19 | 2.546 | 7.34 | |
| 22 | LnROS_Copper | 20 | 0 | 0.209 | 2.67 | 1.057 | 0.725 | 0.162 | 0.652 | 0.927 | 0.0436 | |
| 23 | LnROS_Iron | 20 | 0 | 0.0436 | 1930 | 139.7 | 433.7 | 96.98 | 11.59 | 4.106 | 17.46 | |
| 24 | LnROS_Lithium | 20 | 0 | 21.7 | 91 | 67.89 | 16.73 | 3.741 | 17.79 | -1.083 | 1.67 | |
| 25 | LnROS_Magnesium | 20 | 0 | 37100 | 726000 | 503205 | 166405 | 37209 | 124537 | -1.173 | 2.039 | |
| 26 | LnROS_Manganese | 20 | 0 | 0.23 | 13900 | 3362 | 5190 | 1161 | 7.494 | 1.304 | 0.178 | |
| 27 | LnROS_Molybdenum | 20 | 0 | 3.6 | 61.7 | 16.38 | 18.33 | 4.098 | 1.557 | 1.516 | 1.282 | |
| 28 | LnROS_Nickel | 20 | 0 | 0.319 | 33 | 5.681 | 7.571 | 1.693 | 3.514 | 2.772 | 8.994 | |
| 29 | LnROS_Potassium | 20 | 0 | 31700 | 216000 | 148685 | 41642 | 9311 | 31134 | -0.964 | 2.211 | |
| 30 | LnROS_Rubidium | 20 | 0 | 9.4 | 58.1 | 39.77 | 12.03 | 2.69 | 11.56 | -0.8 | 0.46 | |
| 31 | LnROS_Silicon | 20 | 0 | 2390 | 4960 | 3468 | 625.2 | 139.8 | 600.4 | 0.678 | 0.395 | |
| 32 | LnROS_Sodium | 20 | 0 | 593000 | 6160000 | 4313150 | 1254690 | 280557 | 756116 | -1.418 | 3.06 | |
| 33 | LnROS_Strontium | 20 | 0 | 201 | 5140 | 3478 | 1231 | 275.3 | 837.7 | -1.143 | 1.461 | |
| 34 | LnROS_Thallium | 20 | 0 | 3.5265E-5 | 0.233 | 0.0215 | 0.0537 | 0.012 | 0.00279 | 3.608 | 13.96 | |
| 35 | LnROS_Uranium | 20 | 0 | 0.46 | 5.38 | 2.674 | 1.462 | 0.327 | 1.505 | 0.411 | -1.061 | |
| 36 | LnROS_Vanadium | 20 | 0 | 0.131 | 1.19 | 0.487 | 0.303 | 0.0677 | 0.224 | 0.995 | 0.045 | |
| 37 | LnROS_Yttrium | 20 | 0 | 1.000E-10 | 0.044 | 0.0022 | 0.00984 | 0.0022 | 0 | 4.472 | 20 | |
| 38 | LnROS_Zinc | 20 | 0 | 4.8 | 579 | 70.15 | 133.2 | 29.79 | 19.27 | 3.302 | 12.02 | |
| 39 | | | | | | | | | | | | |
| 40 | Percentiles for Uncensored Data Sets | | | | | | | | | | | |
| 41 | | | | | | | | | | | | |
| 42 | Variable | NumObs | # Missing | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | |
| 43 | LnROS_Aluminum | 20 | 0 | 2.256 | 2.842 | 3.125 | 4.781 | 7.9 | 7.9 | 10.67 | 11.54 | |
| 44 | LnROS_Antimony | 20 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 0.0066 | |
| 45 | LnROS_Arsenic | 20 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 0.03 | |
| 46 | LnROS_Barium | 20 | 0 | 14.52 | 24.54 | 26.68 | 45.75 | 148 | 156.2 | 187.2 | 190.7 | |
| 47 | LnROS_Boron | 20 | 0 | 1534 | 1734 | 1845 | 1985 | 2223 | 2430 | 2586 | 2834 | |
| 48 | LnROS_Cadmium | 20 | 0 | 0.0262 | 0.0359 | 0.0409 | 0.0566 | 0.154 | 0.171 | 0.203 | 0.246 | |
| 49 | LnROS_Calcium | 20 | 0 | 114600 | 177400 | 197250 | 221000 | 260250 | 267600 | 284500 | 307800 | |
| 50 | LnROS_Cesium | 20 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 7.0000E-4 | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | LnROS_Chromium | | 20 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 0.0495 |
| 52 | LnROS_Cobalt | | 20 | 0 | 0.011 | 0.0208 | 0.0279 | 0.137 | 2.068 | 2.42 | 4.9 | 5.316 |
| 53 | LnROS_Copper | | 20 | 0 | 0.324 | 0.476 | 0.523 | 0.92 | 1.433 | 1.614 | 2.066 | 2.49 |
| 54 | LnROS_Iron | | 20 | 0 | 0.256 | 0.732 | 1.129 | 8.016 | 41.5 | 51.6 | 226.2 | 509.8 |
| 55 | LnROS_Lithium | | 20 | 0 | 46.9 | 58.8 | 60.5 | 73.5 | 78.25 | 79.2 | 86.3 | 89.1 |
| 56 | LnROS_Magnesium | | 20 | 0 | 290600 | 433800 | 463750 | 503500 | 592500 | 603400 | 701800 | 718400 |
| 57 | LnROS_Manganese | | 20 | 0 | 0.512 | 0.78 | 1.218 | 5.39 | 5435 | 6476 | 13350 | 13805 |
| 58 | LnROS_Molybdenum | | 20 | 0 | 4.29 | 4.34 | 4.388 | 5.3 | 21.8 | 29.86 | 40.16 | 57.14 |
| 59 | LnROS_Nickel | | 20 | 0 | 0.68 | 1.03 | 1.328 | 3.145 | 6 | 6.802 | 12.88 | 15.43 |
| 60 | LnROS_Potassium | | 20 | 0 | 101700 | 126400 | 129750 | 151000 | 170500 | 173000 | 199800 | 207450 |
| 61 | LnROS_Rubidium | | 20 | 0 | 25.92 | 29.88 | 32.43 | 43.55 | 48.43 | 48.88 | 51.52 | 52.88 |
| 62 | LnROS_Silicon | | 20 | 0 | 2886 | 2982 | 3008 | 3395 | 3848 | 3964 | 4115 | 4542 |
| 63 | LnROS_Sodium | | 20 | 0 | 2759000 | 3852000 | 3945000 | 4575000 | 4940000 | 5008000 | 5564000 | 5799000 |
| 64 | LnROS_Strontium | | 20 | 0 | 1836 | 2958 | 3148 | 3760 | 4178 | 4346 | 4902 | 4931 |
| 65 | LnROS_Thallium | | 20 | 0 | 1.5837E-4 | 3.8857E-4 | 5.6332E-4 | 0.00201 | 0.00988 | 0.0143 | 0.0589 | 0.0839 |
| 66 | LnROS_Uranium | | 20 | 0 | 1.186 | 1.452 | 1.52 | 2.335 | 3.793 | 4.404 | 4.732 | 4.782 |
| 67 | LnROS_Vanadium | | 20 | 0 | 0.193 | 0.243 | 0.267 | 0.398 | 0.6 | 0.77 | 0.961 | 0.981 |
| 68 | LnROS_Yttrium | | 20 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 0.0022 |
| 69 | LnROS_Zinc | | 20 | 0 | 5.17 | 7.56 | 9.05 | 20.05 | 47.98 | 92.92 | 154.8 | 242.7 |

| | M |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | **CV** |
| 12 | 0.636 |
| 13 | 4.472 |
| 14 | 4.472 |
| 15 | 0.883 |
| 16 | 0.261 |
| 17 | 0.788 |
| 18 | 0.345 |
| 19 | 4.472 |
| 20 | 4.472 |
| 21 | 1.774 |
| 22 | 0.686 |
| 23 | 3.104 |
| 24 | 0.246 |
| 25 | 0.331 |
| 26 | 1.544 |
| 27 | 1.119 |
| 28 | 1.333 |
| 29 | 0.28 |
| 30 | 0.303 |
| 31 | 0.18 |
| 32 | 0.291 |
| 33 | 0.354 |
| 34 | 2.493 |
| 35 | 0.547 |
| 36 | 0.622 |
| 37 | 4.472 |
| 38 | 1.899 |
| 39 | |
| 40 | |
| 41 | |
| 42 | **99%ile** |
| 43 | 15.11 |
| 44 | 0.107 |
| 45 | 0.486 |
| 46 | 216.5 |
| 47 | 3039 |
| 48 | 0.282 |
| 49 | 319960 |
| 50 | 0.0113 |

| | M |
|---|---|
| 51 | 0.802 |
| 52 | 10.26 |
| 53 | 2.634 |
| 54 | 1646 |
| 55 | 90.62 |
| 56 | 724480 |
| 57 | 13881 |
| 58 | 60.79 |
| 59 | 29.49 |
| 60 | 214290 |
| 61 | 57.06 |
| 62 | 4876 |
| 63 | 6087800 |
| 64 | 5098 |
| 65 | 0.203 |
| 66 | 5.26 |
| 67 | 1.148 |
| 68 | 0.0356 |
| 69 | 511.7 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **UCL Statistics for Data Sets with Non-Detects** | | | | | | | | | | | |
| 2 | | | | | | | | | | | | |
| 3 | User Selected Options | | | | | | | | | | | |
| 4 | Date/Time of Computation | | | 9/24/2015 10:54:13 AM | | | | | | | | |
| 5 | From File | | | PW_WB_Current_Rec_Metals_Input.xls | | | | | | | | |
| 6 | Full Precision | | | OFF | | | | | | | | |
| 7 | Confidence Coefficient | | | 95% | | | | | | | | |
| 8 | Number of Bootstrap Operations | | | 2000 | | | | | | | | |
| 9 | | | | | | | | | | | | |
| 10 | **Aluminum** | | | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| 12 | **General Statistics** | | | | | | | | | | | |
| 13 | Total Number of Observations | | | | | 20 | Number of Distinct Observations | | | | | 9 |
| 14 | Number of Detects | | | | | 10 | Number of Non-Detects | | | | | 10 |
| 15 | Number of Distinct Detects | | | | | 8 | Number of Distinct Non-Detects | | | | | 1 |
| 16 | Minimum Detect | | | | | 5.1 | Minimum Non-Detect | | | | | 5 |
| 17 | Maximum Detect | | | | | 16 | Maximum Non-Detect | | | | | 5 |
| 18 | Variance Detects | | | | | 10.84 | Percent Non-Detects | | | | | 50% |
| 19 | Mean Detects | | | | | 8.53 | SD Detects | | | | | 3.292 |
| 20 | Median Detects | | | | | 7.9 | CV Detects | | | | | 0.386 |
| 21 | Skewness Detects | | | | | 1.417 | Kurtosis Detects | | | | | 2.041 |
| 22 | Mean of Logged Detects | | | | | 2.085 | SD of Logged Detects | | | | | 0.349 |
| 23 | | | | | | | | | | | | |
| 24 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 25 | Shapiro Wilk Test Statistic | | | | | 0.865 | **Shapiro Wilk GOF Test** | | | | | |
| 26 | 5% Shapiro Wilk Critical Value | | | | | 0.842 | Detected Data appear Normal at 5% Significance Level | | | | | |
| 27 | Lilliefors Test Statistic | | | | | 0.276 | **Lilliefors GOF Test** | | | | | |
| 28 | 5% Lilliefors Critical Value | | | | | 0.28 | Detected Data appear Normal at 5% Significance Level | | | | | |
| 29 | **Detected Data appear Normal at 5% Significance Level** | | | | | | | | | | | |
| 30 | | | | | | | | | | | | |
| 31 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 32 | Mean | | | | | 6.765 | Standard Error of Mean | | | | | 0.666 |
| 33 | SD | | | | | 2.827 | 95% KM (BCA) UCL | | | | | 7.865 |
| 34 | 95% KM (t) UCL | | | | | 7.917 | 95% KM (Percentile Bootstrap) UCL | | | | | 7.835 |
| 35 | 95% KM (z) UCL | | | | | 7.861 | 95% KM Bootstrap t UCL | | | | | 8.528 |
| 36 | 90% KM Chebyshev UCL | | | | | 8.764 | 95% KM Chebyshev UCL | | | | | 9.67 |
| 37 | 97.5% KM Chebyshev UCL | | | | | 10.93 | 99% KM Chebyshev UCL | | | | | 13.4 |
| 38 | | | | | | | | | | | | |
| 39 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 40 | A-D Test Statistic | | | | | 0.394 | **Anderson-Darling GOF Test** | | | | | |
| 41 | 5% A-D Critical Value | | | | | 0.726 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 42 | K-S Test Statistic | | | | | 0.244 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 43 | 5% K-S Critical Value | | | | | 0.267 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 44 | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 45 | | | | | | | | | | | | |
| 46 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 47 | k hat (MLE) | | | | | 8.765 | k star (bias corrected MLE) | | | | | 6.202 |
| 48 | Theta hat (MLE) | | | | | 0.973 | Theta star (bias corrected MLE) | | | | | 1.375 |
| 49 | nu hat (MLE) | | | | | 175.3 | nu star (bias corrected) | | | | | 124 |
| 50 | MLE Mean (bias corrected) | | | | | 8.53 | MLE Sd (bias corrected) | | | | | 3.425 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | | | | | | | | | | | | |
| 52 | | | | | | Gamma Kaplan-Meier (KM) Statistics | | | | | | |
| 53 | | | | | k hat (KM) | 5.725 | | | | | nu hat (KM) | 229 |
| 54 | | | | | Approximate Chi Square Value (229.02, α) | 195 | | | | | Adjusted Chi Square Value (229.02, β) | 192.5 |
| 55 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 7.946 | | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | 8.048 |
| 56 | | | | | | | | | | | | |
| 57 | | | | | | Gamma ROS Statistics using Imputed Non-Detects | | | | | | |
| 58 | | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | |
| 59 | | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | |
| 60 | | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | |
| 61 | | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | |
| 62 | | | | | Minimum | 0.01 | | | | | Mean | 4.876 |
| 63 | | | | | Maximum | 16 | | | | | Median | 4.301 |
| 64 | | | | | SD | 4.476 | | | | | CV | 0.918 |
| 65 | | | | | k hat (MLE) | 0.489 | | | | | k star (bias corrected MLE) | 0.449 |
| 66 | | | | | Theta hat (MLE) | 9.964 | | | | | Theta star (bias corrected MLE) | 10.85 |
| 67 | | | | | nu hat (MLE) | 19.57 | | | | | nu star (bias corrected) | 17.97 |
| 68 | | | | | MLE Mean (bias corrected) | 4.876 | | | | | MLE Sd (bias corrected) | 7.274 |
| 69 | | | | | | | | | | | Adjusted Level of Significance (β) | 0.038 |
| 70 | | | | | Approximate Chi Square Value (17.97, α) | 9.37 | | | | | Adjusted Chi Square Value (17.97, β) | 8.881 |
| 71 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 9.351 | | | | | 95% Gamma Adjusted UCL (use when n<50) | 9.866 |
| 72 | | | | | | | | | | | | |
| 73 | | | | | | Lognormal GOF Test on Detected Observations Only | | | | | | |
| 74 | | | | | Shapiro Wilk Test Statistic | 0.943 | | | | | Shapiro Wilk GOF Test | |
| 75 | | | | | 5% Shapiro Wilk Critical Value | 0.842 | | | | | Detected Data appear Lognormal at 5% Significance Level | |
| 76 | | | | | Lilliefors Test Statistic | 0.221 | | | | | Lilliefors GOF Test | |
| 77 | | | | | 5% Lilliefors Critical Value | 0.28 | | | | | Detected Data appear Lognormal at 5% Significance Level | |
| 78 | | | | | | Detected Data appear Lognormal at 5% Significance Level | | | | | | |
| 79 | | | | | | | | | | | | |
| 80 | | | | | | Lognormal ROS Statistics Using Imputed Non-Detects | | | | | | |
| 81 | | | | | Mean in Original Scale | 5.783 | | | | | Mean in Log Scale | 1.573 |
| 82 | | | | | SD in Original Scale | 3.676 | | | | | SD in Log Scale | 0.624 |
| 83 | | | | | 95% t UCL (assumes normality of ROS data) | 7.204 | | | | | 95% Percentile Bootstrap UCL | 7.178 |
| 84 | | | | | 95% BCA Bootstrap UCL | 7.393 | | | | | 95% Bootstrap t UCL | 7.512 |
| 85 | | | | | 95% H-UCL (Log ROS) | 7.972 | | | | | | |
| 86 | | | | | | | | | | | | |
| 87 | | | | | | UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed | | | | | | |
| 88 | | | | | KM Mean (logged) | 1.847 | | | | | 95% H-UCL (KM -Log) | 7.743 |
| 89 | | | | | KM SD (logged) | 0.334 | | | | | 95% Critical H Value (KM-Log) | 1.876 |
| 90 | | | | | KM Standard Error of Mean (logged) | 0.0787 | | | | | | |
| 91 | | | | | | | | | | | | |
| 92 | | | | | | DL/2 Statistics | | | | | | |
| 93 | | | | | DL/2 Normal | | | | | | DL/2 Log-Transformed | |
| 94 | | | | | Mean in Original Scale | 5.515 | | | | | Mean in Log Scale | 1.501 |
| 95 | | | | | SD in Original Scale | 3.835 | | | | | SD in Log Scale | 0.646 |
| 96 | | | | | 95% t UCL (Assumes normality) | 6.998 | | | | | 95% H-Stat UCL | 7.627 |
| 97 | | | | | | DL/2 is not a recommended method, provided for comparisons and historical reasons | | | | | | |
| 98 | | | | | | | | | | | | |
| 99 | | | | | | Nonparametric Distribution Free UCL Statistics | | | | | | |
| 100 | | | | | | Detected Data appear Normal Distributed at 5% Significance Level | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 101 | | | | | | | | | | | | |
| 102 | | | | | | **Suggested UCL to Use** | | | | | | |
| 103 | | | | | 95% KM (t) UCL | 7.917 | | | | 95% KM (Percentile Bootstrap) UCL | | 7.835 |
| 104 | | | | | | | | | | | | |
| 105 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 106 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 107 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 108 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 109 | | | | | | | | | | | | |
| 110 | **Antimony** | | | | | | | | | | | |
| 111 | | | | | | | | | | | | |
| 112 | | | | | | **General Statistics** | | | | | | |
| 113 | | | | | Total Number of Observations | 20 | | | | Number of Distinct Observations | | 2 |
| 114 | | | | | Number of Detects | 1 | | | | Number of Non-Detects | | 19 |
| 115 | | | | | Number of Distinct Detects | 1 | | | | Number of Distinct Non-Detects | | 1 |
| 116 | | | | | | | | | | | | |
| 117 | | | | | **Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!** | | | | | | | |
| 118 | | | | | **It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).** | | | | | | | |
| 119 | | | | | | | | | | | | |
| 120 | | | | | **The data set for variable Antimony was not processed!** | | | | | | | |
| 121 | | | | | | | | | | | | |
| 122 | | | | | | | | | | | | |
| 123 | **Arsenic** | | | | | | | | | | | |
| 124 | | | | | | | | | | | | |
| 125 | | | | | | **General Statistics** | | | | | | |
| 126 | | | | | Total Number of Observations | 20 | | | | Number of Distinct Observations | | 2 |
| 127 | | | | | Number of Detects | 1 | | | | Number of Non-Detects | | 19 |
| 128 | | | | | Number of Distinct Detects | 1 | | | | Number of Distinct Non-Detects | | 1 |
| 129 | | | | | | | | | | | | |
| 130 | | | | | **Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!** | | | | | | | |
| 131 | | | | | **It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).** | | | | | | | |
| 132 | | | | | | | | | | | | |
| 133 | | | | | **The data set for variable Arsenic was not processed!** | | | | | | | |
| 134 | | | | | | | | | | | | |
| 135 | | | | | | | | | | | | |
| 136 | | | | | | | | | | | | |
| 137 | **Barium** | | | | | | | | | | | |
| 138 | | | | | | | | | | | | |
| 139 | | | | | | **General Statistics** | | | | | | |
| 140 | | | | | Total Number of Observations | 20 | | | | Number of Distinct Observations | | 20 |
| 141 | | | | | | | | | | Number of Missing Observations | | 0 |
| 142 | | | | | Minimum | 2.14 | | | | Mean | | 81.2 |
| 143 | | | | | Maximum | 223 | | | | Median | | 45.75 |
| 144 | | | | | SD | 71.69 | | | | Std. Error of Mean | | 16.03 |
| 145 | | | | | Coefficient of Variation | 0.883 | | | | Skewness | | 0.743 |
| 146 | | | | | | | | | | | | |
| 147 | | | | | | **Normal GOF Test** | | | | | | |
| 148 | | | | | Shapiro Wilk Test Statistic | 0.853 | | | | **Shapiro Wilk GOF Test** | | |
| 149 | | | | | 5% Shapiro Wilk Critical Value | 0.905 | | | | Data Not Normal at 5% Significance Level | | |
| 150 | | | | | Lilliefors Test Statistic | 0.256 | | | | **Lilliefors GOF Test** | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 151 | | | | | 5% Lilliefors Critical Value | 0.198 | Data Not Normal at 5% Significance Level | | | | | |
| 152 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 153 | | | | | | | | | | | | |
| 154 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 155 | **95% Normal UCL** | | | | | | **95% UCLs (Adjusted for Skewness)** | | | | | |
| 156 | | | | | 95% Student's-t UCL | 108.9 | | | | 95% Adjusted-CLT UCL (Chen-1995) | | 110.4 |
| 157 | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | | 109.4 |
| 158 | | | | | | | | | | | | |
| 159 | **Gamma GOF Test** | | | | | | | | | | | |
| 160 | | | | | A-D Test Statistic | 0.494 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 161 | | | | | 5% A-D Critical Value | 0.765 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 162 | | | | | K-S Test Statistic | 0.142 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 163 | | | | | 5% K-S Critical Value | 0.199 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 164 | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 165 | | | | | | | | | | | | |
| 166 | **Gamma Statistics** | | | | | | | | | | | |
| 167 | | | | | k hat (MLE) | 1.132 | | | | k star (bias corrected MLE) | | 0.996 |
| 168 | | | | | Theta hat (MLE) | 71.73 | | | | Theta star (bias corrected MLE) | | 81.56 |
| 169 | | | | | nu hat (MLE) | 45.28 | | | | nu star (bias corrected) | | 39.83 |
| 170 | | | | | MLE Mean (bias corrected) | 81.2 | | | | MLE Sd (bias corrected) | | 81.38 |
| 171 | | | | | | | | | | Approximate Chi Square Value (0.05) | | 26.37 |
| 172 | | | | | Adjusted Level of Significance | 0.038 | | | | Adjusted Chi Square Value | | 25.5 |
| 173 | | | | | | | | | | | | |
| 174 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 175 | | | | | 95% Approximate Gamma UCL (use when n>=50) | 122.6 | | | | 95% Adjusted Gamma UCL (use when n<50) | | 126.8 |
| 176 | | | | | | | | | | | | |
| 177 | **Lognormal GOF Test** | | | | | | | | | | | |
| 178 | | | | | Shapiro Wilk Test Statistic | 0.924 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 179 | | | | | 5% Shapiro Wilk Critical Value | 0.905 | Data appear Lognormal at 5% Significance Level | | | | | |
| 180 | | | | | Lilliefors Test Statistic | 0.123 | **Lilliefors Lognormal GOF Test** | | | | | |
| 181 | | | | | 5% Lilliefors Critical Value | 0.198 | Data appear Lognormal at 5% Significance Level | | | | | |
| 182 | **Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 183 | | | | | | | | | | | | |
| 184 | **Lognormal Statistics** | | | | | | | | | | | |
| 185 | | | | | Minimum of Logged Data | 0.761 | | | | Mean of logged Data | | 3.894 |
| 186 | | | | | Maximum of Logged Data | 5.407 | | | | SD of logged Data | | 1.181 |
| 187 | | | | | | | | | | | | |
| 188 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 189 | | | | | 95% H-UCL | 216.8 | | | | 90% Chebyshev (MVUE) UCL | | 178.5 |
| 190 | | | | | 95% Chebyshev (MVUE) UCL | 217 | | | | 97.5% Chebyshev (MVUE) UCL | | 270.5 |
| 191 | | | | | 99% Chebyshev (MVUE) UCL | 375.6 | | | | | | |
| 192 | | | | | | | | | | | | |
| 193 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 194 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 195 | | | | | | | | | | | | |
| 196 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 197 | | | | | 95% CLT UCL | 107.6 | | | | 95% Jackknife UCL | | 108.9 |
| 198 | | | | | 95% Standard Bootstrap UCL | 106.8 | | | | 95% Bootstrap-t UCL | | 112.8 |
| 199 | | | | | 95% Hall's Bootstrap UCL | 108.6 | | | | 95% Percentile Bootstrap UCL | | 108.6 |
| 200 | | | | | 95% BCA Bootstrap UCL | 110.3 | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 201 | | | | | 90% Chebyshev(Mean, Sd) UCL | 129.3 | | | | | 95% Chebyshev(Mean, Sd) UCL | 151.1 |
| 202 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 181.3 | | | | | 99% Chebyshev(Mean, Sd) UCL | 240.7 |
| 203 | | | | | | | | | | | | |
| 204 | | | | | | **Suggested UCL to Use** | | | | | | |
| 205 | | | | | 95% Adjusted Gamma UCL | 126.8 | | | | | | |
| 206 | | | | | | | | | | | | |
| 207 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 208 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | |
| 209 | | | | | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | |
| 210 | | | | | For additional insight the user may want to consult a statistician. | | | | | | | |
| 211 | | | | | | | | | | | | |
| 212 | | | | | | | | | | | | |
| 213 | **Boron** | | | | | | | | | | | |
| 214 | | | | | | | | | | | | |
| 215 | | | | | | **General Statistics** | | | | | | |
| 216 | | | | | Total Number of Observations | 20 | | | | | Number of Distinct Observations | 20 |
| 217 | | | | | | | | | | | Number of Missing Observations | 0 |
| 218 | | | | | Minimum | 664 | | | | | Mean | 2015 |
| 219 | | | | | Maximum | 3090 | | | | | Median | 1985 |
| 220 | | | | | SD | 525.9 | | | | | Std. Error of Mean | 117.6 |
| 221 | | | | | Coefficient of Variation | 0.261 | | | | | Skewness | -0.318 |
| 222 | | | | | | | | | | | | |
| 223 | | | | | | **Normal GOF Test** | | | | | | |
| 224 | | | | | Shapiro Wilk Test Statistic | 0.953 | | | | | **Shapiro Wilk GOF Test** | |
| 225 | | | | | 5% Shapiro Wilk Critical Value | 0.905 | | | | | Data appear Normal at 5% Significance Level | |
| 226 | | | | | Lilliefors Test Statistic | 0.142 | | | | | **Lilliefors GOF Test** | |
| 227 | | | | | 5% Lilliefors Critical Value | 0.198 | | | | | Data appear Normal at 5% Significance Level | |
| 228 | | | | | | **Data appear Normal at 5% Significance Level** | | | | | | |
| 229 | | | | | | | | | | | | |
| 230 | | | | | | **Assuming Normal Distribution** | | | | | | |
| 231 | | | | | **95% Normal UCL** | | | | | | **95% UCLs (Adjusted for Skewness)** | |
| 232 | | | | | 95% Student's-t UCL | 2218 | | | | | 95% Adjusted-CLT UCL (Chen-1995) | 2199 |
| 233 | | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | 2217 |
| 234 | | | | | | | | | | | | |
| 235 | | | | | | **Gamma GOF Test** | | | | | | |
| 236 | | | | | A-D Test Statistic | 0.728 | | | | | **Anderson-Darling Gamma GOF Test** | |
| 237 | | | | | 5% A-D Critical Value | 0.742 | | | | | Detected data appear Gamma Distributed at 5% Significance Level | |
| 238 | | | | | K-S Test Statistic | 0.185 | | | | | **Kolmogrov-Smirnoff Gamma GOF Test** | |
| 239 | | | | | 5% K-S Critical Value | 0.194 | | | | | Detected data appear Gamma Distributed at 5% Significance Level | |
| 240 | | | | | | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | |
| 241 | | | | | | | | | | | | |
| 242 | | | | | | **Gamma Statistics** | | | | | | |
| 243 | | | | | k hat (MLE) | 12.36 | | | | | k star (bias corrected MLE) | 10.54 |
| 244 | | | | | Theta hat (MLE) | 163 | | | | | Theta star (bias corrected MLE) | 191.1 |
| 245 | | | | | nu hat (MLE) | 494.5 | | | | | nu star (bias corrected) | 421.7 |
| 246 | | | | | MLE Mean (bias corrected) | 2015 | | | | | MLE Sd (bias corrected) | 620.5 |
| 247 | | | | | | | | | | | Approximate Chi Square Value (0.05) | 375.1 |
| 248 | | | | | Adjusted Level of Significance | 0.038 | | | | | Adjusted Chi Square Value | 371.6 |
| 249 | | | | | | | | | | | | |
| 250 | | | | | | **Assuming Gamma Distribution** | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 251 | 95% Approximate Gamma UCL (use when n>=50)) | | | | | 2265 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 2286 |
| 252 | | | | | | | | | | | | |
| 253 | **Lognormal GOF Test** | | | | | | | | | | | |
| 254 | Shapiro Wilk Test Statistic | | | | | 0.831 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 255 | 5% Shapiro Wilk Critical Value | | | | | 0.905 | Data Not Lognormal at 5% Significance Level | | | | | |
| 256 | Lilliefors Test Statistic | | | | | 0.208 | **Lilliefors Lognormal GOF Test** | | | | | |
| 257 | 5% Lilliefors Critical Value | | | | | 0.198 | Data Not Lognormal at 5% Significance Level | | | | | |
| 258 | **Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 259 | | | | | | | | | | | | |
| 260 | **Lognormal Statistics** | | | | | | | | | | | |
| 261 | Minimum of Logged Data | | | | | 6.498 | Mean of logged Data | | | | | 7.567 |
| 262 | Maximum of Logged Data | | | | | 8.036 | SD of logged Data | | | | | 0.319 |
| 263 | | | | | | | | | | | | |
| 264 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 265 | 95% H-UCL | | | | | 2332 | 90% Chebyshev (MVUE) UCL | | | | | 2470 |
| 266 | 95% Chebyshev (MVUE) UCL | | | | | 2670 | 97.5% Chebyshev (MVUE) UCL | | | | | 2947 |
| 267 | 99% Chebyshev (MVUE) UCL | | | | | 3491 | | | | | | |
| 268 | | | | | | | | | | | | |
| 269 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 270 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 271 | | | | | | | | | | | | |
| 272 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 273 | 95% CLT UCL | | | | | 2208 | 95% Jackknife UCL | | | | | 2218 |
| 274 | 95% Standard Bootstrap UCL | | | | | 2206 | 95% Bootstrap-t UCL | | | | | 2211 |
| 275 | 95% Hall's Bootstrap UCL | | | | | 2216 | 95% Percentile Bootstrap UCL | | | | | 2202 |
| 276 | 95% BCA Bootstrap UCL | | | | | 2198 | | | | | | |
| 277 | 90% Chebyshev(Mean, Sd) UCL | | | | | 2367 | 95% Chebyshev(Mean, Sd) UCL | | | | | 2527 |
| 278 | 97.5% Chebyshev(Mean, Sd) UCL | | | | | 2749 | 99% Chebyshev(Mean, Sd) UCL | | | | | 3185 |
| 279 | | | | | | | | | | | | |
| 280 | **Suggested UCL to Use** | | | | | | | | | | | |
| 281 | 95% Student's-t UCL | | | | | 2218 | | | | | | |
| 282 | | | | | | | | | | | | |
| 283 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 284 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 285 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |
| 286 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 287 | | | | | | | | | | | | |
| 288 | **Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be** | | | | | | | | | | | |
| 289 | **reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.** | | | | | | | | | | | |
| 290 | | | | | | | | | | | | |
| 291 | **Cadmium** | | | | | | | | | | | |
| 292 | | | | | | | | | | | | |
| 293 | **General Statistics** | | | | | | | | | | | |
| 294 | Total Number of Observations | | | | | 20 | Number of Distinct Observations | | | | | 11 |
| 295 | Number of Detects | | | | | 11 | Number of Non-Detects | | | | | 9 |
| 296 | Number of Distinct Detects | | | | | 11 | Number of Distinct Non-Detects | | | | | 1 |
| 297 | Minimum Detect | | | | | 0.05 | Minimum Non-Detect | | | | | 0.05 |
| 298 | Maximum Detect | | | | | 0.291 | Maximum Non-Detect | | | | | 0.05 |
| 299 | Variance Detects | | | | | 0.00529 | Percent Non-Detects | | | | | 45% |
| 300 | Mean Detects | | | | | 0.159 | SD Detects | | | | | 0.0727 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 301 | | | | | Median Detects | 0.151 | | | | | CV Detects | 0.458 |
| 302 | | | | | Skewness Detects | 0.158 | | | | | Kurtosis Detects | -0.0405 |
| 303 | | | | | Mean of Logged Detects | -1.961 | | | | | SD of Logged Detects | 0.559 |
| 304 | | | | | | | | | | | | |
| 305 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 306 | | | | | Shapiro Wilk Test Statistic | 0.959 | **Shapiro Wilk GOF Test** | | | | | |
| 307 | | | | | 5% Shapiro Wilk Critical Value | 0.85 | Detected Data appear Normal at 5% Significance Level | | | | | |
| 308 | | | | | Lilliefors Test Statistic | 0.144 | **Lilliefors GOF Test** | | | | | |
| 309 | | | | | 5% Lilliefors Critical Value | 0.267 | Detected Data appear Normal at 5% Significance Level | | | | | |
| 310 | | | | | **Detected Data appear Normal at 5% Significance Level** | | | | | | | |
| 311 | | | | | | | | | | | | |
| 312 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |
| 313 | | | | | Mean | 0.11 | | | | | Standard Error of Mean | 0.0175 |
| 314 | | | | | SD | 0.0747 | | | | | 95% KM (BCA) UCL | 0.138 |
| 315 | | | | | 95% KM (t) UCL | 0.14 | | | | | 95% KM (Percentile Bootstrap) UCL | 0.138 |
| 316 | | | | | 95% KM (z) UCL | 0.139 | | | | | 95% KM Bootstrap t UCL | 0.144 |
| 317 | | | | | 90% KM Chebyshev UCL | 0.162 | | | | | 95% KM Chebyshev UCL | 0.186 |
| 318 | | | | | 97.5% KM Chebyshev UCL | 0.219 | | | | | 99% KM Chebyshev UCL | 0.284 |
| 319 | | | | | | | | | | | | |
| 320 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 321 | | | | | A-D Test Statistic | 0.43 | **Anderson-Darling GOF Test** | | | | | |
| 322 | | | | | 5% A-D Critical Value | 0.732 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 323 | | | | | K-S Test Statistic | 0.201 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 324 | | | | | 5% K-S Critical Value | 0.256 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 325 | | | | | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | |
| 326 | | | | | | | | | | | | |
| 327 | | | | | **Gamma Statistics on Detected Data Only** | | | | | | | |
| 328 | | | | | k hat (MLE) | 4.282 | | | | | k star (bias corrected MLE) | 3.175 |
| 329 | | | | | Theta hat (MLE) | 0.0371 | | | | | Theta star (bias corrected MLE) | 0.0501 |
| 330 | | | | | nu hat (MLE) | 94.2 | | | | | nu star (bias corrected) | 69.84 |
| 331 | | | | | MLE Mean (bias corrected) | 0.159 | | | | | MLE Sd (bias corrected) | 0.0892 |
| 332 | | | | | | | | | | | | |
| 333 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 334 | | | | | k hat (KM) | 2.165 | | | | | nu hat (KM) | 86.58 |
| 335 | | | | | Approximate Chi Square Value (86.58, α) | 66.13 | | | | | Adjusted Chi Square Value (86.58, β) | 64.72 |
| 336 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.144 | | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | 0.147 |
| 337 | | | | | | | | | | | | |
| 338 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 339 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 340 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 341 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 342 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 343 | | | | | Minimum | 0.01 | | | | | Mean | 0.0972 |
| 344 | | | | | Maximum | 0.291 | | | | | Median | 0.053 |
| 345 | | | | | SD | 0.0883 | | | | | CV | 0.908 |
| 346 | | | | | k hat (MLE) | 1.008 | | | | | k star (bias corrected MLE) | 0.89 |
| 347 | | | | | Theta hat (MLE) | 0.0965 | | | | | Theta star (bias corrected MLE) | 0.109 |
| 348 | | | | | nu hat (MLE) | 40.31 | | | | | nu star (bias corrected) | 35.6 |
| 349 | | | | | MLE Mean (bias corrected) | 0.0972 | | | | | MLE Sd (bias corrected) | 0.103 |
| 350 | | | | | | | | | | | Adjusted Level of Significance (β) | 0.038 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 351 | Approximate Chi Square Value (35.60, α) | | | | | 22.95 | Adjusted Chi Square Value (35.60, β) | | | | | 22.14 |
| 352 | 95% Gamma Approximate UCL (use when n>=50) | | | | | 0.151 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 0.156 |
| 353 | | | | | | | | | | | | |
| 354 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 355 | Shapiro Wilk Test Statistic | | | | | 0.881 | **Shapiro Wilk GOF Test** | | | | | |
| 356 | 5% Shapiro Wilk Critical Value | | | | | 0.85 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 357 | Lilliefors Test Statistic | | | | | 0.24 | **Lilliefors GOF Test** | | | | | |
| 358 | 5% Lilliefors Critical Value | | | | | 0.267 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 359 | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 360 | | | | | | | | | | | | |
| 361 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 362 | Mean in Original Scale | | | | | 0.104 | Mean in Log Scale | | | | | -2.595 |
| 363 | SD in Original Scale | | | | | 0.082 | SD in Log Scale | | | | | 0.876 |
| 364 | 95% t UCL (assumes normality of ROS data) | | | | | 0.136 | 95% Percentile Bootstrap UCL | | | | | 0.135 |
| 365 | 95% BCA Bootstrap UCL | | | | | 0.135 | 95% Bootstrap t UCL | | | | | 0.142 |
| 366 | 95% H-UCL (Log ROS) | | | | | 0.179 | | | | | | |
| 367 | | | | | | | | | | | | |
| 368 | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | | | | | |
| 369 | KM Mean (logged) | | | | | -2.426 | 95% H-UCL (KM -Log) | | | | | 0.151 |
| 370 | KM SD (logged) | | | | | 0.649 | 95% Critical H Value (KM-Log) | | | | | 2.177 |
| 371 | KM Standard Error of Mean (logged) | | | | | 0.152 | | | | | | |
| 372 | | | | | | | | | | | | |
| 373 | **DL/2 Statistics** | | | | | | | | | | | |
| 374 | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | | | | | |
| 375 | Mean in Original Scale | | | | | 0.0987 | Mean in Log Scale | | | | | -2.738 |
| 376 | SD in Original Scale | | | | | 0.0863 | SD in Log Scale | | | | | 0.971 |
| 377 | 95% t UCL (Assumes normality) | | | | | 0.132 | 95% H-Stat UCL | | | | | 0.185 |
| 378 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 379 | | | | | | | | | | | | |
| 380 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 381 | **Detected Data appear Normal Distributed at 5% Significance Level** | | | | | | | | | | | |
| 382 | | | | | | | | | | | | |
| 383 | **Suggested UCL to Use** | | | | | | | | | | | |
| 384 | 95% KM (t) UCL | | | | | 0.14 | 95% KM (Percentile Bootstrap) UCL | | | | | 0.138 |
| 385 | | | | | | | | | | | | |
| 386 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 387 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 388 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 389 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 390 | | | | | | | | | | | | |
| 391 | | | | | | | | | | | | |
| 392 | **Calcium** | | | | | | | | | | | |
| 393 | | | | | | | | | | | | |
| 394 | **General Statistics** | | | | | | | | | | | |
| 395 | Total Number of Observations | | | | | 20 | Number of Distinct Observations | | | | | 19 |
| 396 | | | | | | | Number of Missing Observations | | | | | 0 |
| 397 | Minimum | | | | | 15700 | Mean | | | | | 212435 |
| 398 | Maximum | | | | | 323000 | Median | | | | | 221000 |
| 399 | SD | | | | | 73370 | Std. Error of Mean | | | | | 16406 |
| 400 | Coefficient of Variation | | | | | 0.345 | Skewness | | | | | -1.062 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 401 | | | | | | | | | | | | |
| 402 | | | | | | Normal GOF Test | | | | | | |
| 403 | | | | | Shapiro Wilk Test Statistic | 0.927 | Shapiro Wilk GOF Test | | | | | |
| 404 | | | | | 5% Shapiro Wilk Critical Value | 0.905 | Data appear Normal at 5% Significance Level | | | | | |
| 405 | | | | | Lilliefors Test Statistic | 0.188 | Lilliefors GOF Test | | | | | |
| 406 | | | | | 5% Lilliefors Critical Value | 0.198 | Data appear Normal at 5% Significance Level | | | | | |
| 407 | | | | | Data appear Normal at 5% Significance Level | | | | | | | |
| 408 | | | | | | | | | | | | |
| 409 | | | | | Assuming Normal Distribution | | | | | | | |
| 410 | | | | | 95% Normal UCL | | 95% UCLs (Adjusted for Skewness) | | | | | |
| 411 | | | | | 95% Student's-t UCL | 240803 | 95% Adjusted-CLT UCL (Chen-1995) | | | | | 235257 |
| 412 | | | | | | | 95% Modified-t UCL (Johnson-1978) | | | | | 240154 |
| 413 | | | | | | | | | | | | |
| 414 | | | | | Gamma GOF Test | | | | | | | |
| 415 | | | | | A-D Test Statistic | 1.643 | Anderson-Darling Gamma GOF Test | | | | | |
| 416 | | | | | 5% A-D Critical Value | 0.745 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 417 | | | | | K-S Test Statistic | 0.27 | Kolmogrov-Smirnoff Gamma GOF Test | | | | | |
| 418 | | | | | 5% K-S Critical Value | 0.195 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 419 | | | | | Data Not Gamma Distributed at 5% Significance Level | | | | | | | |
| 420 | | | | | | | | | | | | |
| 421 | | | | | Gamma Statistics | | | | | | | |
| 422 | | | | | k hat (MLE) | 4.248 | k star (bias corrected MLE) | | | | | 3.644 |
| 423 | | | | | Theta hat (MLE) | 50006 | Theta star (bias corrected MLE) | | | | | 58292 |
| 424 | | | | | nu hat (MLE) | 169.9 | nu star (bias corrected) | | | | | 145.8 |
| 425 | | | | | MLE Mean (bias corrected) | 212435 | MLE Sd (bias corrected) | | | | | 111280 |
| 426 | | | | | | | Approximate Chi Square Value (0.05) | | | | | 118.9 |
| 427 | | | | | Adjusted Level of Significance | 0.038 | Adjusted Chi Square Value | | | | | 117 |
| 428 | | | | | | | | | | | | |
| 429 | | | | | Assuming Gamma Distribution | | | | | | | |
| 430 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 260515 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 264788 |
| 431 | | | | | | | | | | | | |
| 432 | | | | | Lognormal GOF Test | | | | | | | |
| 433 | | | | | Shapiro Wilk Test Statistic | 0.631 | Shapiro Wilk Lognormal GOF Test | | | | | |
| 434 | | | | | 5% Shapiro Wilk Critical Value | 0.905 | Data Not Lognormal at 5% Significance Level | | | | | |
| 435 | | | | | Lilliefors Test Statistic | 0.294 | Lilliefors Lognormal GOF Test | | | | | |
| 436 | | | | | 5% Lilliefors Critical Value | 0.198 | Data Not Lognormal at 5% Significance Level | | | | | |
| 437 | | | | | Data Not Lognormal at 5% Significance Level | | | | | | | |
| 438 | | | | | | | | | | | | |
| 439 | | | | | Lognormal Statistics | | | | | | | |
| 440 | | | | | Minimum of Logged Data | 9.661 | Mean of logged Data | | | | | 12.14 |
| 441 | | | | | Maximum of Logged Data | 12.69 | SD of logged Data | | | | | 0.655 |
| 442 | | | | | | | | | | | | |
| 443 | | | | | Assuming Lognormal Distribution | | | | | | | |
| 444 | | | | | 95% H-UCL | 323367 | 90% Chebyshev (MVUE) UCL | | | | | 337078 |
| 445 | | | | | 95% Chebyshev (MVUE) UCL | 385578 | 97.5% Chebyshev (MVUE) UCL | | | | | 452894 |
| 446 | | | | | 99% Chebyshev (MVUE) UCL | 585123 | | | | | | |
| 447 | | | | | | | | | | | | |
| 448 | | | | | Nonparametric Distribution Free UCL Statistics | | | | | | | |
| 449 | | | | | Data appear to follow a Discernible Distribution at 5% Significance Level | | | | | | | |
| 450 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 451 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 452 | | | | | 95% CLT UCL | 239420 | | | | 95% Jackknife UCL | | 240803 |
| 453 | | | | | 95% Standard Bootstrap UCL | 239186 | | | | 95% Bootstrap-t UCL | | 237428 |
| 454 | | | | | 95% Hall's Bootstrap UCL | 237231 | | | | 95% Percentile Bootstrap UCL | | 238500 |
| 455 | | | | | 95% BCA Bootstrap UCL | 234950 | | | | | | |
| 456 | | | | | 90% Chebyshev(Mean, Sd) UCL | 261653 | | | | 95% Chebyshev(Mean, Sd) UCL | | 283947 |
| 457 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 314890 | | | | 99% Chebyshev(Mean, Sd) UCL | | 375672 |
| 458 | | | | | | | | | | | | |
| 459 | **Suggested UCL to Use** | | | | | | | | | | | |
| 460 | | | | | 95% Student's-t UCL | 240803 | | | | | | |
| 461 | | | | | | | | | | | | |
| 462 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 463 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 464 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |
| 465 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 466 | | | | | | | | | | | | |
| 467 | **Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be** | | | | | | | | | | | |
| 468 | **reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.** | | | | | | | | | | | |
| 469 | | | | | | | | | | | | |
| 470 | **Cesium** | | | | | | | | | | | |
| 471 | | | | | | | | | | | | |
| 472 | **General Statistics** | | | | | | | | | | | |
| 473 | | | | | Total Number of Observations | 20 | | | | Number of Distinct Observations | | 2 |
| 474 | | | | | Number of Detects | 1 | | | | Number of Non-Detects | | 19 |
| 475 | | | | | Number of Distinct Detects | 1 | | | | Number of Distinct Non-Detects | | 1 |
| 476 | | | | | | | | | | | | |
| 477 | **Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!** | | | | | | | | | | | |
| 478 | **It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).** | | | | | | | | | | | |
| 479 | | | | | | | | | | | | |
| 480 | **The data set for variable Cesium was not processed!** | | | | | | | | | | | |
| 481 | | | | | | | | | | | | |
| 482 | | | | | | | | | | | | |
| 483 | **Chromium** | | | | | | | | | | | |
| 484 | | | | | | | | | | | | |
| 485 | **General Statistics** | | | | | | | | | | | |
| 486 | | | | | Total Number of Observations | 20 | | | | Number of Distinct Observations | | 3 |
| 487 | | | | | Number of Detects | 1 | | | | Number of Non-Detects | | 19 |
| 488 | | | | | Number of Distinct Detects | 1 | | | | Number of Distinct Non-Detects | | 2 |
| 489 | | | | | | | | | | | | |
| 490 | **Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!** | | | | | | | | | | | |
| 491 | **It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).** | | | | | | | | | | | |
| 492 | | | | | | | | | | | | |
| 493 | **The data set for variable Chromium was not processed!** | | | | | | | | | | | |
| 494 | | | | | | | | | | | | |
| 495 | | | | | | | | | | | | |
| 496 | **Cobalt** | | | | | | | | | | | |
| 497 | | | | | | | | | | | | |
| 498 | **General Statistics** | | | | | | | | | | | |
| 499 | | | | | Total Number of Observations | 20 | | | | Number of Distinct Observations | | 16 |
| 500 | | | | | Number of Detects | 14 | | | | Number of Non-Detects | | 6 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 501 | | | | | Number of Distinct Detects | 14 | | | | | Number of Distinct Non-Detects | 2 |
| 502 | | | | | Minimum Detect | 0.06 | | | | | Minimum Non-Detect | 0.05 |
| 503 | | | | | Maximum Detect | 11.5 | | | | | Maximum Non-Detect | 0.1 |
| 504 | | | | | Variance Detects | 10.19 | | | | | Percent Non-Detects | 30% |
| 505 | | | | | Mean Detects | 2.287 | | | | | SD Detects | 3.193 |
| 506 | | | | | Median Detects | 1.033 | | | | | CV Detects | 1.396 |
| 507 | | | | | Skewness Detects | 2.082 | | | | | Kurtosis Detects | 4.932 |
| 508 | | | | | Mean of Logged Detects | -0.328 | | | | | SD of Logged Detects | 1.775 |
| 509 | | | | | | | | | | | | |
| 510 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 511 | | | | | Shapiro Wilk Test Statistic | 0.73 | **Shapiro Wilk GOF Test** | | | | | |
| 512 | | | | | 5% Shapiro Wilk Critical Value | 0.874 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 513 | | | | | Lilliefors Test Statistic | 0.243 | **Lilliefors GOF Test** | | | | | |
| 514 | | | | | 5% Lilliefors Critical Value | 0.237 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 515 | | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | | |
| 516 | | | | | | | | | | | | |
| 517 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |
| 518 | | | | | Mean | 1.616 | | | | | Standard Error of Mean | 0.643 |
| 519 | | | | | SD | 2.77 | | | | | 95% KM (BCA) UCL | 2.691 |
| 520 | | | | | 95% KM (t) UCL | 2.728 | | | | | 95% KM (Percentile Bootstrap) UCL | 2.783 |
| 521 | | | | | 95% KM (z) UCL | 2.674 | | | | | 95% KM Bootstrap t UCL | 3.525 |
| 522 | | | | | 90% KM Chebyshev UCL | 3.545 | | | | | 95% KM Chebyshev UCL | 4.419 |
| 523 | | | | | 97.5% KM Chebyshev UCL | 5.631 | | | | | 99% KM Chebyshev UCL | 8.013 |
| 524 | | | | | | | | | | | | |
| 525 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 526 | | | | | A-D Test Statistic | 0.576 | **Anderson-Darling GOF Test** | | | | | |
| 527 | | | | | 5% A-D Critical Value | 0.789 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 528 | | | | | K-S Test Statistic | 0.2 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 529 | | | | | 5% K-S Critical Value | 0.241 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 530 | | | | | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | |
| 531 | | | | | | | | | | | | |
| 532 | | | | | **Gamma Statistics on Detected Data Only** | | | | | | | |
| 533 | | | | | k hat (MLE) | 0.543 | | | | | k star (bias corrected MLE) | 0.474 |
| 534 | | | | | Theta hat (MLE) | 4.213 | | | | | Theta star (bias corrected MLE) | 4.823 |
| 535 | | | | | nu hat (MLE) | 15.2 | | | | | nu star (bias corrected) | 13.28 |
| 536 | | | | | MLE Mean (bias corrected) | 2.287 | | | | | MLE Sd (bias corrected) | 3.321 |
| 537 | | | | | | | | | | | | |
| 538 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 539 | | | | | k hat (KM) | 0.34 | | | | | nu hat (KM) | 13.62 |
| 540 | | | | | Approximate Chi Square Value (13.62, α) | 6.309 | | | | | Adjusted Chi Square Value (13.62, β) | 5.918 |
| 541 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 3.488 | | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | 3.718 |
| 542 | | | | | | | | | | | | |
| 543 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 544 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 545 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 546 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 547 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 548 | | | | | Minimum | 0.01 | | | | | Mean | 1.604 |
| 549 | | | | | Maximum | 11.5 | | | | | Median | 0.137 |
| 550 | | | | | SD | 2.85 | | | | | CV | 1.777 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 551 | | | | | k hat (MLE) | 0.326 | | | | | k star (bias corrected MLE) | 0.311 |
| 552 | | | | | Theta hat (MLE) | 4.914 | | | | | Theta star (bias corrected MLE) | 5.161 |
| 553 | | | | | nu hat (MLE) | 13.06 | | | | | nu star (bias corrected) | 12.43 |
| 554 | | | | | MLE Mean (bias corrected) | 1.604 | | | | | MLE Sd (bias corrected) | 2.877 |
| 555 | | | | | | | | | | | Adjusted Level of Significance (β) | 0.038 |
| 556 | | | | | Approximate Chi Square Value (12.43, α) | 5.513 | | | | | Adjusted Chi Square Value (12.43, β) | 5.152 |
| 557 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 3.617 | | | | | 95% Gamma Adjusted UCL (use when n<50) | 3.87 |
| 558 | | | | | | | | | | | | |
| 559 | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | | |
| 560 | | | | | Shapiro Wilk Test Statistic | 0.908 | | | **Shapiro Wilk GOF Test** | | | |
| 561 | | | | | 5% Shapiro Wilk Critical Value | 0.874 | | | Detected Data appear Lognormal at 5% Significance Level | | | |
| 562 | | | | | Lilliefors Test Statistic | 0.172 | | | **Lilliefors GOF Test** | | | |
| 563 | | | | | 5% Lilliefors Critical Value | 0.237 | | | Detected Data appear Lognormal at 5% Significance Level | | | |
| 564 | | | | | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | |
| 565 | | | | | | | | | | | | |
| 566 | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | |
| 567 | | | | | Mean in Original Scale | 1.605 | | | | | Mean in Log Scale | -1.578 |
| 568 | | | | | SD in Original Scale | 2.849 | | | | | SD in Log Scale | 2.498 |
| 569 | | | | | 95% t UCL (assumes normality of ROS data) | 2.707 | | | | | 95% Percentile Bootstrap UCL | 2.732 |
| 570 | | | | | 95% BCA Bootstrap UCL | 3.127 | | | | | 95% Bootstrap t UCL | 3.622 |
| 571 | | | | | 95% H-UCL (Log ROS) | 92.89 | | | | | | |
| 572 | | | | | | | | | | | | |
| 573 | | | | | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | |
| 574 | | | | | KM Mean (logged) | -1.122 | | | | | 95% H-UCL (KM -Log) | 11 |
| 575 | | | | | KM SD (logged) | 1.877 | | | | | 95% Critical H Value (KM-Log) | 4.084 |
| 576 | | | | | KM Standard Error of Mean (logged) | 0.436 | | | | | | |
| 577 | | | | | | | | | | | | |
| 578 | | | | | **DL/2 Statistics** | | | | | | | |
| 579 | | | | | **DL/2 Normal** | | | | **DL/2 Log-Transformed** | | | |
| 580 | | | | | Mean in Original Scale | 1.61 | | | | | Mean in Log Scale | -1.302 |
| 581 | | | | | SD in Original Scale | 2.846 | | | | | SD in Log Scale | 2.123 |
| 582 | | | | | 95% t UCL (Assumes normality) | 2.71 | | | | | 95% H-Stat UCL | 23.48 |
| 583 | | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | |
| 584 | | | | | | | | | | | | |
| 585 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 586 | | | | | **Detected Data appear Gamma Distributed at 5% Significance Level** | | | | | | | |
| 587 | | | | | | | | | | | | |
| 588 | | | | | **Suggested UCL to Use** | | | | | | | |
| 589 | | | | | 95% KM (BCA) UCL | 2.691 | | | | | 95% GROS Adjusted Gamma UCL | 3.87 |
| 590 | | | | | 95% Adjusted Gamma KM-UCL | 3.718 | | | | | | |
| 591 | | | | | | | | | | | | |
| 592 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 593 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 594 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 595 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 596 | | | | | | | | | | | | |
| 597 | **Copper** | | | | | | | | | | | |
| 598 | | | | | | | | | | | | |
| 599 | | | | | **General Statistics** | | | | | | | |
| 600 | | | | | Total Number of Observations | 20 | | | | | Number of Distinct Observations | 16 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 601 | | | | | Number of Detects | 16 | | | | | Number of Non-Detects | 4 |
| 602 | | | | | Number of Distinct Detects | 16 | | | | | Number of Distinct Non-Detects | 1 |
| 603 | | | | | Minimum Detect | 0.5 | | | | | Minimum Non-Detect | 0.5 |
| 604 | | | | | Maximum Detect | 2.67 | | | | | Maximum Non-Detect | 0.5 |
| 605 | | | | | Variance Detects | 0.473 | | | | | Percent Non-Detects | 20% |
| 606 | | | | | Mean Detects | 1.246 | | | | | SD Detects | 0.688 |
| 607 | | | | | Median Detects | 1.13 | | | | | CV Detects | 0.552 |
| 608 | | | | | Skewness Detects | 0.861 | | | | | Kurtosis Detects | -0.154 |
| 609 | | | | | Mean of Logged Detects | 0.079 | | | | | SD of Logged Detects | 0.551 |
| 610 | | | | | | | | | | | | |
| 611 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 612 | | | | | Shapiro Wilk Test Statistic | 0.898 | | | | | **Shapiro Wilk GOF Test** | |
| 613 | | | | | 5% Shapiro Wilk Critical Value | 0.887 | | | | | Detected Data appear Normal at 5% Significance Level | |
| 614 | | | | | Lilliefors Test Statistic | 0.175 | | | | | **Lilliefors GOF Test** | |
| 615 | | | | | 5% Lilliefors Critical Value | 0.222 | | | | | Detected Data appear Normal at 5% Significance Level | |
| 616 | | | | | **Detected Data appear Normal at 5% Significance Level** | | | | | | | |
| 617 | | | | | | | | | | | | |
| 618 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |
| 619 | | | | | Mean | 1.097 | | | | | Standard Error of Mean | 0.154 |
| 620 | | | | | SD | 0.666 | | | | | 95% KM (BCA) UCL | 1.337 |
| 621 | | | | | 95% KM (t) UCL | 1.363 | | | | | 95% KM (Percentile Bootstrap) UCL | 1.357 |
| 622 | | | | | 95% KM (z) UCL | 1.35 | | | | | 95% KM Bootstrap t UCL | 1.43 |
| 623 | | | | | 90% KM Chebyshev UCL | 1.559 | | | | | 95% KM Chebyshev UCL | 1.768 |
| 624 | | | | | 97.5% KM Chebyshev UCL | 2.058 | | | | | 99% KM Chebyshev UCL | 2.628 |
| 625 | | | | | | | | | | | | |
| 626 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 627 | | | | | A-D Test Statistic | 0.357 | | | | | **Anderson-Darling GOF Test** | |
| 628 | | | | | 5% A-D Critical Value | 0.743 | | | | | Detected data appear Gamma Distributed at 5% Significance Level | |
| 629 | | | | | K-S Test Statistic | 0.153 | | | | | **Kolmogrov-Smirnoff GOF** | |
| 630 | | | | | 5% K-S Critical Value | 0.216 | | | | | Detected data appear Gamma Distributed at 5% Significance Level | |
| 631 | | | | | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | |
| 632 | | | | | | | | | | | | |
| 633 | | | | | **Gamma Statistics on Detected Data Only** | | | | | | | |
| 634 | | | | | k hat (MLE) | 3.701 | | | | | k star (bias corrected MLE) | 3.049 |
| 635 | | | | | Theta hat (MLE) | 0.337 | | | | | Theta star (bias corrected MLE) | 0.409 |
| 636 | | | | | nu hat (MLE) | 118.4 | | | | | nu star (bias corrected) | 97.56 |
| 637 | | | | | MLE Mean (bias corrected) | 1.246 | | | | | MLE Sd (bias corrected) | 0.714 |
| 638 | | | | | | | | | | | | |
| 639 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 640 | | | | | k hat (KM) | 2.711 | | | | | nu hat (KM) | 108.4 |
| 641 | | | | | Approximate Chi Square Value (108.44, α) | 85.41 | | | | | Adjusted Chi Square Value (108.44, β) | 83.79 |
| 642 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 1.393 | | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | 1.42 |
| 643 | | | | | | | | | | | | |
| 644 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 645 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 646 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 647 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 648 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 649 | | | | | Minimum | 0.01 | | | | | Mean | 1.012 |
| 650 | | | | | Maximum | 2.67 | | | | | Median | 0.92 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 651 | | | | | SD | 0.778 | | | | | CV | 0.768 |
| 652 | | | | | k hat (MLE) | 0.953 | | | | | k star (bias corrected MLE) | 0.843 |
| 653 | | | | | Theta hat (MLE) | 1.063 | | | | | Theta star (bias corrected MLE) | 1.201 |
| 654 | | | | | nu hat (MLE) | 38.11 | | | | | nu star (bias corrected) | 33.73 |
| 655 | | | | | MLE Mean (bias corrected) | 1.012 | | | | | MLE Sd (bias corrected) | 1.103 |
| 656 | | | | | | | | | | | Adjusted Level of Significance (β) | 0.038 |
| 657 | | | | | Approximate Chi Square Value (33.73, α) | 21.45 | | | | | Adjusted Chi Square Value (33.73, β) | 20.67 |
| 658 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 1.592 | | | | | 95% Gamma Adjusted UCL (use when n<50) | 1.652 |
| 659 | | | | | | | | | | | | |
| 660 | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | | |
| 661 | | | | | Shapiro Wilk Test Statistic | 0.941 | | | **Shapiro Wilk GOF Test** | | | |
| 662 | | | | | 5% Shapiro Wilk Critical Value | 0.887 | | | Detected Data appear Lognormal at 5% Significance Level | | | |
| 663 | | | | | Lilliefors Test Statistic | 0.149 | | | **Lilliefors GOF Test** | | | |
| 664 | | | | | 5% Lilliefors Critical Value | 0.222 | | | Detected Data appear Lognormal at 5% Significance Level | | | |
| 665 | | | | | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | |
| 666 | | | | | | | | | | | | |
| 667 | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | |
| 668 | | | | | Mean in Original Scale | 1.057 | | | | | Mean in Log Scale | -0.183 |
| 669 | | | | | SD in Original Scale | 0.725 | | | | | SD in Log Scale | 0.735 |
| 670 | | | | | 95% t UCL (assumes normality of ROS data) | 1.337 | | | | | 95% Percentile Bootstrap UCL | 1.326 |
| 671 | | | | | 95% BCA Bootstrap UCL | 1.377 | | | | | 95% Bootstrap t UCL | 1.395 |
| 672 | | | | | 95% H-UCL (Log ROS) | 1.602 | | | | | | |
| 673 | | | | | | | | | | | | |
| 674 | | | | | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | |
| 675 | | | | | KM Mean (logged) | -0.0754 | | | | | 95% H-UCL (KM -Log) | 1.432 |
| 676 | | | | | KM SD (logged) | 0.569 | | | | | 95% Critical H Value (KM-Log) | 2.089 |
| 677 | | | | | KM Standard Error of Mean (logged) | 0.131 | | | | | | |
| 678 | | | | | | | | | | | | |
| 679 | | | | | **DL/2 Statistics** | | | | | | | |
| 680 | | | | | **DL/2 Normal** | | | | **DL/2 Log-Transformed** | | | |
| 681 | | | | | Mean in Original Scale | 1.047 | | | | | Mean in Log Scale | -0.214 |
| 682 | | | | | SD in Original Scale | 0.735 | | | | | SD in Log Scale | 0.776 |
| 683 | | | | | 95% t UCL (Assumes normality) | 1.331 | | | | | 95% H-Stat UCL | 1.651 |
| 684 | | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | |
| 685 | | | | | | | | | | | | |
| 686 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 687 | | | | | **Detected Data appear Normal Distributed at 5% Significance Level** | | | | | | | |
| 688 | | | | | | | | | | | | |
| 689 | | | | | **Suggested UCL to Use** | | | | | | | |
| 690 | | | | | 95% KM (t) UCL | 1.363 | | | | | 95% KM (Percentile Bootstrap) UCL | 1.357 |
| 691 | | | | | | | | | | | | |
| 692 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 693 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 694 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 695 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 696 | | | | | | | | | | | | |
| 697 | **Iron** | | | | | | | | | | | |
| 698 | | | | | | | | | | | | |
| 699 | | | | | **General Statistics** | | | | | | | |
| 700 | | | | | Total Number of Observations | 20 | | | | | Number of Distinct Observations | 12 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 701 | | | | | Number of Detects | 10 | | | | | Number of Non-Detects | 10 |
| 702 | | | | | Number of Distinct Detects | 10 | | | | | Number of Distinct Non-Detects | 2 |
| 703 | | | | | Minimum Detect | 12 | | | | | Minimum Non-Detect | 10 |
| 704 | | | | | Maximum Detect | 1930 | | | | | Maximum Non-Detect | 30 |
| 705 | | | | | Variance Detects | 354525 | | | | | Percent Non-Detects | 50% |
| 706 | | | | | Mean Detects | 278.1 | | | | | SD Detects | 595.4 |
| 707 | | | | | Median Detects | 44 | | | | | CV Detects | 2.141 |
| 708 | | | | | Skewness Detects | 2.897 | | | | | Kurtosis Detects | 8.639 |
| 709 | | | | | Mean of Logged Detects | 4.16 | | | | | SD of Logged Detects | 1.67 |
| 710 | | | | | | | | | | | | |
| 711 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 712 | | | | | Shapiro Wilk Test Statistic | 0.517 | **Shapiro Wilk GOF Test** | | | | | |
| 713 | | | | | 5% Shapiro Wilk Critical Value | 0.842 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 714 | | | | | Lilliefors Test Statistic | 0.35 | **Lilliefors GOF Test** | | | | | |
| 715 | | | | | 5% Lilliefors Critical Value | 0.28 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 716 | | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | | |
| 717 | | | | | | | | | | | | |
| 718 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |
| 719 | | | | | Mean | 144.1 | | | | | Standard Error of Mean | 99.3 |
| 720 | | | | | SD | 421.3 | | | | | 95% KM (BCA) UCL | 318.8 |
| 721 | | | | | 95% KM (t) UCL | 315.8 | | | | | 95% KM (Percentile Bootstrap) UCL | 323.8 |
| 722 | | | | | 95% KM (z) UCL | 307.5 | | | | | 95% KM Bootstrap t UCL | 1291 |
| 723 | | | | | 90% KM Chebyshev UCL | 442 | | | | | 95% KM Chebyshev UCL | 577 |
| 724 | | | | | 97.5% KM Chebyshev UCL | 764.3 | | | | | 99% KM Chebyshev UCL | 1132 |
| 725 | | | | | | | | | | | | |
| 726 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 727 | | | | | A-D Test Statistic | 1.004 | **Anderson-Darling GOF Test** | | | | | |
| 728 | | | | | 5% A-D Critical Value | 0.788 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 729 | | | | | K-S Test Statistic | 0.306 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 730 | | | | | 5% K-S Critical Value | 0.283 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 731 | | | | | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | |
| 732 | | | | | | | | | | | | |
| 733 | | | | | **Gamma Statistics on Detected Data Only** | | | | | | | |
| 734 | | | | | k hat (MLE) | 0.441 | k star (bias corrected MLE) | | | | | 0.376 |
| 735 | | | | | Theta hat (MLE) | 630.3 | Theta star (bias corrected MLE) | | | | | 740.6 |
| 736 | | | | | nu hat (MLE) | 8.824 | nu star (bias corrected) | | | | | 7.51 |
| 737 | | | | | MLE Mean (bias corrected) | 278.1 | MLE Sd (bias corrected) | | | | | 453.8 |
| 738 | | | | | | | | | | | | |
| 739 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 740 | | | | | k hat (KM) | 0.117 | nu hat (KM) | | | | | 4.682 |
| 741 | | | | | Approximate Chi Square Value (4.68, α) | 1.008 | Adjusted Chi Square Value (4.68, β) | | | | | 0.883 |
| 742 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 669.3 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 764 |
| 743 | | | | | | | | | | | | |
| 744 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 745 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 746 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 747 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 748 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 749 | | | | | Minimum | 0.01 | Mean | | | | | 139.1 |
| 750 | | | | | Maximum | 1930 | Median | | | | | 6.005 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 751 | | | | | SD | 433.9 | | | | | CV | 3.12 |
| 752 | | | | | k hat (MLE) | 0.149 | | | | | k star (bias corrected MLE) | 0.16 |
| 753 | | | | | Theta hat (MLE) | 932.4 | | | | | Theta star (bias corrected MLE) | 868.5 |
| 754 | | | | | nu hat (MLE) | 5.966 | | | | | nu star (bias corrected) | 6.404 |
| 755 | | | | | MLE Mean (bias corrected) | 139.1 | | | | | MLE Sd (bias corrected) | 347.5 |
| 756 | | | | | | | | | | | Adjusted Level of Significance (β) | 0.038 |
| 757 | | | | | Approximate Chi Square Value (6.40, α) | 1.85 | | | | | Adjusted Chi Square Value (6.40, β) | 1.663 |
| 758 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 481.4 | | | | | 95% Gamma Adjusted UCL (use when n<50) | 535.4 |
| 759 | | | | | | | | | | | | |
| 760 | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | | |
| 761 | | | | | Shapiro Wilk Test Statistic | 0.886 | | | | | **Shapiro Wilk GOF Test** | |
| 762 | | | | | 5% Shapiro Wilk Critical Value | 0.842 | | | | | Detected Data appear Lognormal at 5% Significance Level | |
| 763 | | | | | Lilliefors Test Statistic | 0.208 | | | | | **Lilliefors GOF Test** | |
| 764 | | | | | 5% Lilliefors Critical Value | 0.28 | | | | | Detected Data appear Lognormal at 5% Significance Level | |
| 765 | | | | | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | |
| 766 | | | | | | | | | | | | |
| 767 | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | |
| 768 | | | | | Mean in Original Scale | 139.7 | | | | | Mean in Log Scale | 1.906 |
| 769 | | | | | SD in Original Scale | 433.7 | | | | | SD in Log Scale | 2.769 |
| 770 | | | | | 95% t UCL (assumes normality of ROS data) | 307.4 | | | | | 95% Percentile Bootstrap UCL | 325.1 |
| 771 | | | | | 95% BCA Bootstrap UCL | 432.2 | | | | | 95% Bootstrap t UCL | 1286 |
| 772 | | | | | 95% H-UCL (Log ROS) | 11820 | | | | | | |
| 773 | | | | | | | | | | | | |
| 774 | | | | | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | |
| 775 | | | | | KM Mean (logged) | 3.238 | | | | | 95% H-UCL (KM -Log) | 222.9 |
| 776 | | | | | KM SD (logged) | 1.452 | | | | | 95% Critical H Value (KM-Log) | 3.345 |
| 777 | | | | | KM Standard Error of Mean (logged) | 0.342 | | | | | | |
| 778 | | | | | | | | | | | | |
| 779 | | | | | **DL/2 Statistics** | | | | | | | |
| 780 | | | | | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | |
| 781 | | | | | Mean in Original Scale | 142.1 | | | | | Mean in Log Scale | 2.94 |
| 782 | | | | | SD in Original Scale | 432.9 | | | | | SD in Log Scale | 1.716 |
| 783 | | | | | 95% t UCL (Assumes normality) | 309.4 | | | | | 95% H-Stat UCL | 368.2 |
| 784 | | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | |
| 785 | | | | | | | | | | | | |
| 786 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 787 | | | | | **Detected Data appear Lognormal Distributed at 5% Significance Level** | | | | | | | |
| 788 | | | | | | | | | | | | |
| 789 | | | | | **Suggested UCL to Use** | | | | | | | |
| 790 | | | | | 99% KM (Chebyshev) UCL | 1132 | | | | | | |
| 791 | | | | | | | | | | | | |
| 792 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 793 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 794 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 795 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 796 | | | | | | | | | | | | |
| 797 | | | | | | | | | | | | |
| 798 | **Lithium** | | | | | | | | | | | |
| 799 | | | | | | | | | | | | |
| 800 | | | | | **General Statistics** | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 801 | | | | | Total Number of Observations | 20 | | | | | Number of Distinct Observations | 17 |
| 802 | | | | | | | | | | | Number of Missing Observations | 0 |
| 803 | | | | | Minimum | 21.7 | | | | | Mean | 67.89 |
| 804 | | | | | Maximum | 91 | | | | | Median | 73.5 |
| 805 | | | | | SD | 16.73 | | | | | Std. Error of Mean | 3.741 |
| 806 | | | | | Coefficient of Variation | 0.246 | | | | | Skewness | -1.083 |
| 807 | | | | | | | | | | | | |
| 808 | | | | | **Normal GOF Test** | | | | | | | |
| 809 | | | | | Shapiro Wilk Test Statistic | 0.921 | | | **Shapiro Wilk GOF Test** | | | |
| 810 | | | | | 5% Shapiro Wilk Critical Value | 0.905 | | | Data appear Normal at 5% Significance Level | | | |
| 811 | | | | | Lilliefors Test Statistic | 0.17 | | | **Lilliefors GOF Test** | | | |
| 812 | | | | | 5% Lilliefors Critical Value | 0.198 | | | Data appear Normal at 5% Significance Level | | | |
| 813 | | | | | **Data appear Normal at 5% Significance Level** | | | | | | | |
| 814 | | | | | | | | | | | | |
| 815 | | | | | **Assuming Normal Distribution** | | | | | | | |
| 816 | | | | | **95% Normal UCL** | | | | **95% UCLs (Adjusted for Skewness)** | | | |
| 817 | | | | | 95% Student's-t UCL | 74.35 | | | 95% Adjusted-CLT UCL (Chen-1995) | | | 73.07 |
| 818 | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | | | 74.2 |
| 819 | | | | | | | | | | | | |
| 820 | | | | | **Gamma GOF Test** | | | | | | | |
| 821 | | | | | A-D Test Statistic | 0.941 | | | **Anderson-Darling Gamma GOF Test** | | | |
| 822 | | | | | 5% A-D Critical Value | 0.742 | | | Data Not Gamma Distributed at 5% Significance Level | | | |
| 823 | | | | | K-S Test Statistic | 0.188 | | | **Kolmogrov-Smirnoff Gamma GOF Test** | | | |
| 824 | | | | | 5% K-S Critical Value | 0.194 | | | Detected data appear Gamma Distributed at 5% Significance Level | | | |
| 825 | | | | | **Detected data follow Appr. Gamma Distribution at 5% Significance Level** | | | | | | | |
| 826 | | | | | | | | | | | | |
| 827 | | | | | **Gamma Statistics** | | | | | | | |
| 828 | | | | | k hat (MLE) | 12.57 | | | k star (bias corrected MLE) | | | 10.72 |
| 829 | | | | | Theta hat (MLE) | 5.401 | | | Theta star (bias corrected MLE) | | | 6.335 |
| 830 | | | | | nu hat (MLE) | 502.7 | | | nu star (bias corrected) | | | 428.6 |
| 831 | | | | | MLE Mean (bias corrected) | 67.89 | | | MLE Sd (bias corrected) | | | 20.74 |
| 832 | | | | | | | | | Approximate Chi Square Value (0.05) | | | 381.6 |
| 833 | | | | | Adjusted Level of Significance | 0.038 | | | Adjusted Chi Square Value | | | 378.1 |
| 834 | | | | | | | | | | | | |
| 835 | | | | | **Assuming Gamma Distribution** | | | | | | | |
| 836 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 76.24 | | | 95% Adjusted Gamma UCL (use when n<50) | | | 76.95 |
| 837 | | | | | | | | | | | | |
| 838 | | | | | **Lognormal GOF Test** | | | | | | | |
| 839 | | | | | Shapiro Wilk Test Statistic | 0.78 | | | **Shapiro Wilk Lognormal GOF Test** | | | |
| 840 | | | | | 5% Shapiro Wilk Critical Value | 0.905 | | | Data Not Lognormal at 5% Significance Level | | | |
| 841 | | | | | Lilliefors Test Statistic | 0.208 | | | **Lilliefors Lognormal GOF Test** | | | |
| 842 | | | | | 5% Lilliefors Critical Value | 0.198 | | | Data Not Lognormal at 5% Significance Level | | | |
| 843 | | | | | **Data Not Lognormal at 5% Significance Level** | | | | | | | |
| 844 | | | | | | | | | | | | |
| 845 | | | | | **Lognormal Statistics** | | | | | | | |
| 846 | | | | | Minimum of Logged Data | 3.077 | | | Mean of logged Data | | | 4.178 |
| 847 | | | | | Maximum of Logged Data | 4.511 | | | SD of logged Data | | | 0.322 |
| 848 | | | | | | | | | | | | |
| 849 | | | | | **Assuming Lognormal Distribution** | | | | | | | |
| 850 | | | | | 95% H-UCL | 78.83 | | | 90% Chebyshev (MVUE) UCL | | | 83.52 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 851 | | | | | 95% Chebyshev (MVUE) UCL | 90.32 | | | | 97.5% Chebyshev (MVUE) UCL | | 99.77 |
| 852 | | | | | 99% Chebyshev (MVUE) UCL | 118.3 | | | | | | |
| 853 | | | | | | | | | | | | |
| 854 | | | | | Nonparametric Distribution Free UCL Statistics | | | | | | | |
| 855 | | | | | Data appear to follow a Discernible Distribution at 5% Significance Level | | | | | | | |
| 856 | | | | | | | | | | | | |
| 857 | | | | | Nonparametric Distribution Free UCLs | | | | | | | |
| 858 | | | | | 95% CLT UCL | 74.04 | | | | 95% Jackknife UCL | | 74.35 |
| 859 | | | | | 95% Standard Bootstrap UCL | 73.94 | | | | 95% Bootstrap-t UCL | | 73.42 |
| 860 | | | | | 95% Hall's Bootstrap UCL | 73.23 | | | | 95% Percentile Bootstrap UCL | | 73.55 |
| 861 | | | | | 95% BCA Bootstrap UCL | 73.09 | | | | | | |
| 862 | | | | | 90% Chebyshev(Mean, Sd) UCL | 79.11 | | | | 95% Chebyshev(Mean, Sd) UCL | | 84.19 |
| 863 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 91.25 | | | | 99% Chebyshev(Mean, Sd) UCL | | 105.1 |
| 864 | | | | | | | | | | | | |
| 865 | | | | | Suggested UCL to Use | | | | | | | |
| 866 | | | | | 95% Student's-t UCL | 74.35 | | | | | | |
| 867 | | | | | | | | | | | | |
| 868 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 869 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | |
| 870 | | | | | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | |
| 871 | | | | | For additional insight the user may want to consult a statistician. | | | | | | | |
| 872 | | | | | | | | | | | | |
| 873 | | | | | Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be | | | | | | | |
| 874 | | | | | reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets. | | | | | | | |
| 875 | | | | | | | | | | | | |
| 876 | | | | | | | | | | | | |
| 877 | Magnesium | | | | | | | | | | | |
| 878 | | | | | | | | | | | | |
| 879 | | | | | General Statistics | | | | | | | |
| 880 | | | | | Total Number of Observations | 20 | | | | Number of Distinct Observations | | 20 |
| 881 | | | | | | | | | | Number of Missing Observations | | 0 |
| 882 | | | | | Minimum | 37100 | | | | Mean | | 503205 |
| 883 | | | | | Maximum | 726000 | | | | Median | | 503500 |
| 884 | | | | | SD | 166405 | | | | Std. Error of Mean | | 37209 |
| 885 | | | | | Coefficient of Variation | 0.331 | | | | Skewness | | -1.173 |
| 886 | | | | | | | | | | | | |
| 887 | | | | | Normal GOF Test | | | | | | | |
| 888 | | | | | Shapiro Wilk Test Statistic | 0.911 | | | | Shapiro Wilk GOF Test | | |
| 889 | | | | | 5% Shapiro Wilk Critical Value | 0.905 | | | | Data appear Normal at 5% Significance Level | | |
| 890 | | | | | Lilliefors Test Statistic | 0.177 | | | | Lilliefors GOF Test | | |
| 891 | | | | | 5% Lilliefors Critical Value | 0.198 | | | | Data appear Normal at 5% Significance Level | | |
| 892 | | | | | Data appear Normal at 5% Significance Level | | | | | | | |
| 893 | | | | | | | | | | | | |
| 894 | | | | | Assuming Normal Distribution | | | | | | | |
| 895 | | | | | 95% Normal UCL | | | | | 95% UCLs (Adjusted for Skewness) | | |
| 896 | | | | | 95% Student's-t UCL | 567545 | | | | 95% Adjusted-CLT UCL (Chen-1995) | | 553985 |
| 897 | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | | 565919 |
| 898 | | | | | | | | | | | | |
| 899 | | | | | Gamma GOF Test | | | | | | | |
| 900 | | | | | A-D Test Statistic | 1.736 | | | | Anderson-Darling Gamma GOF Test | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 901 | | | | | 5% A-D Critical Value | 0.745 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 902 | | | | | K-S Test Statistic | 0.273 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 903 | | | | | 5% K-S Critical Value | 0.195 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 904 | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 905 | | | | | | | | | | | | |
| 906 | **Gamma Statistics** | | | | | | | | | | | |
| 907 | | | | | k hat (MLE) | 4.471 | k star (bias corrected MLE) | | | | | 3.833 |
| 908 | | | | | Theta hat (MLE) | 112559 | Theta star (bias corrected MLE) | | | | | 131271 |
| 909 | | | | | nu hat (MLE) | 178.8 | nu star (bias corrected) | | | | | 153.3 |
| 910 | | | | | MLE Mean (bias corrected) | 503205 | MLE Sd (bias corrected) | | | | | 257014 |
| 911 | | | | | | | Approximate Chi Square Value (0.05) | | | | | 125.7 |
| 912 | | | | | Adjusted Level of Significance | 0.038 | Adjusted Chi Square Value | | | | | 123.7 |
| 913 | | | | | | | | | | | | |
| 914 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 915 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 613780 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 623576 |
| 916 | | | | | | | | | | | | |
| 917 | **Lognormal GOF Test** | | | | | | | | | | | |
| 918 | | | | | Shapiro Wilk Test Statistic | 0.603 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 919 | | | | | 5% Shapiro Wilk Critical Value | 0.905 | Data Not Lognormal at 5% Significance Level | | | | | |
| 920 | | | | | Lilliefors Test Statistic | 0.304 | **Lilliefors Lognormal GOF Test** | | | | | |
| 921 | | | | | 5% Lilliefors Critical Value | 0.198 | Data Not Lognormal at 5% Significance Level | | | | | |
| 922 | **Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 923 | | | | | | | | | | | | |
| 924 | **Lognormal Statistics** | | | | | | | | | | | |
| 925 | | | | | Minimum of Logged Data | 10.52 | Mean of logged Data | | | | | 13.01 |
| 926 | | | | | Maximum of Logged Data | 13.5 | SD of logged Data | | | | | 0.644 |
| 927 | | | | | | | | | | | | |
| 928 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 929 | | | | | 95% H-UCL | 759723 | 90% Chebyshev (MVUE) UCL | | | | | 793494 |
| 930 | | | | | 95% Chebyshev (MVUE) UCL | 906221 | 97.5% Chebyshev (MVUE) UCL | | | | | 1062682 |
| 931 | | | | | 99% Chebyshev (MVUE) UCL | 1370020 | | | | | | |
| 932 | | | | | | | | | | | | |
| 933 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 934 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 935 | | | | | | | | | | | | |
| 936 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 937 | | | | | 95% CLT UCL | 564409 | 95% Jackknife UCL | | | | | 567545 |
| 938 | | | | | 95% Standard Bootstrap UCL | 563345 | 95% Bootstrap-t UCL | | | | | 558132 |
| 939 | | | | | 95% Hall's Bootstrap UCL | 557014 | 95% Percentile Bootstrap UCL | | | | | 559705 |
| 940 | | | | | 95% BCA Bootstrap UCL | 555905 | | | | | | |
| 941 | | | | | 90% Chebyshev(Mean, Sd) UCL | 614833 | 95% Chebyshev(Mean, Sd) UCL | | | | | 665396 |
| 942 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 735577 | 99% Chebyshev(Mean, Sd) UCL | | | | | 873432 |
| 943 | | | | | | | | | | | | |
| 944 | **Suggested UCL to Use** | | | | | | | | | | | |
| 945 | | | | | 95% Student's-t UCL | 567545 | | | | | | |
| 946 | | | | | | | | | | | | |
| 947 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 948 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 949 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |
| 950 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 951 | | | | | | | | | | | | |
| 952 | Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be | | | | | | | | | | | |
| 953 | reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets. | | | | | | | | | | | |
| 954 | | | | | | | | | | | | |
| 955 | | | | | | | | | | | | |
| 956 | Manganese | | | | | | | | | | | |
| 957 | | | | | | | | | | | | |
| 958 | General Statistics | | | | | | | | | | | |
| 959 | Total Number of Observations | | | | | 20 | Number of Distinct Observations | | | | | 20 |
| 960 | | | | | | | Number of Missing Observations | | | | | 0 |
| 961 | Minimum | | | | | 0.23 | Mean | | | | | 3362 |
| 962 | Maximum | | | | | 13900 | Median | | | | | 5.39 |
| 963 | SD | | | | | 5190 | Std. Error of Mean | | | | | 1161 |
| 964 | Coefficient of Variation | | | | | 1.544 | Skewness | | | | | 1.304 |
| 965 | | | | | | | | | | | | |
| 966 | Normal GOF Test | | | | | | | | | | | |
| 967 | Shapiro Wilk Test Statistic | | | | | 0.68 | Shapiro Wilk GOF Test | | | | | |
| 968 | 5% Shapiro Wilk Critical Value | | | | | 0.905 | Data Not Normal at 5% Significance Level | | | | | |
| 969 | Lilliefors Test Statistic | | | | | 0.34 | Lilliefors GOF Test | | | | | |
| 970 | 5% Lilliefors Critical Value | | | | | 0.198 | Data Not Normal at 5% Significance Level | | | | | |
| 971 | Data Not Normal at 5% Significance Level | | | | | | | | | | | |
| 972 | | | | | | | | | | | | |
| 973 | Assuming Normal Distribution | | | | | | | | | | | |
| 974 | 95% Normal UCL | | | | | | 95% UCLs (Adjusted for Skewness) | | | | | |
| 975 | 95% Student's-t UCL | | | | | 5369 | 95% Adjusted-CLT UCL (Chen-1995) | | | | | 5633 |
| 976 | | | | | | | 95% Modified-t UCL (Johnson-1978) | | | | | 5425 |
| 977 | | | | | | | | | | | | |
| 978 | Gamma GOF Test | | | | | | | | | | | |
| 979 | A-D Test Statistic | | | | | 1.841 | Anderson-Darling Gamma GOF Test | | | | | |
| 980 | 5% A-D Critical Value | | | | | 0.918 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 981 | K-S Test Statistic | | | | | 0.267 | Kolmogrov-Smirnoff Gamma GOF Test | | | | | |
| 982 | 5% K-S Critical Value | | | | | 0.217 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 983 | Data Not Gamma Distributed at 5% Significance Level | | | | | | | | | | | |
| 984 | | | | | | | | | | | | |
| 985 | Gamma Statistics | | | | | | | | | | | |
| 986 | k hat (MLE) | | | | | 0.172 | k star (bias corrected MLE) | | | | | 0.18 |
| 987 | Theta hat (MLE) | | | | | 19513 | Theta star (bias corrected MLE) | | | | | 18701 |
| 988 | nu hat (MLE) | | | | | 6.892 | nu star (bias corrected) | | | | | 7.191 |
| 989 | MLE Mean (bias corrected) | | | | | 3362 | MLE Sd (bias corrected) | | | | | 7929 |
| 990 | | | | | | | Approximate Chi Square Value (0.05) | | | | | 2.276 |
| 991 | Adjusted Level of Significance | | | | | 0.038 | Adjusted Chi Square Value | | | | | 2.064 |
| 992 | | | | | | | | | | | | |
| 993 | Assuming Gamma Distribution | | | | | | | | | | | |
| 994 | 95% Approximate Gamma UCL (use when n>=50)) | | | | | 10622 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 11715 |
| 995 | | | | | | | | | | | | |
| 996 | Lognormal GOF Test | | | | | | | | | | | |
| 997 | Shapiro Wilk Test Statistic | | | | | 0.81 | Shapiro Wilk Lognormal GOF Test | | | | | |
| 998 | 5% Shapiro Wilk Critical Value | | | | | 0.905 | Data Not Lognormal at 5% Significance Level | | | | | |
| 999 | Lilliefors Test Statistic | | | | | 0.238 | Lilliefors Lognormal GOF Test | | | | | |
| 1000 | 5% Lilliefors Critical Value | | | | | 0.198 | Data Not Lognormal at 5% Significance Level | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1001 | **Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1002 | | | | | | | | | | | | |
| 1003 | **Lognormal Statistics** | | | | | | | | | | | |
| 1004 | Minimum of Logged Data | | | | | -1.47 | Mean of logged Data | | | | | 3.75 |
| 1005 | Maximum of Logged Data | | | | | 9.54 | SD of logged Data | | | | | 4.364 |
| 1006 | | | | | | | | | | | | |
| 1007 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 1008 | 95% H-UCL | | | | | 3.164E+9 | 90% Chebyshev (MVUE) UCL | | | | | 173065 |
| 1009 | 95% Chebyshev (MVUE) UCL | | | | | 231093 | 97.5% Chebyshev (MVUE) UCL | | | | | 311633 |
| 1010 | 99% Chebyshev (MVUE) UCL | | | | | 469839 | | | | | | |
| 1011 | | | | | | | | | | | | |
| 1012 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1013 | **Data do not follow a Discernible Distribution (0.05)** | | | | | | | | | | | |
| 1014 | | | | | | | | | | | | |
| 1015 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 1016 | 95% CLT UCL | | | | | 5271 | 95% Jackknife UCL | | | | | 5369 |
| 1017 | 95% Standard Bootstrap UCL | | | | | 5239 | 95% Bootstrap-t UCL | | | | | 6062 |
| 1018 | 95% Hall's Bootstrap UCL | | | | | 5144 | 95% Percentile Bootstrap UCL | | | | | 5395 |
| 1019 | 95% BCA Bootstrap UCL | | | | | 5437 | | | | | | |
| 1020 | 90% Chebyshev(Mean, Sd) UCL | | | | | 6844 | 95% Chebyshev(Mean, Sd) UCL | | | | | 8421 |
| 1021 | 97.5% Chebyshev(Mean, Sd) UCL | | | | | 10610 | 99% Chebyshev(Mean, Sd) UCL | | | | | 14909 |
| 1022 | | | | | | | | | | | | |
| 1023 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1024 | 95% Hall's Bootstrap UCL | | | | | 5144 | | | | | | |
| 1025 | | | | | | | | | | | | |
| 1026 | **In Case Bootstrap t and/or Hall's Bootstrap yields an unreasonably large UCL value, use 97.5% or 99% Chebyshev (Mean, Sd) UCL** | | | | | | | | | | | |
| 1027 | | | | | | | | | | | | |
| 1028 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1029 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 1030 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |
| 1031 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1032 | | | | | | | | | | | | |
| 1033 | | | | | | | | | | | | |
| 1034 | **Mercury** | | | | | | | | | | | |
| 1035 | | | | | | | | | | | | |
| 1036 | **General Statistics** | | | | | | | | | | | |
| 1037 | Total Number of Observations | | | | | 0 | Number of Distinct Observations | | | | | 0 |
| 1038 | | | | | | | Number of Missing Observations | | | | | 20 |
| 1039 | Minimum | | | | | N/A | Mean | | | | | N/A |
| 1040 | Maximum | | | | | N/A | Median | | | | | N/A |
| 1041 | | | | | | | | | | | | |
| 1042 | **Warning: This data set only has 0 observations!** | | | | | | | | | | | |
| 1043 | **Data set is too small to compute reliable and meaningful statistics and estimates!** | | | | | | | | | | | |
| 1044 | **The data set for variable Mercury was not processed!** | | | | | | | | | | | |
| 1045 | | | | | | | | | | | | |
| 1046 | **It is suggested to collect at least 8 to 10 observations before using these statistical methods!** | | | | | | | | | | | |
| 1047 | **If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.** | | | | | | | | | | | |
| 1048 | | | | | | | | | | | | |
| 1049 | | | | | | | | | | | | |
| 1050 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1051 | **Molybdenum** | | | | | | | | | | | |
| 1052 | | | | | | | | | | | | |
| 1053 | | | | | | **General Statistics** | | | | | | |
| 1054 | | | | | Total Number of Observations | 20 | | | | Number of Distinct Observations | | 18 |
| 1055 | | | | | | | | | | Number of Missing Observations | | 0 |
| 1056 | | | | | Minimum | 3.6 | | | | Mean | | 16.38 |
| 1057 | | | | | Maximum | 61.7 | | | | Median | | 5.3 |
| 1058 | | | | | SD | 18.33 | | | | Std. Error of Mean | | 4.098 |
| 1059 | | | | | Coefficient of Variation | 1.119 | | | | Skewness | | 1.516 |
| 1060 | | | | | | | | | | | | |
| 1061 | | | | | | **Normal GOF Test** | | | | | | |
| 1062 | | | | | Shapiro Wilk Test Statistic | 0.719 | | | | **Shapiro Wilk GOF Test** | | |
| 1063 | | | | | 5% Shapiro Wilk Critical Value | 0.905 | | | | Data Not Normal at 5% Significance Level | | |
| 1064 | | | | | Lilliefors Test Statistic | 0.318 | | | | **Lilliefors GOF Test** | | |
| 1065 | | | | | 5% Lilliefors Critical Value | 0.198 | | | | Data Not Normal at 5% Significance Level | | |
| 1066 | | | | | | **Data Not Normal at 5% Significance Level** | | | | | | |
| 1067 | | | | | | | | | | | | |
| 1068 | | | | | | **Assuming Normal Distribution** | | | | | | |
| 1069 | | | | | **95% Normal UCL** | | | | | **95% UCLs (Adjusted for Skewness)** | | |
| 1070 | | | | | 95% Student's-t UCL | 23.47 | | | | 95% Adjusted-CLT UCL (Chen-1995) | | 24.61 |
| 1071 | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | | 23.7 |
| 1072 | | | | | | | | | | | | |
| 1073 | | | | | | **Gamma GOF Test** | | | | | | |
| 1074 | | | | | A-D Test Statistic | 1.923 | | | | **Anderson-Darling Gamma GOF Test** | | |
| 1075 | | | | | 5% A-D Critical Value | 0.766 | | | | Data Not Gamma Distributed at 5% Significance Level | | |
| 1076 | | | | | K-S Test Statistic | 0.322 | | | | **Kolmogrov-Smirnoff Gamma GOF Test** | | |
| 1077 | | | | | 5% K-S Critical Value | 0.199 | | | | Data Not Gamma Distributed at 5% Significance Level | | |
| 1078 | | | | | | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | |
| 1079 | | | | | | | | | | | | |
| 1080 | | | | | | **Gamma Statistics** | | | | | | |
| 1081 | | | | | k hat (MLE) | 1.1 | | | | k star (bias corrected MLE) | | 0.969 |
| 1082 | | | | | Theta hat (MLE) | 14.89 | | | | Theta star (bias corrected MLE) | | 16.91 |
| 1083 | | | | | nu hat (MLE) | 44.01 | | | | nu star (bias corrected) | | 38.75 |
| 1084 | | | | | MLE Mean (bias corrected) | 16.38 | | | | MLE Sd (bias corrected) | | 16.65 |
| 1085 | | | | | | | | | | Approximate Chi Square Value (0.05) | | 25.49 |
| 1086 | | | | | Adjusted Level of Significance | 0.038 | | | | Adjusted Chi Square Value | | 24.64 |
| 1087 | | | | | | | | | | | | |
| 1088 | | | | | | **Assuming Gamma Distribution** | | | | | | |
| 1089 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 24.9 | | | | 95% Adjusted Gamma UCL (use when n<50) | | 25.76 |
| 1090 | | | | | | | | | | | | |
| 1091 | | | | | | **Lognormal GOF Test** | | | | | | |
| 1092 | | | | | Shapiro Wilk Test Statistic | 0.806 | | | | **Shapiro Wilk Lognormal GOF Test** | | |
| 1093 | | | | | 5% Shapiro Wilk Critical Value | 0.905 | | | | Data Not Lognormal at 5% Significance Level | | |
| 1094 | | | | | Lilliefors Test Statistic | 0.298 | | | | **Lilliefors Lognormal GOF Test** | | |
| 1095 | | | | | 5% Lilliefors Critical Value | 0.198 | | | | Data Not Lognormal at 5% Significance Level | | |
| 1096 | | | | | | **Data Not Lognormal at 5% Significance Level** | | | | | | |
| 1097 | | | | | | | | | | | | |
| 1098 | | | | | | **Lognormal Statistics** | | | | | | |
| 1099 | | | | | Minimum of Logged Data | 1.281 | | | | Mean of logged Data | | 2.277 |
| 1100 | | | | | Maximum of Logged Data | 4.122 | | | | SD of logged Data | | 0.999 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 1101 | | | | | | | | | | | | |
| 1102 | | | | | | **Assuming Lognormal Distribution** | | | | | | |
| 1103 | | | | | 95% H-UCL | 29.38 | | | | 90% Chebyshev (MVUE) UCL | | 27.14 |
| 1104 | | | | | 95% Chebyshev (MVUE) UCL | 32.41 | | | | 97.5% Chebyshev (MVUE) UCL | | 39.73 |
| 1105 | | | | | 99% Chebyshev (MVUE) UCL | 54.09 | | | | | | |
| 1106 | | | | | | | | | | | | |
| 1107 | | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | |
| 1108 | | | | | | **Data do not follow a Discernible Distribution (0.05)** | | | | | | |
| 1109 | | | | | | | | | | | | |
| 1110 | | | | | | **Nonparametric Distribution Free UCLs** | | | | | | |
| 1111 | | | | | 95% CLT UCL | 23.12 | | | | 95% Jackknife UCL | | 23.47 |
| 1112 | | | | | 95% Standard Bootstrap UCL | 22.97 | | | | 95% Bootstrap-t UCL | | 26.16 |
| 1113 | | | | | 95% Hall's Bootstrap UCL | 25.06 | | | | 95% Percentile Bootstrap UCL | | 23.28 |
| 1114 | | | | | 95% BCA Bootstrap UCL | 24.54 | | | | | | |
| 1115 | | | | | 90% Chebyshev(Mean, Sd) UCL | 28.68 | | | | 95% Chebyshev(Mean, Sd) UCL | | 34.25 |
| 1116 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 41.98 | | | | 99% Chebyshev(Mean, Sd) UCL | | 57.16 |
| 1117 | | | | | | | | | | | | |
| 1118 | | | | | | **Suggested UCL to Use** | | | | | | |
| 1119 | | | | | 95% Chebyshev (Mean, Sd) UCL | 34.25 | | | | | | |
| 1120 | | | | | | | | | | | | |
| 1121 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 1122 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | |
| 1123 | | | | | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | |
| 1124 | | | | | For additional insight the user may want to consult a statistician. | | | | | | | |
| 1125 | | | | | | | | | | | | |
| 1126 | **Nickel** | | | | | | | | | | | |
| 1127 | | | | | | | | | | | | |
| 1128 | | | | | | **General Statistics** | | | | | | |
| 1129 | | | | | Total Number of Observations | 20 | | | | Number of Distinct Observations | | 20 |
| 1130 | | | | | Number of Detects | 18 | | | | Number of Non-Detects | | 2 |
| 1131 | | | | | Number of Distinct Detects | 18 | | | | Number of Distinct Non-Detects | | 2 |
| 1132 | | | | | Minimum Detect | 0.72 | | | | Minimum Non-Detect | | 0.4 |
| 1133 | | | | | Maximum Detect | 33 | | | | Maximum Non-Detect | | 0.5 |
| 1134 | | | | | Variance Detects | 60.3 | | | | Percent Non-Detects | | 10% |
| 1135 | | | | | Mean Detects | 6.277 | | | | SD Detects | | 7.765 |
| 1136 | | | | | Median Detects | 3.745 | | | | CV Detects | | 1.237 |
| 1137 | | | | | Skewness Detects | 2.691 | | | | Kurtosis Detects | | 8.392 |
| 1138 | | | | | Mean of Logged Detects | 1.312 | | | | SD of Logged Detects | | 1.041 |
| 1139 | | | | | | | | | | | | |
| 1140 | | | | | | **Normal GOF Test on Detects Only** | | | | | | |
| 1141 | | | | | Shapiro Wilk Test Statistic | 0.679 | | | | **Shapiro Wilk GOF Test** | | |
| 1142 | | | | | 5% Shapiro Wilk Critical Value | 0.897 | | | | Detected Data Not Normal at 5% Significance Level | | |
| 1143 | | | | | Lilliefors Test Statistic | 0.284 | | | | **Lilliefors GOF Test** | | |
| 1144 | | | | | 5% Lilliefors Critical Value | 0.209 | | | | Detected Data Not Normal at 5% Significance Level | | |
| 1145 | | | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | |
| 1146 | | | | | | | | | | | | |
| 1147 | | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | |
| 1148 | | | | | Mean | 5.689 | | | | Standard Error of Mean | | 1.696 |
| 1149 | | | | | SD | 7.373 | | | | 95% KM (BCA) UCL | | 8.965 |
| 1150 | | | | | 95% KM (t) UCL | 8.622 | | | | 95% KM (Percentile Bootstrap) UCL | | 8.649 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 1151 | | | | | 95% KM (z) UCL | 8.479 | | | | | 95% KM Bootstrap t UCL | 11.47 |
| 1152 | | | | | 90% KM Chebyshev UCL | 10.78 | | | | | 95% KM Chebyshev UCL | 13.08 |
| 1153 | | | | | 97.5% KM Chebyshev UCL | 16.28 | | | | | 99% KM Chebyshev UCL | 22.57 |
| 1154 | | | | | | | | | | | | |
| 1155 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 1156 | | | | | A-D Test Statistic | 0.416 | **Anderson-Darling GOF Test** | | | | | |
| 1157 | | | | | 5% A-D Critical Value | 0.765 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1158 | | | | | K-S Test Statistic | 0.159 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 1159 | | | | | 5% K-S Critical Value | 0.209 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1160 | | | | | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | |
| 1161 | | | | | | | | | | | | |
| 1162 | | | | | **Gamma Statistics on Detected Data Only** | | | | | | | |
| 1163 | | | | | k hat (MLE) | 1.089 | | | | | k star (bias corrected MLE) | 0.944 |
| 1164 | | | | | Theta hat (MLE) | 5.764 | | | | | Theta star (bias corrected MLE) | 6.646 |
| 1165 | | | | | nu hat (MLE) | 39.2 | | | | | nu star (bias corrected) | 34 |
| 1166 | | | | | MLE Mean (bias corrected) | 6.277 | | | | | MLE Sd (bias corrected) | 6.459 |
| 1167 | | | | | | | | | | | | |
| 1168 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 1169 | | | | | k hat (KM) | 0.595 | | | | | nu hat (KM) | 23.81 |
| 1170 | | | | | Approximate Chi Square Value (23.81, α) | 13.71 | | | | | Adjusted Chi Square Value (23.81, β) | 13.1 |
| 1171 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 9.884 | | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | 10.34 |
| 1172 | | | | | | | | | | | | |
| 1173 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 1174 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 1175 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 1176 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 1177 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 1178 | | | | | Minimum | 0.01 | | | | | Mean | 5.65 |
| 1179 | | | | | Maximum | 33 | | | | | Median | 3.145 |
| 1180 | | | | | SD | 7.594 | | | | | CV | 1.344 |
| 1181 | | | | | k hat (MLE) | 0.609 | | | | | k star (bias corrected MLE) | 0.551 |
| 1182 | | | | | Theta hat (MLE) | 9.27 | | | | | Theta star (bias corrected MLE) | 10.25 |
| 1183 | | | | | nu hat (MLE) | 24.38 | | | | | nu star (bias corrected) | 22.06 |
| 1184 | | | | | MLE Mean (bias corrected) | 5.65 | | | | | MLE Sd (bias corrected) | 7.609 |
| 1185 | | | | | | | | | | | Adjusted Level of Significance (β) | 0.038 |
| 1186 | | | | | Approximate Chi Square Value (22.06, α) | 12.38 | | | | | Adjusted Chi Square Value (22.06, β) | 11.81 |
| 1187 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 10.07 | | | | | 95% Gamma Adjusted UCL (use when n<50) | 10.55 |
| 1188 | | | | | | | | | | | | |
| 1189 | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | | |
| 1190 | | | | | Shapiro Wilk Test Statistic | 0.98 | **Shapiro Wilk GOF Test** | | | | | |
| 1191 | | | | | 5% Shapiro Wilk Critical Value | 0.897 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 1192 | | | | | Lilliefors Test Statistic | 0.0916 | **Lilliefors GOF Test** | | | | | |
| 1193 | | | | | 5% Lilliefors Critical Value | 0.209 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 1194 | | | | | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | |
| 1195 | | | | | | | | | | | | |
| 1196 | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | |
| 1197 | | | | | Mean in Original Scale | 5.681 | | | | | Mean in Log Scale | 1.066 |
| 1198 | | | | | SD in Original Scale | 7.571 | | | | | SD in Log Scale | 1.241 |
| 1199 | | | | | 95% t UCL (assumes normality of ROS data) | 8.608 | | | | | 95% Percentile Bootstrap UCL | 8.723 |
| 1200 | | | | | 95% BCA Bootstrap UCL | 9.681 | | | | | 95% Bootstrap t UCL | 11.44 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 1201 | | | | | 95% H-UCL (Log ROS) | 14.74 | | | | | | |
| 1202 | | | | | | | | | | | | |
| 1203 | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | | | | | |
| 1204 | | | | | KM Mean (logged) | 1.089 | | | | | 95% H-UCL (KM -Log) | 12.77 |
| 1205 | | | | | KM SD (logged) | 1.169 | | | | | 95% Critical H Value (KM-Log) | 2.888 |
| 1206 | | | | | KM Standard Error of Mean (logged) | 0.269 | | | | | | |
| 1207 | | | | | | | | | | | | |
| 1208 | **DL/2 Statistics** | | | | | | | | | | | |
| 1209 | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | | | | | |
| 1210 | | | | | Mean in Original Scale | 5.672 | | | | | Mean in Log Scale | 1.031 |
| 1211 | | | | | SD in Original Scale | 7.578 | | | | | SD in Log Scale | 1.311 |
| 1212 | | | | | 95% t UCL (Assumes normality) | 8.601 | | | | | 95% H-Stat UCL | 16.87 |
| 1213 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 1214 | | | | | | | | | | | | |
| 1215 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1216 | **Detected Data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1217 | | | | | | | | | | | | |
| 1218 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1219 | | | | | 95% KM (Chebyshev) UCL | 13.08 | | | | | 95% GROS Adjusted Gamma UCL | 10.55 |
| 1220 | | | | | 95% Adjusted Gamma KM-UCL | 10.34 | | | | | | |
| 1221 | | | | | | | | | | | | |
| 1222 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1223 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 1224 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 1225 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1226 | | | | | | | | | | | | |
| 1227 | | | | | | | | | | | | |
| 1228 | **Potassium** | | | | | | | | | | | |
| 1229 | | | | | | | | | | | | |
| 1230 | **General Statistics** | | | | | | | | | | | |
| 1231 | | | | | Total Number of Observations | 20 | | | | | Number of Distinct Observations | 18 |
| 1232 | | | | | | | | | | | Number of Missing Observations | 0 |
| 1233 | | | | | Minimum | 31700 | | | | | Mean | 148685 |
| 1234 | | | | | Maximum | 216000 | | | | | Median | 151000 |
| 1235 | | | | | SD | 41642 | | | | | Std. Error of Mean | 9311 |
| 1236 | | | | | Coefficient of Variation | 0.28 | | | | | Skewness | -0.964 |
| 1237 | | | | | | | | | | | | |
| 1238 | **Normal GOF Test** | | | | | | | | | | | |
| 1239 | | | | | Shapiro Wilk Test Statistic | 0.935 | **Shapiro Wilk GOF Test** | | | | | |
| 1240 | | | | | 5% Shapiro Wilk Critical Value | 0.905 | Data appear Normal at 5% Significance Level | | | | | |
| 1241 | | | | | Lilliefors Test Statistic | 0.174 | **Lilliefors GOF Test** | | | | | |
| 1242 | | | | | 5% Lilliefors Critical Value | 0.198 | Data appear Normal at 5% Significance Level | | | | | |
| 1243 | **Data appear Normal at 5% Significance Level** | | | | | | | | | | | |
| 1244 | | | | | | | | | | | | |
| 1245 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 1246 | **95% Normal UCL** | | | | | | **95% UCLs (Adjusted for Skewness)** | | | | | |
| 1247 | | | | | 95% Student's-t UCL | 164786 | | | | | 95% Adjusted-CLT UCL (Chen-1995) | 161856 |
| 1248 | | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | 164451 |
| 1249 | | | | | | | | | | | | |
| 1250 | **Gamma GOF Test** | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 1251 | | | | | A-D Test Statistic | 1.087 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 1252 | | | | | 5% A-D Critical Value | 0.743 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1253 | | | | | K-S Test Statistic | 0.224 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 1254 | | | | | 5% K-S Critical Value | 0.194 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1255 | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1256 | | | | | | | | | | | | |
| 1257 | **Gamma Statistics** | | | | | | | | | | | |
| 1258 | | | | | k hat (MLE) | 8.663 | | | | k star (bias corrected MLE) | | 7.397 |
| 1259 | | | | | Theta hat (MLE) | 17163 | | | | Theta star (bias corrected MLE) | | 20101 |
| 1260 | | | | | nu hat (MLE) | 346.5 | | | | nu star (bias corrected) | | 295.9 |
| 1261 | | | | | MLE Mean (bias corrected) | 148685 | | | | MLE Sd (bias corrected) | | 54669 |
| 1262 | | | | | | | | | | Approximate Chi Square Value (0.05) | | 257 |
| 1263 | | | | | Adjusted Level of Significance | 0.038 | | | | Adjusted Chi Square Value | | 254.2 |
| 1264 | | | | | | | | | | | | |
| 1265 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 1266 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 171155 | | | | 95% Adjusted Gamma UCL (use when n<50) | | 173078 |
| 1267 | | | | | | | | | | | | |
| 1268 | **Lognormal GOF Test** | | | | | | | | | | | |
| 1269 | | | | | Shapiro Wilk Test Statistic | 0.724 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 1270 | | | | | 5% Shapiro Wilk Critical Value | 0.905 | Data Not Lognormal at 5% Significance Level | | | | | |
| 1271 | | | | | Lilliefors Test Statistic | 0.24 | **Lilliefors Lognormal GOF Test** | | | | | |
| 1272 | | | | | 5% Lilliefors Critical Value | 0.198 | Data Not Lognormal at 5% Significance Level | | | | | |
| 1273 | **Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1274 | | | | | | | | | | | | |
| 1275 | **Lognormal Statistics** | | | | | | | | | | | |
| 1276 | | | | | Minimum of Logged Data | 10.36 | | | | Mean of logged Data | | 11.85 |
| 1277 | | | | | Maximum of Logged Data | 12.28 | | | | SD of logged Data | | 0.407 |
| 1278 | | | | | | | | | | | | |
| 1279 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 1280 | | | | | 95% H-UCL | 182510 | | | | 90% Chebyshev (MVUE) UCL | | 194112 |
| 1281 | | | | | 95% Chebyshev (MVUE) UCL | 213349 | | | | 97.5% Chebyshev (MVUE) UCL | | 240050 |
| 1282 | | | | | 99% Chebyshev (MVUE) UCL | 292499 | | | | | | |
| 1283 | | | | | | | | | | | | |
| 1284 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1285 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 1286 | | | | | | | | | | | | |
| 1287 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 1288 | | | | | 95% CLT UCL | 164001 | | | | 95% Jackknife UCL | | 164786 |
| 1289 | | | | | 95% Standard Bootstrap UCL | 163416 | | | | 95% Bootstrap-t UCL | | 163340 |
| 1290 | | | | | 95% Hall's Bootstrap UCL | 162808 | | | | 95% Percentile Bootstrap UCL | | 163850 |
| 1291 | | | | | 95% BCA Bootstrap UCL | 162050 | | | | | | |
| 1292 | | | | | 90% Chebyshev(Mean, Sd) UCL | 176619 | | | | 95% Chebyshev(Mean, Sd) UCL | | 189272 |
| 1293 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 206834 | | | | 99% Chebyshev(Mean, Sd) UCL | | 241332 |
| 1294 | | | | | | | | | | | | |
| 1295 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1296 | | | | | 95% Student's-t UCL | 164786 | | | | | | |
| 1297 | | | | | | | | | | | | |
| 1298 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1299 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 1300 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 1301 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1302 | | | | | | | | | | | | |
| 1303 | **Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be** | | | | | | | | | | | |
| 1304 | **reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.** | | | | | | | | | | | |
| 1305 | | | | | | | | | | | | |
| 1306 | | | | | | | | | | | | |
| 1307 | **Rubidium** | | | | | | | | | | | |
| 1308 | | | | | | | | | | | | |
| 1309 | **General Statistics** | | | | | | | | | | | |
| 1310 | Total Number of Observations | | | | | 20 | Number of Distinct Observations | | | | | 20 |
| 1311 | | | | | | | Number of Missing Observations | | | | | 0 |
| 1312 | Minimum | | | | | 9.4 | Mean | | | | | 39.77 |
| 1313 | Maximum | | | | | 58.1 | Median | | | | | 43.55 |
| 1314 | SD | | | | | 12.03 | Std. Error of Mean | | | | | 2.69 |
| 1315 | Coefficient of Variation | | | | | 0.303 | Skewness | | | | | -0.8 |
| 1316 | | | | | | | | | | | | |
| 1317 | **Normal GOF Test** | | | | | | | | | | | |
| 1318 | Shapiro Wilk Test Statistic | | | | | 0.937 | **Shapiro Wilk GOF Test** | | | | | |
| 1319 | 5% Shapiro Wilk Critical Value | | | | | 0.905 | Data appear Normal at 5% Significance Level | | | | | |
| 1320 | Lilliefors Test Statistic | | | | | 0.168 | **Lilliefors GOF Test** | | | | | |
| 1321 | 5% Lilliefors Critical Value | | | | | 0.198 | Data appear Normal at 5% Significance Level | | | | | |
| 1322 | **Data appear Normal at 5% Significance Level** | | | | | | | | | | | |
| 1323 | | | | | | | | | | | | |
| 1324 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 1325 | **95% Normal UCL** | | | | | | **95% UCLs (Adjusted for Skewness)** | | | | | |
| 1326 | 95% Student's-t UCL | | | | | 44.42 | 95% Adjusted-CLT UCL (Chen-1995) | | | | | 43.68 |
| 1327 | | | | | | | 95% Modified-t UCL (Johnson-1978) | | | | | 44.34 |
| 1328 | | | | | | | | | | | | |
| 1329 | **Gamma GOF Test** | | | | | | | | | | | |
| 1330 | A-D Test Statistic | | | | | 0.872 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 1331 | 5% A-D Critical Value | | | | | 0.743 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1332 | K-S Test Statistic | | | | | 0.183 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 1333 | 5% K-S Critical Value | | | | | 0.194 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1334 | **Detected data follow Appr. Gamma Distribution at 5% Significance Level** | | | | | | | | | | | |
| 1335 | | | | | | | | | | | | |
| 1336 | **Gamma Statistics** | | | | | | | | | | | |
| 1337 | k hat (MLE) | | | | | 8.064 | k star (bias corrected MLE) | | | | | 6.888 |
| 1338 | Theta hat (MLE) | | | | | 4.932 | Theta star (bias corrected MLE) | | | | | 5.774 |
| 1339 | nu hat (MLE) | | | | | 322.6 | nu star (bias corrected) | | | | | 275.5 |
| 1340 | MLE Mean (bias corrected) | | | | | 39.77 | MLE Sd (bias corrected) | | | | | 15.15 |
| 1341 | | | | | | | Approximate Chi Square Value (0.05) | | | | | 238.1 |
| 1342 | Adjusted Level of Significance | | | | | 0.038 | Adjusted Chi Square Value | | | | | 235.3 |
| 1343 | | | | | | | | | | | | |
| 1344 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 1345 | 95% Approximate Gamma UCL (use when n>=50)) | | | | | 46.02 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 46.56 |
| 1346 | | | | | | | | | | | | |
| 1347 | **Lognormal GOF Test** | | | | | | | | | | | |
| 1348 | Shapiro Wilk Test Statistic | | | | | 0.792 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 1349 | 5% Shapiro Wilk Critical Value | | | | | 0.905 | Data Not Lognormal at 5% Significance Level | | | | | |
| 1350 | Lilliefors Test Statistic | | | | | 0.175 | **Lilliefors Lognormal GOF Test** | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1351 | | | | | 5% Lilliefors Critical Value | 0.198 | Data appear Lognormal at 5% Significance Level | | | | | |
| 1352 | **Data appear Approximate Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1353 | | | | | | | | | | | | |
| 1354 | **Lognormal Statistics** | | | | | | | | | | | |
| 1355 | | | | | Minimum of Logged Data | 2.241 | Mean of logged Data | | | | | 3.62 |
| 1356 | | | | | Maximum of Logged Data | 4.062 | SD of logged Data | | | | | 0.411 |
| 1357 | | | | | | | | | | | | |
| 1358 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 1359 | | | | | 95% H-UCL | 48.76 | 90% Chebyshev (MVUE) UCL | | | | | 51.86 |
| 1360 | | | | | 95% Chebyshev (MVUE) UCL | 57.03 | 97.5% Chebyshev (MVUE) UCL | | | | | 64.21 |
| 1361 | | | | | 99% Chebyshev (MVUE) UCL | 78.32 | | | | | | |
| 1362 | | | | | | | | | | | | |
| 1363 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1364 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 1365 | | | | | | | | | | | | |
| 1366 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 1367 | | | | | 95% CLT UCL | 44.2 | 95% Jackknife UCL | | | | | 44.42 |
| 1368 | | | | | 95% Standard Bootstrap UCL | 43.97 | 95% Bootstrap-t UCL | | | | | 43.99 |
| 1369 | | | | | 95% Hall's Bootstrap UCL | 43.79 | 95% Percentile Bootstrap UCL | | | | | 44.01 |
| 1370 | | | | | 95% BCA Bootstrap UCL | 43.58 | | | | | | |
| 1371 | | | | | 90% Chebyshev(Mean, Sd) UCL | 47.84 | 95% Chebyshev(Mean, Sd) UCL | | | | | 51.5 |
| 1372 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 56.57 | 99% Chebyshev(Mean, Sd) UCL | | | | | 66.54 |
| 1373 | | | | | | | | | | | | |
| 1374 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1375 | | | | | 95% Student's-t UCL | 44.42 | | | | | | |
| 1376 | | | | | | | | | | | | |
| 1377 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1378 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 1379 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |
| 1380 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1381 | | | | | | | | | | | | |
| 1382 | **Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be** | | | | | | | | | | | |
| 1383 | **reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.** | | | | | | | | | | | |
| 1384 | | | | | | | | | | | | |
| 1385 | | | | | | | | | | | | |
| 1386 | **Silicon** | | | | | | | | | | | |
| 1387 | | | | | | | | | | | | |
| 1388 | **General Statistics** | | | | | | | | | | | |
| 1389 | | | | | Total Number of Observations | 20 | Number of Distinct Observations | | | | | 19 |
| 1390 | | | | | | | Number of Missing Observations | | | | | 0 |
| 1391 | | | | | Minimum | 2390 | Mean | | | | | 3468 |
| 1392 | | | | | Maximum | 4960 | Median | | | | | 3395 |
| 1393 | | | | | SD | 625.2 | Std. Error of Mean | | | | | 139.8 |
| 1394 | | | | | Coefficient of Variation | 0.18 | Skewness | | | | | 0.678 |
| 1395 | | | | | | | | | | | | |
| 1396 | **Normal GOF Test** | | | | | | | | | | | |
| 1397 | | | | | Shapiro Wilk Test Statistic | 0.955 | **Shapiro Wilk GOF Test** | | | | | |
| 1398 | | | | | 5% Shapiro Wilk Critical Value | 0.905 | Data appear Normal at 5% Significance Level | | | | | |
| 1399 | | | | | Lilliefors Test Statistic | 0.143 | **Lilliefors GOF Test** | | | | | |
| 1400 | | | | | 5% Lilliefors Critical Value | 0.198 | Data appear Normal at 5% Significance Level | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1401 | Data appear Normal at 5% Significance Level | | | | | | | | | | | |
| 1402 | | | | | | | | | | | | |
| 1403 | Assuming Normal Distribution | | | | | | | | | | | |
| 1404 | 95% Normal UCL | | | | | | 95% UCLs (Adjusted for Skewness) | | | | | |
| 1405 | 95% Student's-t UCL | | | | | 3710 | 95% Adjusted-CLT UCL (Chen-1995) | | | | | 3721 |
| 1406 | | | | | | | 95% Modified-t UCL (Johnson-1978) | | | | | 3713 |
| 1407 | | | | | | | | | | | | |
| 1408 | Gamma GOF Test | | | | | | | | | | | |
| 1409 | A-D Test Statistic | | | | | 0.302 | Anderson-Darling Gamma GOF Test | | | | | |
| 1410 | 5% A-D Critical Value | | | | | 0.74 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1411 | K-S Test Statistic | | | | | 0.123 | Kolmogrov-Smirnoff Gamma GOF Test | | | | | |
| 1412 | 5% K-S Critical Value | | | | | 0.193 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1413 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | | | | | | | |
| 1414 | | | | | | | | | | | | |
| 1415 | Gamma Statistics | | | | | | | | | | | |
| 1416 | k hat (MLE) | | | | | 33.64 | k star (bias corrected MLE) | | | | | 28.63 |
| 1417 | Theta hat (MLE) | | | | | 103.1 | Theta star (bias corrected MLE) | | | | | 121.1 |
| 1418 | nu hat (MLE) | | | | | 1346 | nu star (bias corrected) | | | | | 1145 |
| 1419 | MLE Mean (bias corrected) | | | | | 3468 | MLE Sd (bias corrected) | | | | | 648.2 |
| 1420 | | | | | | | Approximate Chi Square Value (0.05) | | | | | 1067 |
| 1421 | Adjusted Level of Significance | | | | | 0.038 | Adjusted Chi Square Value | | | | | 1062 |
| 1422 | | | | | | | | | | | | |
| 1423 | Assuming Gamma Distribution | | | | | | | | | | | |
| 1424 | 95% Approximate Gamma UCL (use when n>=50)) | | | | | 3720 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 3741 |
| 1425 | | | | | | | | | | | | |
| 1426 | Lognormal GOF Test | | | | | | | | | | | |
| 1427 | Shapiro Wilk Test Statistic | | | | | 0.976 | Shapiro Wilk Lognormal GOF Test | | | | | |
| 1428 | 5% Shapiro Wilk Critical Value | | | | | 0.905 | Data appear Lognormal at 5% Significance Level | | | | | |
| 1429 | Lilliefors Test Statistic | | | | | 0.111 | Lilliefors Lognormal GOF Test | | | | | |
| 1430 | 5% Lilliefors Critical Value | | | | | 0.198 | Data appear Lognormal at 5% Significance Level | | | | | |
| 1431 | Data appear Lognormal at 5% Significance Level | | | | | | | | | | | |
| 1432 | | | | | | | | | | | | |
| 1433 | Lognormal Statistics | | | | | | | | | | | |
| 1434 | Minimum of Logged Data | | | | | 7.779 | Mean of logged Data | | | | | 8.136 |
| 1435 | Maximum of Logged Data | | | | | 8.509 | SD of logged Data | | | | | 0.176 |
| 1436 | | | | | | | | | | | | |
| 1437 | Assuming Lognormal Distribution | | | | | | | | | | | |
| 1438 | 95% H-UCL | | | | | 3728 | 90% Chebyshev (MVUE) UCL | | | | | 3880 |
| 1439 | 95% Chebyshev (MVUE) UCL | | | | | 4066 | 97.5% Chebyshev (MVUE) UCL | | | | | 4326 |
| 1440 | 99% Chebyshev (MVUE) UCL | | | | | 4835 | | | | | | |
| 1441 | | | | | | | | | | | | |
| 1442 | Nonparametric Distribution Free UCL Statistics | | | | | | | | | | | |
| 1443 | Data appear to follow a Discernible Distribution at 5% Significance Level | | | | | | | | | | | |
| 1444 | | | | | | | | | | | | |
| 1445 | Nonparametric Distribution Free UCLs | | | | | | | | | | | |
| 1446 | 95% CLT UCL | | | | | 3698 | 95% Jackknife UCL | | | | | 3710 |
| 1447 | 95% Standard Bootstrap UCL | | | | | 3692 | 95% Bootstrap-t UCL | | | | | 3744 |
| 1448 | 95% Hall's Bootstrap UCL | | | | | 3738 | 95% Percentile Bootstrap UCL | | | | | 3707 |
| 1449 | 95% BCA Bootstrap UCL | | | | | 3734 | | | | | | |
| 1450 | 90% Chebyshev(Mean, Sd) UCL | | | | | 3887 | 95% Chebyshev(Mean, Sd) UCL | | | | | 4077 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1451 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 4341 | | | | | 99% Chebyshev(Mean, Sd) UCL | 4859 |
| 1452 | | | | | | | | | | | | |
| 1453 | | | | | | **Suggested UCL to Use** | | | | | | |
| 1454 | | | | | 95% Student's-t UCL | 3710 | | | | | | |
| 1455 | | | | | | | | | | | | |
| 1456 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 1457 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | |
| 1458 | | | | | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | |
| 1459 | | | | | For additional insight the user may want to consult a statistician. | | | | | | | |
| 1460 | | | | | | | | | | | | |
| 1461 | | | | | | | | | | | | |
| 1462 | **Sodium** | | | | | | | | | | | |
| 1463 | | | | | | | | | | | | |
| 1464 | | | | | | **General Statistics** | | | | | | |
| 1465 | | | | | Total Number of Observations | 20 | | | | | Number of Distinct Observations | 19 |
| 1466 | | | | | | | | | | | Number of Missing Observations | 0 |
| 1467 | | | | | Minimum | 593000 | | | | | Mean | 4313150 |
| 1468 | | | | | Maximum | 6160000 | | | | | Median | 4575000 |
| 1469 | | | | | SD | 1254690 | | | | | Std. Error of Mean | 280557 |
| 1470 | | | | | Coefficient of Variation | 0.291 | | | | | Skewness | -1.418 |
| 1471 | | | | | | | | | | | | |
| 1472 | | | | | | **Normal GOF Test** | | | | | | |
| 1473 | | | | | Shapiro Wilk Test Statistic | 0.895 | | | | | **Shapiro Wilk GOF Test** | |
| 1474 | | | | | 5% Shapiro Wilk Critical Value | 0.905 | | | | | Data Not Normal at 5% Significance Level | |
| 1475 | | | | | Lilliefors Test Statistic | 0.18 | | | | | **Lilliefors GOF Test** | |
| 1476 | | | | | 5% Lilliefors Critical Value | 0.198 | | | | | Data appear Normal at 5% Significance Level | |
| 1477 | | | | | | **Data appear Approximate Normal at 5% Significance Level** | | | | | | |
| 1478 | | | | | | | | | | | | |
| 1479 | | | | | | **Assuming Normal Distribution** | | | | | | |
| 1480 | | | | | **95% Normal UCL** | | | | | | **95% UCLs (Adjusted for Skewness)** | |
| 1481 | | | | | 95% Student's-t UCL | 4798271 | | | | | 95% Adjusted-CLT UCL (Chen-1995) | 4679551 |
| 1482 | | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | 4783441 |
| 1483 | | | | | | | | | | | | |
| 1484 | | | | | | **Gamma GOF Test** | | | | | | |
| 1485 | | | | | A-D Test Statistic | 1.703 | | | | | **Anderson-Darling Gamma GOF Test** | |
| 1486 | | | | | 5% A-D Critical Value | 0.744 | | | | | Data Not Gamma Distributed at 5% Significance Level | |
| 1487 | | | | | K-S Test Statistic | 0.259 | | | | | **Kolmogrov-Smirnoff Gamma GOF Test** | |
| 1488 | | | | | 5% K-S Critical Value | 0.194 | | | | | Data Not Gamma Distributed at 5% Significance Level | |
| 1489 | | | | | | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | |
| 1490 | | | | | | | | | | | | |
| 1491 | | | | | | **Gamma Statistics** | | | | | | |
| 1492 | | | | | k hat (MLE) | 6.549 | | | | | k star (bias corrected MLE) | 5.6 |
| 1493 | | | | | Theta hat (MLE) | 658583 | | | | | Theta star (bias corrected MLE) | 770191 |
| 1494 | | | | | nu hat (MLE) | 262 | | | | | nu star (bias corrected) | 224 |
| 1495 | | | | | MLE Mean (bias corrected) | 4313150 | | | | | MLE Sd (bias corrected) | 1822622 |
| 1496 | | | | | | | | | | | Approximate Chi Square Value (0.05) | 190.4 |
| 1497 | | | | | Adjusted Level of Significance | 0.038 | | | | | Adjusted Chi Square Value | 187.9 |
| 1498 | | | | | | | | | | | | |
| 1499 | | | | | | **Assuming Gamma Distribution** | | | | | | |
| 1500 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 5075391 | | | | | 95% Adjusted Gamma UCL (use when n<50) | 5141505 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1501 | | | | | | | | | | | | |
| 1502 | | | | | | **Lognormal GOF Test** | | | | | | |
| 1503 | | | | | Shapiro Wilk Test Statistic | 0.63 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 1504 | | | | | 5% Shapiro Wilk Critical Value | 0.905 | Data Not Lognormal at 5% Significance Level | | | | | |
| 1505 | | | | | Lilliefors Test Statistic | 0.288 | **Lilliefors Lognormal GOF Test** | | | | | |
| 1506 | | | | | 5% Lilliefors Critical Value | 0.198 | Data Not Lognormal at 5% Significance Level | | | | | |
| 1507 | | | | | **Data Not Lognormal at 5% Significance Level** | | | | | | | |
| 1508 | | | | | | | | | | | | |
| 1509 | | | | | | **Lognormal Statistics** | | | | | | |
| 1510 | | | | | Minimum of Logged Data | 13.29 | | | Mean of logged Data | | | 15.2 |
| 1511 | | | | | Maximum of Logged Data | 15.63 | | | SD of logged Data | | | 0.499 |
| 1512 | | | | | | | | | | | | |
| 1513 | | | | | | **Assuming Lognormal Distribution** | | | | | | |
| 1514 | | | | | 95% H-UCL | 5692262 | | | 90% Chebyshev (MVUE) UCL | | | 6043930 |
| 1515 | | | | | 95% Chebyshev (MVUE) UCL | 6749358 | | | 97.5% Chebyshev (MVUE) UCL | | | 7728465 |
| 1516 | | | | | 99% Chebyshev (MVUE) UCL | 9651731 | | | | | | |
| 1517 | | | | | | | | | | | | |
| 1518 | | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | |
| 1519 | | | | | | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | |
| 1520 | | | | | | | | | | | | |
| 1521 | | | | | | **Nonparametric Distribution Free UCLs** | | | | | | |
| 1522 | | | | | 95% CLT UCL | 4774626 | | | 95% Jackknife UCL | | | 4798271 |
| 1523 | | | | | 95% Standard Bootstrap UCL | 4756664 | | | 95% Bootstrap-t UCL | | | 4701787 |
| 1524 | | | | | 95% Hall's Bootstrap UCL | 4697532 | | | 95% Percentile Bootstrap UCL | | | 4725150 |
| 1525 | | | | | 95% BCA Bootstrap UCL | 4698000 | | | | | | |
| 1526 | | | | | 90% Chebyshev(Mean, Sd) UCL | 5154822 | | | 95% Chebyshev(Mean, Sd) UCL | | | 5536070 |
| 1527 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 6065229 | | | 99% Chebyshev(Mean, Sd) UCL | | | 7104659 |
| 1528 | | | | | | | | | | | | |
| 1529 | | | | | | **Suggested UCL to Use** | | | | | | |
| 1530 | | | | | 95% Student's-t UCL | 4798271 | | | | | | |
| 1531 | | | | | | | | | | | | |
| 1532 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 1533 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | |
| 1534 | | | | | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | |
| 1535 | | | | | For additional insight the user may want to consult a statistician. | | | | | | | |
| 1536 | | | | | | | | | | | | |
| 1537 | | | | | **Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be** | | | | | | | |
| 1538 | | | | | **reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.** | | | | | | | |
| 1539 | | | | | | | | | | | | |
| 1540 | | | | | | | | | | | | |
| 1541 | **Strontium** | | | | | | | | | | | |
| 1542 | | | | | | | | | | | | |
| 1543 | | | | | | **General Statistics** | | | | | | |
| 1544 | | | | | Total Number of Observations | 20 | | | Number of Distinct Observations | | | 19 |
| 1545 | | | | | | | | | Number of Missing Observations | | | 0 |
| 1546 | | | | | Minimum | 201 | | | Mean | | | 3478 |
| 1547 | | | | | Maximum | 5140 | | | Median | | | 3760 |
| 1548 | | | | | SD | 1231 | | | Std. Error of Mean | | | 275.3 |
| 1549 | | | | | Coefficient of Variation | 0.354 | | | Skewness | | | -1.143 |
| 1550 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1551 | **Normal GOF Test** | | | | | | | | | | | |
| 1552 | | | | | Shapiro Wilk Test Statistic | 0.912 | **Shapiro Wilk GOF Test** | | | | | |
| 1553 | | | | | 5% Shapiro Wilk Critical Value | 0.905 | Data appear Normal at 5% Significance Level | | | | | |
| 1554 | | | | | Lilliefors Test Statistic | 0.182 | **Lilliefors GOF Test** | | | | | |
| 1555 | | | | | 5% Lilliefors Critical Value | 0.198 | Data appear Normal at 5% Significance Level | | | | | |
| 1556 | **Data appear Normal at 5% Significance Level** | | | | | | | | | | | |
| 1557 | | | | | | | | | | | | |
| 1558 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 1559 | **95% Normal UCL** | | | | | | **95% UCLs (Adjusted for Skewness)** | | | | | |
| 1560 | | | | | 95% Student's-t UCL | 3954 | | | | 95% Adjusted-CLT UCL (Chen-1995) | | 3856 |
| 1561 | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | | 3942 |
| 1562 | | | | | | | | | | | | |
| 1563 | **Gamma GOF Test** | | | | | | | | | | | |
| 1564 | | | | | A-D Test Statistic | 1.811 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 1565 | | | | | 5% A-D Critical Value | 0.746 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1566 | | | | | K-S Test Statistic | 0.284 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 1567 | | | | | 5% K-S Critical Value | 0.195 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1568 | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1569 | | | | | | | | | | | | |
| 1570 | **Gamma Statistics** | | | | | | | | | | | |
| 1571 | | | | | k hat (MLE) | 3.773 | | | | k star (bias corrected MLE) | | 3.24 |
| 1572 | | | | | Theta hat (MLE) | 921.9 | | | | Theta star (bias corrected MLE) | | 1073 |
| 1573 | | | | | nu hat (MLE) | 150.9 | | | | nu star (bias corrected) | | 129.6 |
| 1574 | | | | | MLE Mean (bias corrected) | 3478 | | | | MLE Sd (bias corrected) | | 1932 |
| 1575 | | | | | | | | | | Approximate Chi Square Value (0.05) | | 104.3 |
| 1576 | | | | | Adjusted Level of Significance | 0.038 | | | | Adjusted Chi Square Value | | 102.5 |
| 1577 | | | | | | | | | | | | |
| 1578 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 1579 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 4322 | | | | 95% Adjusted Gamma UCL (use when n<50) | | 4397 |
| 1580 | | | | | | | | | | | | |
| 1581 | **Lognormal GOF Test** | | | | | | | | | | | |
| 1582 | | | | | Shapiro Wilk Test Statistic | 0.612 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 1583 | | | | | 5% Shapiro Wilk Critical Value | 0.905 | Data Not Lognormal at 5% Significance Level | | | | | |
| 1584 | | | | | Lilliefors Test Statistic | 0.315 | **Lilliefors Lognormal GOF Test** | | | | | |
| 1585 | | | | | 5% Lilliefors Critical Value | 0.198 | Data Not Lognormal at 5% Significance Level | | | | | |
| 1586 | **Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1587 | | | | | | | | | | | | |
| 1588 | **Lognormal Statistics** | | | | | | | | | | | |
| 1589 | | | | | Minimum of Logged Data | 5.303 | | | | Mean of logged Data | | 8.016 |
| 1590 | | | | | Maximum of Logged Data | 8.545 | | | | SD of logged Data | | 0.713 |
| 1591 | | | | | | | | | | | | |
| 1592 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 1593 | | | | | 95% H-UCL | 5647 | | | | 90% Chebyshev (MVUE) UCL | | 5814 |
| 1594 | | | | | 95% Chebyshev (MVUE) UCL | 6706 | | | | 97.5% Chebyshev (MVUE) UCL | | 7943 |
| 1595 | | | | | 99% Chebyshev (MVUE) UCL | 10373 | | | | | | |
| 1596 | | | | | | | | | | | | |
| 1597 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1598 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 1599 | | | | | | | | | | | | |
| 1600 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1601 | | | | | 95% CLT UCL | 3931 | | | | 95% Jackknife UCL | | 3954 |
| 1602 | | | | | 95% Standard Bootstrap UCL | 3922 | | | | 95% Bootstrap-t UCL | | 3905 |
| 1603 | | | | | 95% Hall's Bootstrap UCL | 3865 | | | | 95% Percentile Bootstrap UCL | | 3896 |
| 1604 | | | | | 95% BCA Bootstrap UCL | 3845 | | | | | | |
| 1605 | | | | | 90% Chebyshev(Mean, Sd) UCL | 4304 | | | | 95% Chebyshev(Mean, Sd) UCL | | 4678 |
| 1606 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 5197 | | | | 99% Chebyshev(Mean, Sd) UCL | | 6217 |
| 1607 | | | | | | | | | | | | |
| 1608 | | | | | **Suggested UCL to Use** | | | | | | | |
| 1609 | | | | | 95% Student's-t UCL | 3954 | | | | | | |
| 1610 | | | | | | | | | | | | |
| 1611 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1612 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 1613 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |
| 1614 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1615 | | | | | | | | | | | | |
| 1616 | **Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be** | | | | | | | | | | | |
| 1617 | **reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.** | | | | | | | | | | | |
| 1618 | | | | | | | | | | | | |
| 1619 | **Thallium** | | | | | | | | | | | |
| 1620 | | | | | | | | | | | | |
| 1621 | | | | | **General Statistics** | | | | | | | |
| 1622 | | | | | Total Number of Observations | 20 | | | | Number of Distinct Observations | | 5 |
| 1623 | | | | | Number of Detects | 3 | | | | Number of Non-Detects | | 17 |
| 1624 | | | | | Number of Distinct Detects | 3 | | | | Number of Distinct Non-Detects | | 2 |
| 1625 | | | | | Minimum Detect | 0.057 | | | | Minimum Non-Detect | | 0.004 |
| 1626 | | | | | Maximum Detect | 0.233 | | | | Maximum Non-Detect | | 0.05 |
| 1627 | | | | | Variance Detects | 0.00933 | | | | Percent Non-Detects | | 85% |
| 1628 | | | | | Mean Detects | 0.122 | | | | SD Detects | | 0.0966 |
| 1629 | | | | | Median Detects | 0.076 | | | | CV Detects | | 0.792 |
| 1630 | | | | | Skewness Detects | 1.657 | | | | Kurtosis Detects | | N/A |
| 1631 | | | | | Mean of Logged Detects | -2.299 | | | | SD of Logged Detects | | 0.744 |
| 1632 | | | | | | | | | | | | |
| 1633 | | | | | **Warning: Data set has only 3 Detected Values.** | | | | | | | |
| 1634 | | | | | **This is not enough to compute meaningful or reliable statistics and estimates.** | | | | | | | |
| 1635 | | | | | | | | | | | | |
| 1636 | | | | | | | | | | | | |
| 1637 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 1638 | | | | | Shapiro Wilk Test Statistic | 0.83 | | | | **Shapiro Wilk GOF Test** | | |
| 1639 | | | | | 5% Shapiro Wilk Critical Value | 0.767 | | | | Detected Data appear Normal at 5% Significance Level | | |
| 1640 | | | | | Lilliefors Test Statistic | 0.35 | | | | **Lilliefors GOF Test** | | |
| 1641 | | | | | 5% Lilliefors Critical Value | 0.512 | | | | Detected Data appear Normal at 5% Significance Level | | |
| 1642 | | | | | **Detected Data appear Normal at 5% Significance Level** | | | | | | | |
| 1643 | | | | | | | | | | | | |
| 1644 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |
| 1645 | | | | | Mean | 0.0217 | | | | Standard Error of Mean | | 0.0143 |
| 1646 | | | | | SD | 0.052 | | | | 95% KM (BCA) UCL | | N/A |
| 1647 | | | | | 95% KM (t) UCL | 0.0463 | | | | 95% KM (Percentile Bootstrap) UCL | | N/A |
| 1648 | | | | | 95% KM (z) UCL | 0.0451 | | | | 95% KM Bootstrap t UCL | | N/A |
| 1649 | | | | | 90% KM Chebyshev UCL | 0.0645 | | | | 95% KM Chebyshev UCL | | 0.0838 |
| 1650 | | | | | 97.5% KM Chebyshev UCL | 0.111 | | | | 99% KM Chebyshev UCL | | 0.164 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 1651 | | | | | | | | | | | | |
| 1652 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 1653 | **Not Enough Data to Perform GOF Test** | | | | | | | | | | | |
| 1654 | | | | | | | | | | | | |
| 1655 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 1656 | | | | | k hat (MLE) | 2.709 | | | k star (bias corrected MLE) | | | N/A |
| 1657 | | | | | Theta hat (MLE) | 0.045 | | | Theta star (bias corrected MLE) | | | N/A |
| 1658 | | | | | nu hat (MLE) | 16.26 | | | nu star (bias corrected) | | | N/A |
| 1659 | | | | | MLE Mean (bias corrected) | N/A | | | MLE Sd (bias corrected) | | | N/A |
| 1660 | | | | | | | | | | | | |
| 1661 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 1662 | | | | | k hat (KM) | 0.174 | | | nu hat (KM) | | | 6.954 |
| 1663 | | | | | | | | | Adjusted Level of Significance (β) | | | 0.038 |
| 1664 | | | | | Approximate Chi Square Value (6.95, α) | 2.146 | | | Adjusted Chi Square Value (6.95, β) | | | 1.941 |
| 1665 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.0703 | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | | 0.0778 |
| 1666 | | | | | | | | | | | | |
| 1667 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 1668 | | | | | Shapiro Wilk Test Statistic | 0.896 | | | **Shapiro Wilk GOF Test** | | | |
| 1669 | | | | | 5% Shapiro Wilk Critical Value | 0.767 | | | Detected Data appear Lognormal at 5% Significance Level | | | |
| 1670 | | | | | Lilliefors Test Statistic | 0.312 | | | **Lilliefors GOF Test** | | | |
| 1671 | | | | | 5% Lilliefors Critical Value | 0.512 | | | Detected Data appear Lognormal at 5% Significance Level | | | |
| 1672 | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1673 | | | | | | | | | | | | |
| 1674 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 1675 | | | | | Mean in Original Scale | 0.0215 | | | Mean in Log Scale | | | -6.027 |
| 1676 | | | | | SD in Original Scale | 0.0537 | | | SD in Log Scale | | | 2.301 |
| 1677 | | | | | 95% t UCL (assumes normality of ROS data) | 0.0423 | | | 95% Percentile Bootstrap UCL | | | 0.0437 |
| 1678 | | | | | 95% BCA Bootstrap UCL | 0.0575 | | | 95% Bootstrap t UCL | | | 0.0876 |
| 1679 | | | | | 95% H-UCL (Log ROS) | 0.442 | | | | | | |
| 1680 | | | | | | | | | | | | |
| 1681 | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | | | | | |
| 1682 | | | | | KM Mean (logged) | -5.038 | | | 95% H-UCL (KM -Log) | | | 0.0282 |
| 1683 | | | | | KM SD (logged) | 1.174 | | | 95% Critical H Value (KM-Log) | | | 2.896 |
| 1684 | | | | | KM Standard Error of Mean (logged) | 0.322 | | | | | | |
| 1685 | | | | | | | | | | | | |
| 1686 | **DL/2 Statistics** | | | | | | | | | | | |
| 1687 | | | | **DL/2 Normal** | | | | | **DL/2 Log-Transformed** | | | |
| 1688 | | | | | Mean in Original Scale | 0.0384 | | | Mean in Log Scale | | | -3.607 |
| 1689 | | | | | SD in Original Scale | 0.048 | | | SD in Log Scale | | | 0.832 |
| 1690 | | | | | 95% t UCL (Assumes normality) | 0.057 | | | 95% H-Stat UCL | | | 0.0606 |
| 1691 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 1692 | | | | | | | | | | | | |
| 1693 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1694 | **Detected Data appear Normal Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1695 | | | | | | | | | | | | |
| 1696 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1697 | | | | | 95% KM (t) UCL | 0.0463 | | | 95% KM (Percentile Bootstrap) UCL | | | N/A |
| 1698 | **Warning: One or more Recommended UCL(s) not available!** | | | | | | | | | | | |
| 1699 | | | | | | | | | | | | |
| 1700 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1701 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 1702 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 1703 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1704 | | | | | | | | | | | | |
| 1705 | | | | | | | | | | | | |
| 1706 | **Uranium** | | | | | | | | | | | |
| 1707 | | | | | | | | | | | | |
| 1708 | **General Statistics** | | | | | | | | | | | |
| 1709 | Total Number of Observations | | | | | 20 | Number of Distinct Observations | | | | | 20 |
| 1710 | | | | | | | Number of Missing Observations | | | | | 0 |
| 1711 | Minimum | | | | | 0.46 | Mean | | | | | 2.674 |
| 1712 | Maximum | | | | | 5.38 | Median | | | | | 2.335 |
| 1713 | SD | | | | | 1.462 | Std. Error of Mean | | | | | 0.327 |
| 1714 | Coefficient of Variation | | | | | 0.547 | Skewness | | | | | 0.411 |
| 1715 | | | | | | | | | | | | |
| 1716 | **Normal GOF Test** | | | | | | | | | | | |
| 1717 | Shapiro Wilk Test Statistic | | | | | 0.937 | **Shapiro Wilk GOF Test** | | | | | |
| 1718 | 5% Shapiro Wilk Critical Value | | | | | 0.905 | Data appear Normal at 5% Significance Level | | | | | |
| 1719 | Lilliefors Test Statistic | | | | | 0.131 | **Lilliefors GOF Test** | | | | | |
| 1720 | 5% Lilliefors Critical Value | | | | | 0.198 | Data appear Normal at 5% Significance Level | | | | | |
| 1721 | **Data appear Normal at 5% Significance Level** | | | | | | | | | | | |
| 1722 | | | | | | | | | | | | |
| 1723 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 1724 | **95% Normal UCL** | | | | | | **95% UCLs (Adjusted for Skewness)** | | | | | |
| 1725 | 95% Student's-t UCL | | | | | 3.239 | 95% Adjusted-CLT UCL (Chen-1995) | | | | | 3.244 |
| 1726 | | | | | | | 95% Modified-t UCL (Johnson-1978) | | | | | 3.244 |
| 1727 | | | | | | | | | | | | |
| 1728 | **Gamma GOF Test** | | | | | | | | | | | |
| 1729 | A-D Test Statistic | | | | | 0.286 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 1730 | 5% A-D Critical Value | | | | | 0.747 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1731 | K-S Test Statistic | | | | | 0.122 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 1732 | 5% K-S Critical Value | | | | | 0.195 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1733 | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1734 | | | | | | | | | | | | |
| 1735 | **Gamma Statistics** | | | | | | | | | | | |
| 1736 | k hat (MLE) | | | | | 3.097 | k star (bias corrected MLE) | | | | | 2.666 |
| 1737 | Theta hat (MLE) | | | | | 0.863 | Theta star (bias corrected MLE) | | | | | 1.003 |
| 1738 | nu hat (MLE) | | | | | 123.9 | nu star (bias corrected) | | | | | 106.6 |
| 1739 | MLE Mean (bias corrected) | | | | | 2.674 | MLE Sd (bias corrected) | | | | | 1.637 |
| 1740 | | | | | | | Approximate Chi Square Value (0.05) | | | | | 83.81 |
| 1741 | Adjusted Level of Significance | | | | | 0.038 | Adjusted Chi Square Value | | | | | 82.22 |
| 1742 | | | | | | | | | | | | |
| 1743 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 1744 | 95% Approximate Gamma UCL (use when n>=50)) | | | | | 3.402 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 3.468 |
| 1745 | | | | | | | | | | | | |
| 1746 | **Lognormal GOF Test** | | | | | | | | | | | |
| 1747 | Shapiro Wilk Test Statistic | | | | | 0.946 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 1748 | 5% Shapiro Wilk Critical Value | | | | | 0.905 | Data appear Lognormal at 5% Significance Level | | | | | |
| 1749 | Lilliefors Test Statistic | | | | | 0.102 | **Lilliefors Lognormal GOF Test** | | | | | |
| 1750 | 5% Lilliefors Critical Value | | | | | 0.198 | Data appear Lognormal at 5% Significance Level | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 1751 | **Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1752 | | | | | | | | | | | | |
| 1753 | **Lognormal Statistics** | | | | | | | | | | | |
| 1754 | | | | | Minimum of Logged Data | -0.777 | | | | Mean of logged Data | | 0.813 |
| 1755 | | | | | Maximum of Logged Data | 1.683 | | | | SD of logged Data | | 0.641 |
| 1756 | | | | | | | | | | | | |
| 1757 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 1758 | | | | | 95% H-UCL | 3.811 | | | | 90% Chebyshev (MVUE) UCL | | 3.983 |
| 1759 | | | | | 95% Chebyshev (MVUE) UCL | 4.547 | | | | 97.5% Chebyshev (MVUE) UCL | | 5.329 |
| 1760 | | | | | 99% Chebyshev (MVUE) UCL | 6.867 | | | | | | |
| 1761 | | | | | | | | | | | | |
| 1762 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1763 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 1764 | | | | | | | | | | | | |
| 1765 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 1766 | | | | | 95% CLT UCL | 3.212 | | | | 95% Jackknife UCL | | 3.239 |
| 1767 | | | | | 95% Standard Bootstrap UCL | 3.19 | | | | 95% Bootstrap-t UCL | | 3.277 |
| 1768 | | | | | 95% Hall's Bootstrap UCL | 3.219 | | | | 95% Percentile Bootstrap UCL | | 3.206 |
| 1769 | | | | | 95% BCA Bootstrap UCL | 3.204 | | | | | | |
| 1770 | | | | | 90% Chebyshev(Mean, Sd) UCL | 3.655 | | | | 95% Chebyshev(Mean, Sd) UCL | | 4.099 |
| 1771 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 4.716 | | | | 99% Chebyshev(Mean, Sd) UCL | | 5.927 |
| 1772 | | | | | | | | | | | | |
| 1773 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1774 | | | | | 95% Student's-t UCL | 3.239 | | | | | | |
| 1775 | | | | | | | | | | | | |
| 1776 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1777 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 1778 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |
| 1779 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1780 | | | | | | | | | | | | |
| 1781 | **Vanadium** | | | | | | | | | | | |
| 1782 | | | | | | | | | | | | |
| 1783 | **General Statistics** | | | | | | | | | | | |
| 1784 | | | | | Total Number of Observations | 20 | | | | Number of Distinct Observations | | 8 |
| 1785 | | | | | Number of Detects | 7 | | | | Number of Non-Detects | | 13 |
| 1786 | | | | | Number of Distinct Detects | 7 | | | | Number of Distinct Non-Detects | | 1 |
| 1787 | | | | | Minimum Detect | 0.53 | | | | Minimum Non-Detect | | 0.5 |
| 1788 | | | | | Maximum Detect | 1.19 | | | | Maximum Non-Detect | | 0.5 |
| 1789 | | | | | Variance Detects | 0.0569 | | | | Percent Non-Detects | | 65% |
| 1790 | | | | | Mean Detects | 0.829 | | | | SD Detects | | 0.238 |
| 1791 | | | | | Median Detects | 0.85 | | | | CV Detects | | 0.288 |
| 1792 | | | | | Skewness Detects | 0.062 | | | | Kurtosis Detects | | -0.818 |
| 1793 | | | | | Mean of Logged Detects | -0.226 | | | | SD of Logged Detects | | 0.302 |
| 1794 | | | | | | | | | | | | |
| 1795 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 1796 | | | | | Shapiro Wilk Test Statistic | 0.946 | | | | **Shapiro Wilk GOF Test** | | |
| 1797 | | | | | 5% Shapiro Wilk Critical Value | 0.803 | | | | Detected Data appear Normal at 5% Significance Level | | |
| 1798 | | | | | Lilliefors Test Statistic | 0.164 | | | | **Lilliefors GOF Test** | | |
| 1799 | | | | | 5% Lilliefors Critical Value | 0.335 | | | | Detected Data appear Normal at 5% Significance Level | | |
| 1800 | **Detected Data appear Normal at 5% Significance Level** | | | | | | | | | | | |

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| 1801 | | | | | | | | | | | | |
| 1802 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 1803 | | | | | Mean | 0.615 | | | Standard Error of Mean | | | 0.0493 |
| 1804 | | | | | SD | 0.204 | | | 95% KM (BCA) UCL | | | 0.691 |
| 1805 | | | | | 95% KM (t) UCL | 0.7 | | | 95% KM (Percentile Bootstrap) UCL | | | 0.699 |
| 1806 | | | | | 95% KM (z) UCL | 0.696 | | | 95% KM Bootstrap t UCL | | | 0.704 |
| 1807 | | | | | 90% KM Chebyshev UCL | 0.763 | | | 95% KM Chebyshev UCL | | | 0.83 |
| 1808 | | | | | 97.5% KM Chebyshev UCL | 0.923 | | | 99% KM Chebyshev UCL | | | 1.105 |
| 1809 | | | | | | | | | | | | |
| 1810 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 1811 | | | | | A-D Test Statistic | 0.308 | **Anderson-Darling GOF Test** | | | | | |
| 1812 | | | | | 5% A-D Critical Value | 0.708 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1813 | | | | | K-S Test Statistic | 0.191 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 1814 | | | | | 5% K-S Critical Value | 0.312 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1815 | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1816 | | | | | | | | | | | | |
| 1817 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 1818 | | | | | k hat (MLE) | 13.43 | | | k star (bias corrected MLE) | | | 7.769 |
| 1819 | | | | | Theta hat (MLE) | 0.0617 | | | Theta star (bias corrected MLE) | | | 0.107 |
| 1820 | | | | | nu hat (MLE) | 188 | | | nu star (bias corrected) | | | 108.8 |
| 1821 | | | | | MLE Mean (bias corrected) | 0.829 | | | MLE Sd (bias corrected) | | | 0.297 |
| 1822 | | | | | | | | | | | | |
| 1823 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 1824 | | | | | k hat (KM) | 9.086 | | | nu hat (KM) | | | 363.5 |
| 1825 | | | | | Approximate Chi Square Value (363.46, α) | 320.3 | | | Adjusted Chi Square Value (363.46, β) | | | 317.1 |
| 1826 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.698 | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | | 0.705 |
| 1827 | | | | | | | | | | | | |
| 1828 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 1829 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 1830 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 1831 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 1832 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 1833 | | | | | Minimum | 0.01 | | | Mean | | | 0.398 |
| 1834 | | | | | Maximum | 1.19 | | | Median | | | 0.313 |
| 1835 | | | | | SD | 0.373 | | | CV | | | 0.938 |
| 1836 | | | | | k hat (MLE) | 0.7 | | | k star (bias corrected MLE) | | | 0.628 |
| 1837 | | | | | Theta hat (MLE) | 0.568 | | | Theta star (bias corrected MLE) | | | 0.633 |
| 1838 | | | | | nu hat (MLE) | 28.01 | | | nu star (bias corrected) | | | 25.14 |
| 1839 | | | | | MLE Mean (bias corrected) | 0.398 | | | MLE Sd (bias corrected) | | | 0.502 |
| 1840 | | | | | | | | | Adjusted Level of Significance (β) | | | 0.038 |
| 1841 | | | | | Approximate Chi Square Value (25.14, α) | 14.72 | | | Adjusted Chi Square Value (25.14, β) | | | 14.09 |
| 1842 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.679 | | | 95% Gamma Adjusted UCL (use when n<50) | | | 0.71 |
| 1843 | | | | | | | | | | | | |
| 1844 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 1845 | | | | | Shapiro Wilk Test Statistic | 0.925 | **Shapiro Wilk GOF Test** | | | | | |
| 1846 | | | | | 5% Shapiro Wilk Critical Value | 0.803 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 1847 | | | | | Lilliefors Test Statistic | 0.177 | **Lilliefors GOF Test** | | | | | |
| 1848 | | | | | 5% Lilliefors Critical Value | 0.335 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 1849 | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1850 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1851 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 1852 | | | | | Mean in Original Scale | 0.487 | | | | | Mean in Log Scale | -0.899 |
| 1853 | | | | | SD in Original Scale | 0.303 | | | | | SD in Log Scale | 0.62 |
| 1854 | | | | 95% t UCL (assumes normality of ROS data) | | 0.604 | | | | | 95% Percentile Bootstrap UCL | 0.595 |
| 1855 | | | | | 95% BCA Bootstrap UCL | 0.61 | | | | | 95% Bootstrap t UCL | 0.629 |
| 1856 | | | | | 95% H-UCL (Log ROS) | 0.67 | | | | | | |
| 1857 | | | | | | | | | | | | |
| 1858 | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | | | | | |
| 1859 | | | | | KM Mean (logged) | -0.53 | | | | | 95% H-UCL (KM -Log) | 0.688 |
| 1860 | | | | | KM SD (logged) | 0.277 | | | | | 95% Critical H Value (KM-Log) | 1.835 |
| 1861 | | | | | KM Standard Error of Mean (logged) | 0.067 | | | | | | |
| 1862 | | | | | | | | | | | | |
| 1863 | **DL/2 Statistics** | | | | | | | | | | | |
| 1864 | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | | | | | |
| 1865 | | | | | Mean in Original Scale | 0.453 | | | | | Mean in Log Scale | -0.98 |
| 1866 | | | | | SD in Original Scale | 0.313 | | | | | SD in Log Scale | 0.593 |
| 1867 | | | | | 95% t UCL (Assumes normality) | 0.574 | | | | | 95% H-Stat UCL | 0.596 |
| 1868 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 1869 | | | | | | | | | | | | |
| 1870 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1871 | **Detected Data appear Normal Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1872 | | | | | | | | | | | | |
| 1873 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1874 | | | | | 95% KM (t) UCL | 0.7 | | | | | 95% KM (Percentile Bootstrap) UCL | 0.699 |
| 1875 | | | | | | | | | | | | |
| 1876 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1877 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 1878 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 1879 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1880 | | | | | | | | | | | | |
| 1881 | **Yttrium** | | | | | | | | | | | |
| 1882 | | | | | | | | | | | | |
| 1883 | **General Statistics** | | | | | | | | | | | |
| 1884 | | | | | Total Number of Observations | 20 | | | | | Number of Distinct Observations | 2 |
| 1885 | | | | | Number of Detects | 1 | | | | | Number of Non-Detects | 19 |
| 1886 | | | | | Number of Distinct Detects | 1 | | | | | Number of Distinct Non-Detects | 1 |
| 1887 | | | | | | | | | | | | |
| 1888 | **Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!** | | | | | | | | | | | |
| 1889 | **It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).** | | | | | | | | | | | |
| 1890 | | | | | | | | | | | | |
| 1891 | **The data set for variable Yttrium was not processed!** | | | | | | | | | | | |
| 1892 | | | | | | | | | | | | |
| 1893 | | | | | | | | | | | | |
| 1894 | | | | | | | | | | | | |
| 1895 | **Zinc** | | | | | | | | | | | |
| 1896 | | | | | | | | | | | | |
| 1897 | **General Statistics** | | | | | | | | | | | |
| 1898 | | | | | Total Number of Observations | 20 | | | | | Number of Distinct Observations | 19 |
| 1899 | | | | | | | | | | | Number of Missing Observations | 0 |
| 1900 | | | | | Minimum | 4.8 | | | | | Mean | 70.15 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1901 | | | | | Maximum | 579 | | | | | Median | 20.05 |
| 1902 | | | | | SD | 133.2 | | | | | Std. Error of Mean | 29.79 |
| 1903 | | | | | Coefficient of Variation | 1.899 | | | | | Skewness | 3.302 |
| 1904 | | | | | | | | | | | | |
| 1905 | | | | | **Normal GOF Test** | | | | | | | |
| 1906 | | | | | Shapiro Wilk Test Statistic | 0.533 | **Shapiro Wilk GOF Test** | | | | | |
| 1907 | | | | | 5% Shapiro Wilk Critical Value | 0.905 | Data Not Normal at 5% Significance Level | | | | | |
| 1908 | | | | | Lilliefors Test Statistic | 0.353 | **Lilliefors GOF Test** | | | | | |
| 1909 | | | | | 5% Lilliefors Critical Value | 0.198 | Data Not Normal at 5% Significance Level | | | | | |
| 1910 | | | | | **Data Not Normal at 5% Significance Level** | | | | | | | |
| 1911 | | | | | | | | | | | | |
| 1912 | | | | | **Assuming Normal Distribution** | | | | | | | |
| 1913 | | | **95% Normal UCL** | | | | **95% UCLs (Adjusted for Skewness)** | | | | | |
| 1914 | | | | | 95% Student's-t UCL | 121.6 | | | | | 95% Adjusted-CLT UCL (Chen-1995) | 142.6 |
| 1915 | | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | 125.3 |
| 1916 | | | | | | | | | | | | |
| 1917 | | | | | **Gamma GOF Test** | | | | | | | |
| 1918 | | | | | A-D Test Statistic | 1.316 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 1919 | | | | | 5% A-D Critical Value | 0.793 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1920 | | | | | K-S Test Statistic | 0.259 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 1921 | | | | | 5% K-S Critical Value | 0.203 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1922 | | | | | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | |
| 1923 | | | | | | | | | | | | |
| 1924 | | | | | **Gamma Statistics** | | | | | | | |
| 1925 | | | | | k hat (MLE) | 0.6 | | | | | k star (bias corrected MLE) | 0.543 |
| 1926 | | | | | Theta hat (MLE) | 117 | | | | | Theta star (bias corrected MLE) | 129.2 |
| 1927 | | | | | nu hat (MLE) | 23.99 | | | | | nu star (bias corrected) | 21.72 |
| 1928 | | | | | MLE Mean (bias corrected) | 70.15 | | | | | MLE Sd (bias corrected) | 95.18 |
| 1929 | | | | | | | | | | | Approximate Chi Square Value (0.05) | 12.13 |
| 1930 | | | | | Adjusted Level of Significance | 0.038 | | | | | Adjusted Chi Square Value | 11.57 |
| 1931 | | | | | | | | | | | | |
| 1932 | | | | | **Assuming Gamma Distribution** | | | | | | | |
| 1933 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 125.6 | | | | | 95% Adjusted Gamma UCL (use when n<50) | 131.7 |
| 1934 | | | | | | | | | | | | |
| 1935 | | | | | **Lognormal GOF Test** | | | | | | | |
| 1936 | | | | | Shapiro Wilk Test Statistic | 0.927 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 1937 | | | | | 5% Shapiro Wilk Critical Value | 0.905 | Data appear Lognormal at 5% Significance Level | | | | | |
| 1938 | | | | | Lilliefors Test Statistic | 0.149 | **Lilliefors Lognormal GOF Test** | | | | | |
| 1939 | | | | | 5% Lilliefors Critical Value | 0.198 | Data appear Lognormal at 5% Significance Level | | | | | |
| 1940 | | | | | **Data appear Lognormal at 5% Significance Level** | | | | | | | |
| 1941 | | | | | | | | | | | | |
| 1942 | | | | | **Lognormal Statistics** | | | | | | | |
| 1943 | | | | | Minimum of Logged Data | 1.569 | | | | | Mean of logged Data | 3.22 |
| 1944 | | | | | Maximum of Logged Data | 6.361 | | | | | SD of logged Data | 1.369 |
| 1945 | | | | | | | | | | | | |
| 1946 | | | | | **Assuming Lognormal Distribution** | | | | | | | |
| 1947 | | | | | 95% H-UCL | 174.8 | | | | | 90% Chebyshev (MVUE) UCL | 122.6 |
| 1948 | | | | | 95% Chebyshev (MVUE) UCL | 151.5 | | | | | 97.5% Chebyshev (MVUE) UCL | 191.5 |
| 1949 | | | | | 99% Chebyshev (MVUE) UCL | 270.2 | | | | | | |
| 1950 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1951 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1952 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 1953 | | | | | | | | | | | | |
| 1954 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 1955 | | | | | 95% CLT UCL | 119.1 | | | | 95% Jackknife UCL | | 121.6 |
| 1956 | | | | | 95% Standard Bootstrap UCL | 117.8 | | | | 95% Bootstrap-t UCL | | 215.6 |
| 1957 | | | | | 95% Hall's Bootstrap UCL | 294.7 | | | | 95% Percentile Bootstrap UCL | | 125.3 |
| 1958 | | | | | 95% BCA Bootstrap UCL | 154.3 | | | | | | |
| 1959 | | | | | 90% Chebyshev(Mean, Sd) UCL | 159.5 | | | | 95% Chebyshev(Mean, Sd) UCL | | 200 |
| 1960 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 256.2 | | | | 99% Chebyshev(Mean, Sd) UCL | | 366.5 |
| 1961 | | | | | | | | | | | | |
| 1962 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1963 | | | | | 95% Chebyshev (Mean, Sd) UCL | 200 | | | | | | |
| 1964 | | | | | | | | | | | | |
| 1965 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1966 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 1967 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |
| 1968 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1969 | | | | | | | | | | | | |

From File: PHCs Input.wst

### Summary Statistics for Raw Full Data Sets

| Variable | NumObs | Minimum | Maximum | Mean | Median | Variance | SD | MAD/0.675 | Skewness | Kurtosis | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_LEPHw | 139 | 32.34 | 43900 | 1288 | N/A | N/A | 3810 | 530.6 | 10.35 | 115.4 | 2.959 |
| LnROS_HEPHw | 138 | 12.12 | 53000 | 1003 | 345 | 20999259 | 4582 | 367.8 | 10.87 | 123.4 | 4.57 |
| OS_EPHw(C10-<C19) 1 | 139 | 32.18 | 43900 | 1298 | N/A | N/A | 3812 | 534.6 | 10.32 | 115.1 | 2.937 |
| (C10-<C19) 1 (Silica gel) | 139 | 8.244 | 39500 | 723.8 | N/A | N/A | 3381 | 231.9 | 11.12 | 127.9 | 4.672 |
| .nROS_EPHw(C19-C32) | 138 | 12.12 | 53000 | 1003 | 345 | 20999259 | 4582 | 367.8 | 10.87 | 123.4 | 4.57 |
| Hw(C19-C32) (Silica gel) | 138 | 3.105 | 47700 | 689.9 | 129.3 | 16759432 | 4094 | 162.1 | 11.24 | 129.6 | 5.934 |
| LnROS_VPHw | 139 | 51.96 | 6300 | 1770 | 870 | 3060385 | 1749 | 1082 | 0.982 | -0.223 | 0.988 |
| LnROS_VHw (C6-C10) | 139 | 56.4 | 19100 | 3562 | 2060 | 14363447 | 3790 | 2709 | 1.291 | 1.621 | 1.064 |
| LnROS_TPH (10-32) | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Benzene | 139 | 0.205 | 3880 | 551 | 258 | 543033 | 736.9 | 379.1 | 1.889 | 4.249 | 1.337 |
| LnROS_Ethylbenzene | 139 | 0.538 | 1110 | 172.8 | 50.2 | 49481 | 222.4 | 70.91 | 1.63 | 2.724 | 1.287 |
| LnROS_Styrene | 139 | 0.00118 | 1.09 | 0.0658 | 0.0279 | 0.0145 | 0.12 | 0.0306 | 5.431 | 39.74 | 1.829 |
| LnROS_Toluene | 139 | 0.00374 | 3750 | 141.4 | 4.8 | 219817 | 468.8 | 7.049 | 5.556 | 34.9 | 3.315 |
| LnROS_ortho-Xylene | 136 | 0.0474 | 1580 | 213.2 | 15.69 | 127070 | 356.5 | 22.72 | 2.032 | 3.589 | 1.672 |
| OS_meta- & para-Xylene | 136 | 0.0624 | 4200 | 632.2 | 40.77 | 858271 | 926.4 | 60.3 | 1.749 | 2.829 | 1.465 |
| LnROS_Xylenes | 139 | 0.358 | 5770 | 855.8 | 98.1 | 1575189 | 1255 | 142.6 | 1.846 | 3.22 | 1.467 |

### Percentiles for Raw Full Data Sets

| Variable | NumObs | 5%ile | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | 99%ile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_LEPHw | 139 | N/A | 134.1 | 224.5 | 259.3 | 444.4 | 1545 | 1694 | 2012 | 2468 | 7734 |
| LnROS_HEPHw | 138 | 37.93 | 59.12 | 103.4 | 128.2 | 345 | 795 | 902 | 1373 | 2020 | 8165 |
| OS_EPHw(C10-<C19) 1 | 139 | N/A | 134.2 | 225.2 | 260.2 | 447 | 1580 | 1732 | 2054 | 2526 | 7734 |
| (C10-<C19) 1 (Silica gel) | 139 | N/A | 42.92 | 77.26 | 97.06 | 213.6 | 665 | 778 | 994 | 1343 | 4963 |
| .nROS_EPHw(C19-C32) | 138 | 37.93 | 59.12 | 103.4 | 128.2 | 345 | 795 | 902 | 1373 | 2020 | 8165 |
| Hw(C19-C32) (Silica gel) | 138 | 11.92 | 20.16 | 39.16 | 50.63 | 129.3 | 382.5 | 450 | 727 | 1194 | 5684 |
| LnROS_VPHw | 139 | 124 | 180.5 | 324.4 | 390.6 | 870 | 3000 | 3332 | 4520 | 5410 | 6224 |
| LnROS_VHw (C6-C10) | 139 | 139.7 | 232.4 | 434.2 | 555.7 | 2060 | 5850 | 7208 | 9020 | 9960 | 15320 |
| LnROS_TPH (10-32) | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Benzene | 139 | 0.982 | 1.954 | 5.441 | 8.418 | 258 | 853 | 1076 | 1454 | 1818 | 3158 |
| LnROS_Ethylbenzene | 139 | 2.04 | 3.559 | 8.386 | 11.7 | 50.2 | 287.5 | 335 | 498.8 | 582.6 | 901.2 |
| LnROS_Styrene | 139 | 0.00329 | 0.00507 | 0.00914 | 0.0111 | 0.0279 | 0.071 | 0.086 | 0.154 | 0.243 | 0.487 |
| LnROS_Toluene | 139 | 0.0543 | 0.155 | 0.545 | 0.634 | 4.8 | 50.75 | 94.36 | 285.2 | 636.8 | 2557 |
| LnROS_ortho-Xylene | 136 | 0.455 | 0.784 | 2.034 | 3.166 | 15.69 | 251 | 351 | 752 | 1065 | 1493 |
| OS_meta- & para-Xylene | 136 | 0.595 | 1.146 | 3.224 | 5.219 | 40.77 | 969 | 1310 | 1980 | 2563 | 3884 |
| LnROS_Xylenes | 139 | 2.097 | 3.83 | 11.22 | 17.57 | 98.1 | 1195 | 1522 | 2632 | 3561 | 5355 |

## General UCL Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| From File | PHCs Input.wst |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**LEPHw**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 139 | Number of Distinct Observations | 68 |
| Number of Detects | 77 | Number of Non-Detects | 62 |
| Number of Distinct Detects | 62 | Number of Distinct Non-Detects | 7 |
| Minimum Detect | 290 | Minimum Non-Detect | 250 |
| Maximum Detect | 43900 | Maximum Non-Detect | 470 |
| Variance Detects | 24731981 | Percent Non-Detects | 44.6% |
| Mean Detects | 2132 | SD Detects | 4973 |
| Median Detects | 1500 | CV Detects | 2.332 |
| Skewness Detects | 8.03 | Kurtosis Detects | 67.77 |
| Mean of Logged Detects | 7.19 | SD of Logged Detects | 0.797 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.261 | **Normal GOF Test on Detected Observations Only** |
| 5% Shapiro Wilk P Value | 0 | Detected Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.386 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.101 | Detected Data Not Normal at 5% Significance Level |

Detected Data Not Normal at 5% Significance Level

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

| | | | |
|---|---|---|---|
| Mean | 1293 | Standard Error of Mean | 323.9 |
| SD | 3794 | 95% KM (BCA) UCL | 1910 |
| 95% KM (t) UCL | 1829 | 95% KM (Percentile Bootstrap) UCL | 1885 |
| 95% KM (z) UCL | 1826 | 95% KM Bootstrap t UCL | 2964 |
| 90% KM Chebyshev UCL | 2265 | 95% KM Chebyshev UCL | 2705 |
| 97.5% KM Chebyshev UCL | 3316 | 99% KM Chebyshev UCL | 4516 |

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 5.743 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.777 | Detected Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.258 | **Kolmogrov-Smirnoff GOF** |
| 5% K-S Critical Value | 0.104 | Detected Data Not Gamma Distributed at 5% Significance Level |

Detected Data Not Gamma Distributed at 5% Significance Level

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.192 | k star (bias corrected MLE) | 1.154 |
| Theta hat (MLE) | 1789 | Theta star (bias corrected MLE) | 1847 |
| nu hat (MLE) | 183.6 | nu star (bias corrected) | 177.8 |
| MLE Mean (bias corrected) | 2132 | MLE Sd (bias corrected) | 1985 |

**Gamma Kaplan-Meier (KM) Statistics**

| | | | |
|---|---|---|---|
| k hat (KM) | 0.116 | nu hat (KM) | 32.28 |

| | | | |
|---|---|---|---|
| Approximate Chi Square Value (32.28, α) | 20.3 | Adjusted Chi Square Value (32.28, β) | 20.2 |
| 95% Gamma Approximate KM-UCL (use when n>=50) | 2057 | 95% Gamma Adjusted KM-UCL (use when n<50) | 2067 |

**Gamma ROS Statistics using Imputed Non-Detects**

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 0.01 | Mean | 1181 |
| Maximum | 43900 | Median | 350 |
| SD | 3841 | CV | 3.252 |
| k hat (MLE) | 0.149 | k star (bias corrected MLE) | 0.151 |
| Theta hat (MLE) | 7903 | Theta star (bias corrected MLE) | 7821 |
| nu hat (MLE) | 41.55 | nu star (bias corrected) | 41.98 |
| MLE Mean (bias corrected) | 1181 | MLE Sd (bias corrected) | 3039 |
| | | Adjusted Level of Significance (β) | 0.0483 |
| Approximate Chi Square Value (41.98, α) | 28.13 | Adjusted Chi Square Value (41.98, β) | 28.01 |
| 95% Gamma Approximate UCL (use when n>=50) | 1763 | 95% Gamma Adjusted UCL (use when n<50) | 1770 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Lilliefors Test Statistic | 0.155 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.101 | Detected Data Not Lognormal at 5% Significance Level |

Detected Data Not Lognormal at 5% Significance Level

**Lognormal ROS Statistics Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 1288 | Mean in Log Scale | 6.356 |
| SD in Original Scale | 3810 | SD in Log Scale | 1.178 |
| 95% t UCL (assumes normality of ROS data) | 1823 | 95% Percentile Bootstrap UCL | 1883 |
| 95% BCA Bootstrap UCL | 2557 | 95% Bootstrap t UCL | 2986 |
| 95% H-UCL (Log ROS) | 1461 | | |

**DL/2 Statistics**

| **DL/2 Normal** | | **DL/2 Log-Transformed** | |
|---|---|---|---|
| Mean in Original Scale | 1240 | Mean in Log Scale | 6.158 |
| SD in Original Scale | 3823 | SD in Log Scale | 1.301 |
| 95% t UCL (Assumes normality) | 1777 | 95% H-Stat UCL | 1449 |

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

**Nonparametric Distribution Free UCL Statistics**

Data do not follow a Discernible Distribution at 5% Significance Level

**Suggested UCL to Use**

| | | | |
|---|---|---|---|
| 95% KM (t) UCL | 1829 | 95% KM (% Bootstrap) UCL | 1885 |

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

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

## General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 138 | Number of Detected Data | 84 |
| Number of Distinct Detected Data | 62 | Number of Non-Detect Data | 54 |
| | | Percent Non-Detects | 39.13% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 260 | Minimum Detected | 5.561 |
| Maximum Detected | 53000 | Maximum Detected | 10.88 |
| Mean of Detected | 1580 | Mean of Detected | 6.569 |
| SD of Detected | 5814 | SD of Detected | 0.874 |
| Minimum Non-Detect | 250 | Minimum Non-Detect | 5.521 |
| Maximum Non-Detect | 250 | Maximum Non-Detect | 5.521 |

## UCL Statistics

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Lilliefors Test Statistic | 0.41 | Lilliefors Test Statistic | 0.124 |
| 5% Lilliefors Critical Value | 0.0967 | 5% Lilliefors Critical Value | 0.0967 |
| 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 | 1011 | Mean | 5.888 |
| SD | 4581 | SD | 1.091 |
| 95% DL/2 (t) UCL | 1656 | 95% H-Stat (DL/2) UCL | 808.5 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE yields a negative mean | | Mean in Log Scale | 5.744 |
| | | SD in Log Scale | 1.31 |
| | | Mean in Original Scale | 1003 |
| | | SD in Original Scale | 4582 |
| | | 95% t UCL | 1649 |
| | | 95% Percentile Bootstrap UCL | 1801 |
| | | 95% BCA Bootstrap UCL | 2334 |
| | | 95% H-UCL | 973.7 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 0.733 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 2155 | |
| nu star | 123.1 | |
| | | |
| A-D Test Statistic | 9.945 | Nonparametric Statistics |
| 5% A-D Critical Value | 0.793 | Kaplan-Meier (KM) Method |
| K-S Test Statistic | 0.793 | Mean 1063 |
| 5% K-S Critical Value | 0.101 | SD 4554 |
| Data not Gamma Distributed at 5% Significance Level | | SE of Mean 390 |
| | | 95% KM (t) UCL 1709 |
| Assuming Gamma Distribution | | 95% KM (z) UCL 1705 |
| Gamma ROS Statistics using Extrapolated Data | | 95% KM (jackknife) UCL 1704 |
| Minimum | 0.000001 | 95% KM (bootstrap t) UCL 4695 |
| Maximum | 53000 | 95% KM (BCA) UCL 1892 |

| | | | |
|---|---|---|---|
| Mean | 961.7 | 95% KM (Percentile Bootstrap) UCL | 1789 |
| Median | 345 | 95% KM (Chebyshev) UCL | 2763 |
| SD | 4591 | 97.5% KM (Chebyshev) UCL | 3499 |
| k star | 0.101 | 99% KM (Chebyshev) UCL | 4944 |
| Theta star | 9519 | | |
| Nu star | 27.88 | **Potential UCLs to Use** | |
| AppChi2 | 16.84 | 95% KM (BCA) UCL | 1892 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 1593 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 1601 | | |

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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**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 139 | Number of Distinct Observations | 71 |
| Number of Detects | 77 | Number of Non-Detects | 62 |
| Number of Distinct Detects | 65 | Number of Distinct Non-Detects | 7 |
| Minimum Detect | 290 | Minimum Non-Detect | 250 |
| Maximum Detect | 43900 | Maximum Non-Detect | 470 |
| Variance Detects | 24722851 | Percent Non-Detects | 44.6% |
| Mean Detects | 2150 | SD Detects | 4972 |
| Median Detects | 1520 | CV Detects | 2.312 |
| Skewness Detects | 8.023 | Kurtosis Detects | 67.7 |
| Mean of Logged Detects | 7.201 | SD of Logged Detects | 0.8 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.263 | **Normal GOF Test on Detected Observations Only** |
| 5% Shapiro Wilk P Value | 0 | Detected Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.382 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.101 | Detected Data Not Normal at 5% Significance Level |

Detected Data Not Normal at 5% Significance Level

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

| | | | |
|---|---|---|---|
| Mean | 1303 | Standard Error of Mean | 324.1 |
| SD | 3796 | 95% KM (BCA) UCL | 1974 |
| 95% KM (t) UCL | 1840 | 95% KM (Percentile Bootstrap) UCL | 1897 |
| 95% KM (z) UCL | 1836 | 95% KM Bootstrap t UCL | 3065 |
| 90% KM Chebyshev UCL | 2275 | 95% KM Chebyshev UCL | 2716 |
| 97.5% KM Chebyshev UCL | 3327 | 99% KM Chebyshev UCL | 4528 |

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 5.582 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.777 | Detected Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.253 | **Kolmogrov-Smirnoff GOF** |
| 5% K-S Critical Value | 0.104 | Detected Data Not Gamma Distributed at 5% Significance Level |

Detected Data Not Gamma Distributed at 5% Significance Level

### Gamma Statistics on Detected Data Only

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.197 | k star (bias corrected MLE) | 1.159 |
| Theta hat (MLE) | 1797 | Theta star (bias corrected MLE) | 1856 |
| nu hat (MLE) | 184.3 | nu star (bias corrected) | 178.4 |
| MLE Mean (bias corrected) | 2150 | MLE Sd (bias corrected) | 1998 |

### Gamma Kaplan-Meier (KM) Statistics

| | | | |
|---|---|---|---|
| k hat (KM) | 0.118 | nu hat (KM) | 32.76 |
| Approximate Chi Square Value (32.76, α) | 20.68 | Adjusted Chi Square Value (32.76, β) | 20.58 |
| 95% Gamma Approximate KM-UCL (use when n>=50) | 2065 | 95% Gamma Adjusted KM-UCL (use when n<50) | 2075 |

### Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 0.01 | Mean | 1191 |
| Maximum | 43900 | Median | 350 |
| SD | 3843 | CV | 3.226 |
| k hat (MLE) | 0.149 | k star (bias corrected MLE) | 0.151 |
| Theta hat (MLE) | 7974 | Theta star (bias corrected MLE) | 7891 |
| nu hat (MLE) | 41.53 | nu star (bias corrected) | 41.97 |
| MLE Mean (bias corrected) | 1191 | MLE Sd (bias corrected) | 3066 |
| | | Adjusted Level of Significance (β) | 0.0483 |
| Approximate Chi Square Value (41.97, α) | 28.12 | Adjusted Chi Square Value (41.97, β) | 28 |
| 95% Gamma Approximate UCL (use when n>=50) | 1778 | 95% Gamma Adjusted UCL (use when n<50) | 1786 |

### Lognormal GOF Test on Detected Observations Only

| | | |
|---|---|---|
| Lilliefors Test Statistic | 0.151 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.101 | Detected Data Not Lognormal at 5% Significance Level |

Detected Data Not Lognormal at 5% Significance Level

### Lognormal ROS Statistics Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 1298 | Mean in Log Scale | 6.363 |
| SD in Original Scale | 3812 | SD in Log Scale | 1.183 |
| 95% t UCL (assumes normality of ROS data) | 1833 | 95% Percentile Bootstrap UCL | 1939 |
| 95% BCA Bootstrap UCL | 2372 | 95% Bootstrap t UCL | 2985 |
| 95% H-UCL (Log ROS) | 1482 | | |

### DL/2 Statistics

| DL/2 Normal | | DL/2 Log-Transformed | |
|---|---|---|---|
| Mean in Original Scale | 1250 | Mean in Log Scale | 6.163 |
| SD in Original Scale | 3825 | SD in Log Scale | 1.306 |
| 95% t UCL (Assumes normality) | 1787 | 95% H-Stat UCL | 1471 |

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

### Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

### Suggested UCL to Use

| | | | |
|---|---|---|---|
| 95% KM (t) UCL | 1840 | 95% KM (% Bootstrap) UCL | 1897 |

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

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**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 139 | Number of Distinct Observations | 53 |
| Number of Detects | 60 | Number of Non-Detects | 79 |
| Number of Distinct Detects | 48 | Number of Distinct Non-Detects | 7 |
| Minimum Detect | 270 | Minimum Non-Detect | 250 |
| Maximum Detect | 39500 | Maximum Non-Detect | 570 |
| Variance Detects | 25584285 | Percent Non-Detects | 56.83% |
| Mean Detects | 1526 | SD Detects | 5058 |
| Median Detects | 740 | CV Detects | 3.314 |
| Skewness Detects | 7.429 | Kurtosis Detects | 56.47 |
| Mean of Logged Detects | 6.625 | SD of Logged Detects | 0.802 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.215 | **Normal GOF Test on Detected Observations Only** |
| 5% Shapiro Wilk P Value | 0 | Detected Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.418 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.114 | Detected Data Not Normal at 5% Significance Level |

Detected Data Not Normal at 5% Significance Level

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

| | | | |
|---|---|---|---|
| Mean | 801.2 | Standard Error of Mean | 287 |
| SD | 3355 | 95% KM (BCA) UCL | 1408 |
| 95% KM (t) UCL | 1276 | 95% KM (Percentile Bootstrap) UCL | 1369 |
| 95% KM (z) UCL | 1273 | 95% KM Bootstrap t UCL | 3681 |
| 90% KM Chebyshev UCL | 1662 | 95% KM Chebyshev UCL | 2052 |
| 97.5% KM Chebyshev UCL | 2594 | 99% KM Chebyshev UCL | 3657 |

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 8.041 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.788 | Detected Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.294 | **Kolmogrov-Smirnoff GOF** |
| 5% K-S Critical Value | 0.119 | Detected Data Not Gamma Distributed at 5% Significance Level |

Detected Data Not Gamma Distributed at 5% Significance Level

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.836 | k star (bias corrected MLE) | 0.806 |
| Theta hat (MLE) | 1825 | Theta star (bias corrected MLE) | 1895 |
| nu hat (MLE) | 100.3 | nu star (bias corrected) | 96.67 |
| MLE Mean (bias corrected) | 1526 | MLE Sd (bias corrected) | 1700 |

**Gamma Kaplan-Meier (KM) Statistics**

| | | | |
|---|---|---|---|
| k hat (KM) | 0.057 | nu hat (KM) | 15.85 |
| Approximate Chi Square Value (15.85, α) | 7.856 | Adjusted Chi Square Value (15.85, β) | 7.797 |

| | | | |
|---|---|---|---|
| 95% Gamma Approximate KM-UCL (use when n>=50) | 1616 | 95% Gamma Adjusted KM-UCL (use when n<50) | 1629 |

Gamma (KM) may not be used when k hat (KM) is < 0.1

**Gamma ROS Statistics using Imputed Non-Detects**

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 0.01 | Mean | 658.8 |
| Maximum | 39500 | Median | 0.01 |
| SD | 3393 | CV | 5.151 |
| k hat (MLE) | 0.126 | k star (bias corrected MLE) | 0.128 |
| Theta hat (MLE) | 5225 | Theta star (bias corrected MLE) | 5141 |
| nu hat (MLE) | 35.05 | nu star (bias corrected) | 35.63 |
| MLE Mean (bias corrected) | 658.8 | MLE Sd (bias corrected) | 1840 |
| | | Adjusted Level of Significance (β) | 0.0483 |
| Approximate Chi Square Value (35.63, α) | 22.97 | Adjusted Chi Square Value (35.63, β) | 22.86 |
| 95% Gamma Approximate UCL (use when n>=50) | 1022 | 95% Gamma Adjusted UCL (use when n<50) | 1027 |

**Lognormal GOF Test on Detected Observations Only**

| | | | |
|---|---|---|---|
| Lilliefors Test Statistic | 0.141 | **Lilliefors GOF Test** | |
| 5% Lilliefors Critical Value | 0.114 | Detected Data Not Lognormal at 5% Significance Level | |

Detected Data Not Lognormal at 5% Significance Level

**Lognormal ROS Statistics Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 723.8 | Mean in Log Scale | 5.412 |
| SD in Original Scale | 3381 | SD in Log Scale | 1.326 |
| 95% t UCL (assumes normality of ROS data) | 1199 | 95% Percentile Bootstrap UCL | 1275 |
| 95% BCA Bootstrap UCL | 1602 | 95% Bootstrap t UCL | 3474 |
| 95% H-UCL (Log ROS) | 716.6 | | |

**DL/2 Statistics**

| **DL/2 Normal** | | **DL/2 Log-Transformed** | |
|---|---|---|---|
| Mean in Original Scale | 732.1 | Mean in Log Scale | 5.618 |
| SD in Original Scale | 3379 | SD in Log Scale | 1.028 |
| 95% t UCL (Assumes normality) | 1207 | 95% H-Stat UCL | 567.5 |

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

**Nonparametric Distribution Free UCL Statistics**

Data do not follow a Discernible Distribution at 5% Significance Level

**Suggested UCL to Use**

| | | | |
|---|---|---|---|
| 95% KM (t) UCL | 1276 | 95% KM (% Bootstrap) UCL | 1369 |

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

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

## General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 138 | Number of Detected Data | 84 |
| Number of Distinct Detected Data | 62 | Number of Non-Detect Data | 54 |
| | | Percent Non-Detects | 39.13% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 260 | Minimum Detected | 5.561 |
| Maximum Detected | 53000 | Maximum Detected | 10.88 |
| Mean of Detected | 1580 | Mean of Detected | 6.569 |
| SD of Detected | 5814 | SD of Detected | 0.874 |
| Minimum Non-Detect | 250 | Minimum Non-Detect | 5.521 |
| Maximum Non-Detect | 250 | Maximum Non-Detect | 5.521 |

## UCL Statistics

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Lilliefors Test Statistic | 0.41 | Lilliefors Test Statistic | 0.124 |
| 5% Lilliefors Critical Value | 0.0967 | 5% Lilliefors Critical Value | 0.0967 |
| 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 | 1011 | Mean | 5.888 |
| SD | 4581 | SD | 1.091 |
| 95% DL/2 (t) UCL | 1656 | 95% H-Stat (DL/2) UCL | 808.5 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE yields a negative mean | | Mean in Log Scale | 5.744 |
| | | SD in Log Scale | 1.31 |
| | | Mean in Original Scale | 1003 |
| | | SD in Original Scale | 4582 |
| | | 95% t UCL | 1649 |
| | | 95% Percentile Bootstrap UCL | 1733 |
| | | 95% BCA Bootstrap UCL | 2396 |
| | | 95% H-UCL | 973.7 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 0.733 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 2155 | |
| nu star | 123.1 | |
| | | |
| A-D Test Statistic | 9.945 | Nonparametric Statistics |
| 5% A-D Critical Value | 0.793 | Kaplan-Meier (KM) Method |
| K-S Test Statistic | 0.793 | Mean 1063 |
| 5% K-S Critical Value | 0.101 | SD 4554 |
| Data not Gamma Distributed at 5% Significance Level | | SE of Mean 390 |
| | | 95% KM (t) UCL 1709 |
| Assuming Gamma Distribution | | 95% KM (z) UCL 1705 |
| Gamma ROS Statistics using Extrapolated Data | | 95% KM (jackknife) UCL 1704 |
| Minimum | 0.000001 | 95% KM (bootstrap t) UCL 4239 |

| | | | |
|---|---|---|---|
| Maximum | 53000 | 95% KM (BCA) UCL | 1831 |
| Mean | 961.7 | 95% KM (Percentile Bootstrap) UCL | 1802 |
| Median | 345 | 95% KM (Chebyshev) UCL | 2763 |
| SD | 4591 | 97.5% KM (Chebyshev) UCL | 3499 |
| k star | 0.101 | 99% KM (Chebyshev) UCL | 4944 |
| Theta star | 9519 | | |
| Nu star | 27.88 | **Potential UCLs to Use** | |
| AppChi2 | 16.84 | 95% KM (BCA) UCL | 1831 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 1593 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 1601 | | |

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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**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 138 | Number of Detected Data | 55 |
| Number of Distinct Detected Data | 37 | Number of Non-Detect Data | 83 |
| | | Percent Non-Detects | 60.14% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 250 | Minimum Detected | 5.521 |
| Maximum Detected | 47700 | Maximum Detected | 10.77 |
| Mean of Detected | 1621 | Mean of Detected | 6.396 |
| SD of Detected | 6407 | SD of Detected | 0.909 |
| Minimum Non-Detect | 250 | Minimum Non-Detect | 5.521 |
| Maximum Non-Detect | 1100 | Maximum Non-Detect | 7.003 |

| | | | |
|---|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | | Number treated as Non-Detect | 130 |
| For all methods (except KM, DL/2, and ROS Methods), | | Number treated as Detected | 8 |
| Observations < Largest ND are treated as NDs | | Single DL Non-Detect Percentage | 94.20% |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Lilliefors Test Statistic | 0.437 | Lilliefors Test Statistic | 0.178 |
| 5% Lilliefors Critical Value | 0.119 | 5% Lilliefors Critical Value | 0.119 |
| 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 | 727.5 | Mean | 5.478 |
| SD | 4088 | SD | 0.958 |
| 95% DL/2 (t) UCL | 1304 | 95% H-Stat (DL/2) UCL | 452.2 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| **MLE yields a negative mean** | | Mean in Log Scale | 4.923 |
| | | SD in Log Scale | 1.523 |

| | |
|---|---|
| Mean in Original Scale | 689.9 |
| SD in Original Scale | 4094 |
| 95% t UCL | 1267 |
| 95% Percentile Bootstrap UCL | 1368 |
| 95% BCA Bootstrap UCL | 1789 |
| 95% H-UCL | 624.3 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.597 |
| Theta Star | 2716 |
| nu star | 65.64 |
| | |
| A-D Test Statistic | 9.322 |
| 5% A-D Critical Value | 0.805 |
| K-S Test Statistic | 0.805 |
| 5% K-S Critical Value | 0.126 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 47700 |
| Mean | 645.9 |
| Median | 0.000001 |
| SD | 4100 |
| k star | 0.0726 |
| Theta star | 8894 |
| Nu star | 20.04 |
| AppChi2 | 10.88 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 1190 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 1197 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 797.6 |
| SD | 4063 |
| SE of Mean | 349.1 |
| 95% KM (t) UCL | 1376 |
| 95% KM (z) UCL | 1372 |
| 95% KM (jackknife) UCL | 1367 |
| 95% KM (bootstrap t) UCL | 5189 |
| 95% KM (BCA) UCL | 1578 |
| 95% KM (Percentile Bootstrap) UCL | 1483 |
| 95% KM (Chebyshev) UCL | 2319 |
| 97.5% KM (Chebyshev) UCL | 2978 |
| 99% KM (Chebyshev) UCL | 4271 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 1376 |
| 95% KM (% Bootstrap) UCL | 1483 |

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.

**VPHw**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 139 | Number of Detected Data | 77 |
| Number of Distinct Detected Data | 62 | Number of Non-Detect Data | 62 |
| | | Percent Non-Detects | 44.60% |

**Raw Statistics**

| | |
|---|---|
| Minimum Detected | 110 |
| Maximum Detected | 6300 |
| Mean of Detected | 2872 |
| SD of Detected | 1663 |
| Minimum Non-Detect | 100 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum Detected | 4.7 |
| Maximum Detected | 8.748 |
| Mean of Detected | 7.688 |
| SD of Detected | 0.917 |
| Minimum Non-Detect | 4.605 |

| | |
|---|---|
| Maximum Non-Detect | 5000 |

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

| | |
|---|---|
| Maximum Non-Detect | 8.517 |
| Number treated as Non-Detect | 128 |
| Number treated as Detected | 11 |
| Single DL Non-Detect Percentage | 92.09% |

## UCL Statistics

### Normal Distribution Test with Detected Values Only

| | |
|---|---|
| Lilliefors Test Statistic | 0.0762 |
| 5% Lilliefors Critical Value | 0.101 |

Data appear Normal at 5% Significance Level

### Lognormal Distribution Test with Detected Values Only

| | |
|---|---|
| Lilliefors Test Statistic | 0.151 |
| 5% Lilliefors Critical Value | 0.101 |

Data not Lognormal at 5% Significance Level

### Assuming Normal Distribution

DL/2 Substitution Method

| | |
|---|---|
| Mean | 1649 |
| SD | 1859 |
| 95% DL/2 (t) UCL | 1910 |

| | |
|---|---|
| Maximum Likelihood Estimate(MLE) Method | N/A |

MLE method failed to converge properly

### Assuming Lognormal Distribution

DL/2 Substitution Method

| | |
|---|---|
| Mean | 6.094 |
| SD | 1.974 |
| 95% H-Stat (DL/2) UCL | 5371 |

Log ROS Method

| | |
|---|---|
| Mean in Log Scale | 6.859 |
| SD in Log Scale | 1.227 |
| Mean in Original Scale | 1770 |
| SD in Original Scale | 1749 |
| 95% t UCL | 2016 |
| 95% Percentile Bootstrap UCL | 2014 |
| 95% BCA Bootstrap UCL | 2025 |
| 95% H-UCL | 2599 |

### Gamma Distribution Test with Detected Values Only

| | |
|---|---|
| k star (bias corrected) | 1.902 |
| Theta Star | 1510 |
| nu star | 292.9 |

| | |
|---|---|
| A-D Test Statistic | 1.303 |
| 5% A-D Critical Value | 0.764 |
| K-S Test Statistic | 0.764 |
| 5% K-S Critical Value | 0.103 |

Data not Gamma Distributed at 5% Significance Level

### Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 6300 |
| Mean | 1592 |
| Median | 870 |
| SD | 1890 |
| k star | 0.0928 |
| Theta star | 17146 |
| Nu star | 25.81 |
| AppChi2 | 15.23 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 2697 |

### Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

### Nonparametric Statistics

Kaplan-Meier (KM) Method

| | |
|---|---|
| Mean | 1655 |
| SD | 1841 |
| SE of Mean | 157.7 |
| 95% KM (t) UCL | 1916 |
| 95% KM (z) UCL | 1914 |
| 95% KM (jackknife) UCL | 1915 |
| 95% KM (bootstrap t) UCL | 1938 |
| 95% KM (BCA) UCL | 1921 |
| 95% KM (Percentile Bootstrap) UCL | 1930 |
| 95% KM (Chebyshev) UCL | 2342 |
| 97.5% KM (Chebyshev) UCL | 2639 |
| 99% KM (Chebyshev) UCL | 3223 |

### Potential UCLs to Use

| | |
|---|---|
| 95% KM (t) UCL | 1916 |
| 95% KM (Percentile Bootstrap) UCL | 1930 |

| | |
|---|---|
| 95% Adjusted Gamma UCL (Use when n < 40) | 2712 |

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.

VHw (C6-C10)

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 139 | Number of Detected Data | 83 |
| Number of Distinct Detected Data | 79 | Number of Non-Detect Data | 56 |
| | | Percent Non-Detects | 40.29% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 110 | Minimum Detected | 4.7 |
| Maximum Detected | 19100 | Maximum Detected | 9.857 |
| Mean of Detected | 5595 | Mean of Detected | 8.278 |
| SD of Detected | 3705 | SD of Detected | 1.069 |
| Minimum Non-Detect | 100 | Minimum Non-Detect | 4.605 |
| Maximum Non-Detect | 100 | Maximum Non-Detect | 4.605 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Lilliefors Test Statistic | 0.091 | Lilliefors Test Statistic | 0.167 |
| 5% Lilliefors Critical Value | 0.0973 | 5% Lilliefors Critical Value | 0.0973 |
| Data appear 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 | 3361 | Mean | 6.519 |
| SD | 3951 | SD | 2.302 |
| 95% DL/2 (t) UCL | 3916 | 95% H-Stat (DL/2) UCL | 19596 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 1696 | Mean in Log Scale | 7.4 |
| SD | 5915 | SD in Log Scale | 1.428 |
| 95% MLE (t) UCL | 2526 | Mean in Original Scale | 3562 |
| 95% MLE (Tiku) UCL | 2636 | SD in Original Scale | 3790 |
| | | 95% t UCL | 4095 |
| | | 95% Percentile Bootstrap UCL | 4142 |
| | | 95% BCA Bootstrap UCL | 4123 |
| | | 95% H UCL | 6243 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 1.519 | Data appear Normal at 5% Significance Level |
| Theta Star | 3684 | |
| nu star | 252.2 | |

| | |
|---|---|
| A-D Test Statistic | 1.499 |
| 5% A-D Critical Value | 0.77 |
| K-S Test Statistic | 0.77 |
| 5% K-S Critical Value | 0.0998 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 19100 |
| Mean | 3341 |
| Median | 2060 |
| SD | 3968 |
| k star | 0.0965 |
| Theta star | 34631 |
| Nu star | 26.82 |
| AppChi2 | 16.01 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 5596 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 5627 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 3385 |
| SD | 3916 |
| SE of Mean | 334.2 |
| 95% KM (t) UCL | 3939 |
| 95% KM (z) UCL | 3935 |
| 95% KM (jackknife) UCL | 3937 |
| 95% KM (bootstrap t) UCL | 3959 |
| 95% KM (BCA) UCL | 3902 |
| 95% KM (Percentile Bootstrap) UCL | 3956 |
| 95% KM (Chebyshev) UCL | 4842 |
| 97.5% KM (Chebyshev) UCL | 5472 |
| 99% KM (Chebyshev) UCL | 6710 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 3939 |
| 95% KM (Percentile Bootstrap) UCL | 3956 |

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.

TPH (10-32)

**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 TPH (10-32) 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.

Benzene

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 139 | Number of Detected Data | 91 |
| Number of Distinct Detected Data | 85 | Number of Non-Detect Data | 48 |
| | | Percent Non-Detects | 34.53% |

| **Raw Statistics** | | **Log-transformed Statistics** | |
|---|---|---|---|
| Minimum Detected | 0.55 | Minimum Detected | -0.598 |

| | | | |
|---|---|---|---|
| Maximum Detected | 3880 | Maximum Detected | 8.264 |
| Mean of Detected | 836 | Mean of Detected | 5.812 |
| SD of Detected | 771.3 | SD of Detected | 2.135 |
| Minimum Non-Detect | 0.5 | Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | 0.5 | Maximum Non-Detect | -0.693 |

## UCL Statistics

**Normal Distribution Test with Detected Values Only**

| | |
|---|---|
| Lilliefors Test Statistic | 0.139 |
| 5% Lilliefors Critical Value | 0.0929 |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Lilliefors Test Statistic | 0.235 |
| 5% Lilliefors Critical Value | 0.0929 |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 547.4 |
| SD | 739.6 |
| 95% DL/2 (t) UCL | 651.3 |
| | |
| Maximum Likelihood Estimate(MLE) Method | |
| Mean | 301.8 |
| SD | 1017 |
| 95% MLE (t) UCL | 444.7 |
| 95% MLE (Tiku) UCL | 456.5 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 3.326 |
| SD | 3.844 |
| 95% H-Stat (DL/2) UCL | 286309 |
| | |
| Log ROS Method | |
| Mean in Log Scale | 4.447 |
| SD in Log Scale | 2.654 |
| Mean in Original Scale | 551 |
| SD in Original Scale | 736.9 |
| 95% t UCL | 654.5 |
| 95% Percentile Bootstrap UCL | 657.4 |
| 95% BCA Bootstrap UCL | 663.6 |
| 95% H UCL | 7298 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.65 |
| Theta Star | 1286 |
| nu star | 118.3 |
| | |
| A-D Test Statistic | 3.268 |
| 5% A-D Critical Value | 0.802 |
| K-S Test Statistic | 0.802 |
| 5% K-S Critical Value | 0.098 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 3880 |
| Mean | 547.3 |
| Median | 258 |
| SD | 739.7 |
| k star | 0.113 |
| Theta star | 4855 |
| Nu star | 31.34 |
| AppChi2 | 19.55 |

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 547.5 |
| SD | 736.8 |
| SE of Mean | 62.85 |
| 95% KM (t) UCL | 651.6 |
| 95% KM (z) UCL | 650.9 |
| 95% KM (jackknife) UCL | 651.3 |
| 95% KM (bootstrap t) UCL | 658.7 |
| 95% KM (BCA) UCL | 657.2 |
| 95% KM (Percentile Bootstrap) UCL | 652.7 |
| 95% KM (Chebyshev) UCL | 821.4 |
| 97.5% KM (Chebyshev) UCL | 939.9 |
| 99% KM (Chebyshev) UCL | 1173 |

**Potential UCLs to Use**

| | |
|---|---|
| 97.5% KM (Chebyshev) UCL | 939.9 |

| | |
|---|---|
| 95% Gamma Approximate UCL (Use when n >= 40) | 877.4 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 881.8 |

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.

**Ethylbenzene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 139 | Number of Detected Data | 79 |
| Number of Distinct Detected Data | 74 | Number of Non-Detect Data | 60 |
| | | Percent Non-Detects | 43.17% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.66 | Minimum Detected | -0.416 |
| Maximum Detected | 1110 | Maximum Detected | 7.012 |
| Mean of Detected | 293.8 | Mean of Detected | 5.14 |
| SD of Detected | 230.5 | SD of Detected | 1.457 |
| Minimum Non-Detect | 0.5 | Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | 2.5 | Maximum Non-Detect | 0.916 |

| | | |
|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | Number treated as Non-Detect | 62 |
| For all methods (except KM, DL/2, and ROS Methods), | Number treated as Detected | 77 |
| Observations < Largest ND are treated as NDs | Single DL Non-Detect Percentage | 44.60% |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Lilliefors Test Statistic | 0.106 | Lilliefors Test Statistic | 0.171 |
| 5% Lilliefors Critical Value | 0.0997 | 5% Lilliefors Critical Value | 0.0997 |
| 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 | 167.1 | Mean | 2.335 |
| SD | 226.5 | SD | 3.414 |
| 95% DL/2 (t) UCL | 198.9 | 95% H-Stat (DL/2) UCL | 15400 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 48.32 | Mean in Log Scale | 3.886 |
| SD | 356.6 | SD in Log Scale | 1.925 |
| 95% MLE (t) UCL | 98.4 | Mean in Original Scale | 172.8 |
| 95% MLE (Tiku) UCL | 106.9 | SD in Original Scale | 222.4 |
| | | 95% t UCL | 204 |
| | | 95% Percentile Bootstrap UCL | 204.5 |
| | | 95% BCA Bootstrap UCL | 207.4 |
| | | 95% H UCL | 524.1 |

| Gamma Distribution Test with Detected Values Only | Data Distribution Test with Detected Values Only |
|---|---|

| | |
|---|---|
| k star (bias corrected) | 1.026 |
| Theta Star | 286.5 |
| nu star | 162 |

Data do not follow a Discernable Distribution (0.05)

| | |
|---|---|
| A-D Test Statistic | 1.332 |
| 5% A-D Critical Value | 0.78 |
| K-S Test Statistic | 0.78 |
| 5% K-S Critical Value | 0.103 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| Gamma ROS Statistics using Extrapolated Data | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 1110 |
| Mean | 167 |
| Median | 50.2 |
| SD | 226.6 |
| k star | 0.102 |
| Theta star | 1633 |
| Nu star | 28.42 |
| AppChi2 | 17.25 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 275 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 276.5 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

| Kaplan-Meier (KM) Method | |
|---|---|
| Mean | 167.3 |
| SD | 225.6 |
| SE of Mean | 19.25 |
| 95% KM (t) UCL | 199.1 |
| 95% KM (z) UCL | 198.9 |
| 95% KM (jackknife) UCL | 198.9 |
| 95% KM (bootstrap t) UCL | 201.9 |
| 95% KM (BCA) UCL | 202.1 |
| 95% KM (Percentile Bootstrap) UCL | 199.5 |
| 95% KM (Chebyshev) UCL | 251.2 |
| 97.5% KM (Chebyshev) UCL | 287.5 |
| 99% KM (Chebyshev) UCL | 358.8 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (Chebyshev) UCL | 251.2 |

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

**Styrene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 139 | Number of Detected Data | 2 |
| Number of Distinct Detected Data | 2 | Number of Non-Detect Data | 137 |
| | | Percent Non-Detects | 98.56% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.57 | Minimum Detected | -0.562 |
| Maximum Detected | 1.09 | Maximum Detected | 0.0862 |
| Mean of Detected | 0.83 | Mean of Detected | -0.238 |
| SD of Detected | 0.368 | SD of Detected | 0.458 |
| Minimum Non-Detect | 0.5 | Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | 25 | Maximum Non-Detect | 3.219 |

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 | 139 |
| Number treated as Detected | 0 |
| Single DL Non-Detect Percentage | 100.00% |

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

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**

| | |
|---|---|
| Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 1.019 |
| SD | 1.422 |
| 95% DL/2 (t) UCL | 1.219 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |

MLE method failed to converge properly

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -0.543 |
| SD | 0.991 |
| 95% H-Stat (DL/2) UCL | 1.141 |
| | |
| Log ROS Method | |
| Mean in Log Scale | N/A |
| SD in Log Scale | N/A |
| Mean in Original Scale | N/A |
| SD in Original Scale | N/A |
| 95% t UCL | N/A |
| 95% Percentile Bootstrap UCL | N/A |
| 95% BCA Bootstrap UCL | N/A |
| 95% H-UCL | N/A |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | N/A |
| Theta Star | N/A |
| nu star | N/A |
| | |
| A-D Test Statistic | N/A |
| 5% A-D Critical Value | N/A |
| K-S Test Statistic | N/A |
| 5% K-S Critical Value | N/A |

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.576 |
| SD | 0.0542 |

Data not Gamma Distributed at 5% Significance Level

| | |
|---|---|
| SE of Mean | 0.00804 |
| 95% KM (t) UCL | 0.589 |
| 95% KM (z) UCL | 0.589 |
| 95% KM (jackknife) UCL | 0.911 |
| 95% KM (bootstrap t) UCL | 0.577 |
| 95% KM (BCA) UCL | N/A |
| 95% KM (Percentile Bootstrap) UCL | 1.09 |
| 95% KM (Chebyshev) UCL | 0.611 |
| 97.5% KM (Chebyshev) UCL | 0.626 |
| 99% KM (Chebyshev) UCL | 0.656 |

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | N/A |
| Maximum | N/A |
| Mean | N/A |
| Median | N/A |
| SD | N/A |
| k star | N/A |
| Theta star | N/A |
| Nu star | N/A |
| AppChi2 | N/A |
| 95% Gamma Approximate UCL (Use when n >= 40) | N/A |
| 95% Adjusted Gamma UCL (Use when n < 40) | N/A |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.589 |
| 95% KM (% Bootstrap) UCL | 1.09 |

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.

**Toluene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 139 | Number of Detected Data | 77 |
| Number of Distinct Detected Data | 76 | Number of Non-Detect Data | 62 |
| | | Percent Non-Detects | 44.60% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 1.33 | Minimum Detected | 0.285 |
| Maximum Detected | 3750 | Maximum Detected | 8.23 |
| Mean of Detected | 254.6 | Mean of Detected | 3.886 |
| SD of Detected | 608.3 | SD of Detected | 1.857 |
| Minimum Non-Detect | 0.5 | Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | 2.5 | Maximum Non-Detect | 0.916 |

| | | | |
|---|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | | Number treated as Non-Detect | 64 |
| For all methods (except KM, DL/2, and ROS Methods), | | Number treated as Detected | 75 |
| Observations < Largest ND are treated as NDs | | Single DL Non-Detect Percentage | 46.04% |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Lilliefors Test Statistic | 0.339 | Lilliefors Test Statistic | 0.0979 |
| 5% Lilliefors Critical Value | 0.101 | 5% Lilliefors Critical Value | 0.101 |
| 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 | 141.1 | Mean | 1.575 |
| SD | 468.9 | SD | 2.937 |

| | |
|---|---|
| 95% DL/2 (t) UCL | 207 |
| 95% H-Stat (DL/2) UCL | 1101 |

| | |
|---|---|
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE yields a negative mean**

| | |
|---|---|
| Log ROS Method | |
| Mean in Log Scale | 1.762 |
| SD in Log Scale | 2.94 |
| Mean in Original Scale | 141.4 |
| SD in Original Scale | 468.8 |
| 95% t UCL | 207.3 |
| 95% Percentile Bootstrap UCL | 212.4 |
| 95% BCA Bootstrap UCL | 233.9 |
| 95% H-UCL | 1341 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.391 |
| Theta Star | 650.3 |
| nu star | 60.28 |
| A-D Test Statistic | 3.453 |
| 5% A-D Critical Value | 0.842 |
| K-S Test Statistic | 0.842 |
| 5% K-S Critical Value | 0.109 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 3750 |
| Mean | 141 |
| Median | 4.8 |
| SD | 469 |
| k star | 0.0945 |
| Theta star | 1493 |
| Nu star | 26.26 |
| AppChi2 | 15.58 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 237.7 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 239 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data appear Lognormal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 141.6 |
| SD | 467.1 |
| SE of Mean | 39.88 |
| 95% KM (t) UCL | 207.6 |
| 95% KM (z) UCL | 207.2 |
| 95% KM (jackknife) UCL | 207.3 |
| 95% KM (bootstrap t) UCL | 254.1 |
| 95% KM (BCA) UCL | 211.7 |
| 95% KM (Percentile Bootstrap) UCL | 209.8 |
| 95% KM (Chebyshev) UCL | 315.4 |
| 97.5% KM (Chebyshev) UCL | 390.7 |
| 99% KM (Chebyshev) UCL | 538.4 |

**Potential UCLs to Use**

| | |
|---|---|
| 97.5% KM (Chebyshev) UCL | 390.7 |

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

**ortho-Xylene**

**General Statistics**

| | |
|---|---|
| Number of Valid Data | 136 |
| Number of Distinct Detected Data | 65 |
| Number of Detected Data | 70 |
| Number of Non-Detect Data | 66 |
| Percent Non-Detects | 48.53% |

**Raw Statistics**

**Log-transformed Statistics**

| | | | |
|---|---|---|---|
| Minimum Detected | 0.53 | Minimum Detected | -0.635 |
| Maximum Detected | 1580 | Maximum Detected | 7.365 |
| Mean of Detected | 408.7 | Mean of Detected | 5.141 |
| SD of Detected | 410.7 | SD of Detected | 1.878 |
| Minimum Non-Detect | 0.5 | Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | 2.5 | Maximum Non-Detect | 0.916 |

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 | 71 |
| Number treated as Detected | 65 |
| Single DL Non-Detect Percentage | 52.21% |

## UCL Statistics

**Normal Distribution Test with Detected Values Only**

| | |
|---|---|
| Lilliefors Test Statistic | 0.192 |
| 5% Lilliefors Critical Value | 0.106 |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Lilliefors Test Statistic | 0.148 |
| 5% Lilliefors Critical Value | 0.106 |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 210.5 |
| SD | 358 |
| 95% DL/2 (t) UCL | 261.4 |
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE yields a negative mean**

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 2.034 |
| SD | 3.49 |
| 95% H-Stat (DL/2) UCL | 16005 |
| Log ROS Method | |
| Mean in Log Scale | 3.174 |
| SD in Log Scale | 2.627 |
| Mean in Original Scale | 213.2 |
| SD in Original Scale | 356.5 |
| 95% t UCL | 263.8 |
| 95% Percentile Bootstrap UCL | 262.2 |
| 95% BCA Bootstrap UCL | 270.9 |
| 95% H-UCL | 1881 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.674 |
| Theta Star | 606.8 |
| nu star | 94.3 |
| A-D Test Statistic | 0.608 |
| 5% A-D Critical Value | 0.798 |
| K-S Test Statistic | 0.798 |
| 5% K-S Critical Value | 0.111 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 1580 |
| Mean | 210.4 |
| Median | 0.695 |
| SD | 358.1 |

**Data Distribution Test with Detected Values Only**

Data appear Gamma Distributed at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 210.6 |
| SD | 356.6 |
| SE of Mean | 30.8 |
| 95% KM (t) UCL | 261.6 |
| 95% KM (z) UCL | 261.3 |
| 95% KM (jackknife) UCL | 261.5 |
| 95% KM (bootstrap t) UCL | 272 |
| 95% KM (BCA) UCL | 263.1 |
| 95% KM (Percentile Bootstrap) UCL | 263.6 |
| 95% KM (Chebyshev) UCL | 344.9 |
| 97.5% KM (Chebyshev) UCL | 403 |

| | | | |
|---|---|---|---|
| k star | 0.0907 | 99% KM (Chebyshev) UCL | 517.1 |
| Theta star | 2320 | | |
| Nu star | 24.67 | Potential UCLs to Use | |
| AppChi2 | 14.36 | 95% KM (BCA) UCL | 263.1 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 361.4 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 363.6 | | |

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.

meta- & para-Xylene

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 136 | Number of Detected Data | 78 |
| Number of Distinct Detected Data | 77 | Number of Non-Detect Data | 58 |
| | | Percent Non-Detects | 42.65% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.53 | Minimum Detected | -0.635 |
| Maximum Detected | 4200 | Maximum Detected | 8.343 |
| Mean of Detected | 1095 | Mean of Detected | 5.973 |
| SD of Detected | 997.7 | SD of Detected | 2.293 |
| Minimum Non-Detect | 0.5 | Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | 2.5 | Maximum Non-Detect | 0.916 |

| | | |
|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | Number treated as Non-Detect | 64 |
| For all methods (except KM, DL/2, and ROS Methods), | Number treated as Detected | 72 |
| Observations < Largest ND are treated as NDs | Single DL Non-Detect Percentage | 47.06% |

UCL Statistics

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Lilliefors Test Statistic | 0.136 | Lilliefors Test Statistic | 0.261 |
| 5% Lilliefors Critical Value | 0.1 | 5% Lilliefors Critical Value | 0.1 |
| 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 | 628.3 | Mean | 2.863 |
| SD | 929.1 | SD | 4.018 |
| 95% DL/2 (t) UCL | 760.2 | 95% H-Stat (DL/2) UCL | 428822 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 75.74 | Mean in Log Scale | 4.078 |
| SD | 1507 | SD in Log Scale | 2.966 |
| 95% MLE (t) UCL | 289.8 | Mean in Original Scale | 632.2 |
| 95% MLE (Tiku) UCL | 331.6 | SD in Original Scale | 926.4 |
| | | 95% t UCL | 763.7 |
| | | 95% Percentile Bootstrap UCL | 766.5 |

| | |
|---|---|
| 95% BCA Bootstrap UCL | 773.6 |
| 95% H UCL | 15101 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.588 |
| Theta Star | 1864 |
| nu star | 91.67 |
| | |
| A-D Test Statistic | 2.853 |
| 5% A-D Critical Value | 0.808 |
| K-S Test Statistic | 0.808 |
| 5% K-S Critical Value | 0.106 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 4200 |
| Mean | 628.2 |
| Median | 29.05 |
| SD | 929.1 |
| k star | 0.095 |
| Theta star | 6615 |
| Nu star | 25.83 |
| AppChi2 | 15.25 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 1064 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 1070 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 628.4 |
| SD | 925.6 |
| SE of Mean | 79.88 |
| 95% KM (t) UCL | 760.7 |
| 95% KM (z) UCL | 759.8 |
| 95% KM (jackknife) UCL | 760.2 |
| 95% KM (bootstrap t) UCL | 779.1 |
| 95% KM (BCA) UCL | 768.5 |
| 95% KM (Percentile Bootstrap) UCL | 762.8 |
| 95% KM (Chebyshev) UCL | 976.6 |
| 97.5% KM (Chebyshev) UCL | 1127 |
| 99% KM (Chebyshev) UCL | 1423 |
| | |
| Potential UCLs to Use | |
| 97.5% KM (Chebyshev) UCL | 1127 |

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.

**Xylenes**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 139 | Number of Detected Data | 78 |
| Number of Distinct Detected Data | 75 | Number of Non-Detect Data | 61 |
| | | Percent Non-Detects | 43.88% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.93 | Minimum Detected | -0.0726 |
| Maximum Detected | 5770 | Maximum Detected | 8.66 |
| Mean of Detected | 1505 | Mean of Detected | 6.503 |
| SD of Detected | 1361 | SD of Detected | 1.933 |
| Minimum Non-Detect | 0.75 | Minimum Non-Detect | -0.288 |
| Maximum Non-Detect | 3.5 | Maximum Non-Detect | 1.253 |

| | | |
|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | Number treated as Non-Detect | 66 |
| For all methods (except KM, DL/2, and ROS Methods), | Number treated as Detected | 73 |

Observations < Largest ND are treated as NDs

Single DL Non-Detect Percentage 47.48%

## UCL Statistics

### Normal Distribution Test with Detected Values Only

| | |
|---|---|
| Lilliefors Test Statistic | 0.171 |
| 5% Lilliefors Critical Value | 0.1 |

Data not Normal at 5% Significance Level

### Assuming Normal Distribution

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 844.4 |
| SD | 1263 |
| 95% DL/2 (t) UCL | 1022 |
| | |
| Maximum Likelihood Estimate(MLE) Method | |
| Mean | 78.57 |
| SD | 2059 |
| 95% MLE (t) UCL | 367.8 |
| 95% MLE (Tiku) UCL | 425.8 |

### Lognormal Distribution Test with Detected Values Only

| | |
|---|---|
| Lilliefors Test Statistic | 0.257 |
| 5% Lilliefors Critical Value | 0.1 |

Data not Lognormal at 5% Significance Level

### Assuming Lognormal Distribution

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 3.25 |
| SD | 3.969 |
| 95% H-Stat (DL/2) UCL | 486600 |
| | |
| Log ROS Method | |
| Mean in Log Scale | 4.838 |
| SD in Log Scale | 2.523 |
| Mean in Original Scale | 855.8 |
| SD in Original Scale | 1255 |
| 95% t UCL | 1032 |
| 95% Percentile Bootstrap UCL | 1038 |
| 95% BCA Bootstrap UCL | 1052 |
| 95% H UCL | 7083 |

### Gamma Distribution Test with Detected Values Only

| | |
|---|---|
| k star (bias corrected) | 0.718 |
| Theta Star | 2095 |
| nu star | 112 |
| | |
| A-D Test Statistic | 1.927 |
| 5% A-D Critical Value | 0.794 |
| K-S Test Statistic | 0.794 |
| 5% K-S Critical Value | 0.105 |

Data not Gamma Distributed at 5% Significance Level

### Assuming Gamma Distribution

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 5770 |
| Mean | 844.3 |
| Median | 98.1 |
| SD | 1263 |
| k star | 0.0928 |
| Theta star | 9101 |
| Nu star | 25.79 |
| AppChi2 | 15.22 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 1431 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 1439 |

Note: DL/2 is not a recommended method.

### Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

### Nonparametric Statistics

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 844.7 |
| SD | 1258 |
| SE of Mean | 107.4 |
| 95% KM (t) UCL | 1022 |
| 95% KM (z) UCL | 1021 |
| 95% KM (jackknife) UCL | 1022 |
| 95% KM (bootstrap t) UCL | 1041 |
| 95% KM (BCA) UCL | 1011 |
| 95% KM (Percentile Bootstrap) UCL | 1027 |
| 95% KM (Chebyshev) UCL | 1313 |
| 97.5% KM (Chebyshev) UCL | 1515 |
| 99% KM (Chebyshev) UCL | 1913 |

### Potential UCLs to Use

| | |
|---|---|
| 97.5% KM (Chebyshev) UCL | 1515 |

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.

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | **General Statistics on Uncensored Full Data** | | | | | | | | |
| 2 | | Date/Time of Computation | | 9/24/2015 1:29:41 PM | | | | | | | | |
| 3 | | **User Selected Options** | | | | | | | | | | |
| 4 | | From File | | PW_EB_Current_MW_PAHs_Input.xls | | | | | | | | |
| 5 | | Full Precision | | OFF | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | **From File: PW_EB_Current_MW_PAHs_Input.xls** | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 9 | **General Statistics for Uncensored Data Sets** | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 11 | **Variable** | **NumObs** | **# Missing** | **Minimum** | **Maximum** | **Mean** | **SD** | **SEM** | **MAD/0.675** | **Skewness** | **Kurtosis** | |
| 12 | LnROS_Acenaphthene | 143 | 0 | 1.8915E-4 | 0.563 | 0.0354 | 0.0859 | 0.00718 | 0.0107 | 4.301 | 19.39 | |
| 13 | LnROS_Benzo(a)pyrene | 143 | 0 | 1.1487E-4 | 0.039 | 0.0039 | 0.00569 | 4.7618E-4 | 0.002 | 3.701 | 16.89 | |
| 14 | S_Benzo(b)fluoranthene | 143 | 0 | 1.000E-10 | 0.053 | 3.7063E-4 | 0.00443 | 3.7063E-4 | 0 | 11.96 | 143 | |
| 15 | LnROS_Chrysene | 143 | 0 | 0.002 | 0.059 | 0.0128 | 0.00917 | 7.6657E-4 | 0.00651 | 2.014 | 5.786 | |
| 16 | LnROS_Fluoranthene | 143 | 0 | 3.7997E-5 | 0.289 | 0.0106 | 0.0284 | 0.00237 | 0.00336 | 7.262 | 66.27 | |
| 17 | LnROS_Fluorene | 143 | 0 | 6.0417E-4 | 0.873 | 0.0931 | 0.157 | 0.0132 | 0.0354 | 2.658 | 7.277 | |
| 18 | LnROS_Naphthalene | 143 | 0 | 1.3150E-4 | 74.8 | 9.853 | 17.47 | 1.461 | 0.207 | 1.703 | 1.675 | |
| 19 | LnROS_Phenanthrene | 143 | 0 | 0.00121 | 0.482 | 0.0627 | 0.0915 | 0.00765 | 0.03 | 2.764 | 8.17 | |
| 20 | LnROS_Pyrene | 143 | 0 | 1.3225E-4 | 0.205 | 0.0148 | 0.0283 | 0.00236 | 0.00616 | 4.211 | 21.19 | |
| 21 | | | | | | | | | | | | |
| 22 | **Percentiles for Uncensored Data Sets** | | | | | | | | | | | |
| 23 | | | | | | | | | | | | |
| 24 | **Variable** | **NumObs** | **# Missing** | **10%ile** | **20%ile** | **25%ile(Q1)** | **50%ile(Q2)** | **75%ile(Q3)** | **80%ile** | **90%ile** | **95%ile** | |
| 25 | LnROS_Acenaphthene | 143 | 0 | 0.0015 | 0.00243 | 0.00329 | 0.00894 | 0.0273 | 0.0338 | 0.0593 | 0.159 | |
| 26 | LnROS_Benzo(a)pyrene | 143 | 0 | 4.8713E-4 | 7.8832E-4 | 9.6459E-4 | 0.00204 | 0.00432 | 0.00529 | 0.00859 | 0.0121 | |
| 27 | S_Benzo(b)fluoranthene | 143 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | |
| 28 | LnROS_Chrysene | 143 | 0 | 0.00449 | 0.00596 | 0.00665 | 0.0104 | 0.0162 | 0.018 | 0.0239 | 0.03 | |
| 29 | LnROS_Fluoranthene | 143 | 0 | 3.0774E-4 | 6.4027E-4 | 8.4904E-4 | 0.00267 | 0.00842 | 0.0112 | 0.0232 | 0.0415 | |
| 30 | LnROS_Fluorene | 143 | 0 | 0.00419 | 0.00827 | 0.0108 | 0.0296 | 0.073 | 0.113 | 0.332 | 0.489 | |
| 31 | LnROS_Naphthalene | 143 | 0 | 0.00856 | 0.0311 | 0.0453 | 0.145 | 6.155 | 21.6 | 43.66 | 49.09 | |
| 32 | LnROS_Phenanthrene | 143 | 0 | 0.00582 | 0.0101 | 0.0125 | 0.0284 | 0.0638 | 0.0776 | 0.162 | 0.254 | |
| 33 | LnROS_Pyrene | 143 | 0 | 8.1156E-4 | 0.00153 | 0.00196 | 0.00529 | 0.0143 | 0.0183 | 0.0344 | 0.057 | |

| | M |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | **CV** |
| 12 | 2.429 |
| 13 | 1.46 |
| 14 | 11.96 |
| 15 | 0.714 |
| 16 | 2.672 |
| 17 | 1.689 |
| 18 | 1.773 |
| 19 | 1.458 |
| 20 | 1.905 |
| 21 | |
| 22 | |
| 23 | |
| 24 | **99%ile** |
| 25 | 0.458 |
| 26 | 0.0304 |
| 27 | 1.000E-10 |
| 28 | 0.046 |
| 29 | 0.0854 |
| 30 | 0.703 |
| 31 | 55.95 |
| 32 | 0.458 |
| 33 | 0.152 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **UCL Statistics for Data Sets with Non-Detects** | | | | | | | | | | | |
| 2 | | | | | | | | | | | | |
| 3 | User Selected Options | | | | | | | | | | | |
| 4 | Date/Time of Computation | | | 9/24/2015 1:29:56 PM | | | | | | | | |
| 5 | From File | | | PW_EB_Current_MW_PAHs_Input.xls | | | | | | | | |
| 6 | Full Precision | | | OFF | | | | | | | | |
| 7 | Confidence Coefficient | | | 95% | | | | | | | | |
| 8 | Number of Bootstrap Operations | | | 2000 | | | | | | | | |
| 9 | | | | | | | | | | | | |
| 10 | **Acenaphthene** | | | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| 12 | **General Statistics** | | | | | | | | | | | |
| 13 | Total Number of Observations | | | | | 143 | Number of Distinct Observations | | | | | 23 |
| 14 | Number of Detects | | | | | 11 | Number of Non-Detects | | | | | 132 |
| 15 | Number of Distinct Detects | | | | | 11 | Number of Distinct Non-Detects | | | | | 12 |
| 16 | Minimum Detect | | | | | 0.052 | Minimum Non-Detect | | | | | 0.05 |
| 17 | Maximum Detect | | | | | 0.563 | Maximum Non-Detect | | | | | 0.5 |
| 18 | Variance Detects | | | | | 0.0289 | Percent Non-Detects | | | | | 92.31% |
| 19 | Mean Detects | | | | | 0.281 | SD Detects | | | | | 0.17 |
| 20 | Median Detects | | | | | 0.302 | CV Detects | | | | | 0.605 |
| 21 | Skewness Detects | | | | | 0.193 | Kurtosis Detects | | | | | -1.113 |
| 22 | Mean of Logged Detects | | | | | -1.5 | SD of Logged Detects | | | | | 0.787 |
| 23 | | | | | | | | | | | | |
| 24 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 25 | Shapiro Wilk Test Statistic | | | | | 0.959 | **Shapiro Wilk GOF Test** | | | | | |
| 26 | 5% Shapiro Wilk Critical Value | | | | | 0.85 | Detected Data appear Normal at 5% Significance Level | | | | | |
| 27 | Lilliefors Test Statistic | | | | | 0.122 | **Lilliefors GOF Test** | | | | | |
| 28 | 5% Lilliefors Critical Value | | | | | 0.267 | Detected Data appear Normal at 5% Significance Level | | | | | |
| 29 | **Detected Data appear Normal at 5% Significance Level** | | | | | | | | | | | |
| 30 | | | | | | | | | | | | |
| 31 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 32 | Mean | | | | | 0.0688 | Standard Error of Mean | | | | | 0.00689 |
| 33 | SD | | | | | 0.0772 | 95% KM (BCA) UCL | | | | | 0.0807 |
| 34 | 95% KM (t) UCL | | | | | 0.0802 | 95% KM (Percentile Bootstrap) UCL | | | | | 0.0804 |
| 35 | 95% KM (z) UCL | | | | | 0.0802 | 95% KM Bootstrap t UCL | | | | | 0.083 |
| 36 | 90% KM Chebyshev UCL | | | | | 0.0895 | 95% KM Chebyshev UCL | | | | | 0.0989 |
| 37 | 97.5% KM Chebyshev UCL | | | | | 0.112 | 99% KM Chebyshev UCL | | | | | 0.137 |
| 38 | | | | | | | | | | | | |
| 39 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 40 | A-D Test Statistic | | | | | 0.274 | **Anderson-Darling GOF Test** | | | | | |
| 41 | 5% A-D Critical Value | | | | | 0.737 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 42 | K-S Test Statistic | | | | | 0.175 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 43 | 5% K-S Critical Value | | | | | 0.258 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 44 | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 45 | | | | | | | | | | | | |
| 46 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 47 | k hat (MLE) | | | | | 2.319 | k star (bias corrected MLE) | | | | | 1.747 |
| 48 | Theta hat (MLE) | | | | | 0.121 | Theta star (bias corrected MLE) | | | | | 0.161 |
| 49 | nu hat (MLE) | | | | | 51.02 | nu star (bias corrected) | | | | | 38.44 |
| 50 | MLE Mean (bias corrected) | | | | | 0.281 | MLE Sd (bias corrected) | | | | | 0.213 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | | | | | | | | | | | | |
| 52 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 53 | | | | | k hat (KM) | 0.794 | | | | nu hat (KM) | | 227.1 |
| 54 | | | | | Approximate Chi Square Value (227.13, α) | 193.2 | | | | Adjusted Chi Square Value (227.13, β) | | 192.9 |
| 55 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.0809 | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | 0.081 |
| 56 | | | | | | | | | | | | |
| 57 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 58 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 59 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 60 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 61 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 62 | | | | | Minimum | 0.01 | | | | Mean | | 0.032 |
| 63 | | | | | Maximum | 0.563 | | | | Median | | 0.01 |
| 64 | | | | | SD | 0.0854 | | | | CV | | 2.667 |
| 65 | | | | | k hat (MLE) | 0.688 | | | | k star (bias corrected MLE) | | 0.679 |
| 66 | | | | | Theta hat (MLE) | 0.0465 | | | | Theta star (bias corrected MLE) | | 0.0472 |
| 67 | | | | | nu hat (MLE) | 196.9 | | | | nu star (bias corrected) | | 194.1 |
| 68 | | | | | MLE Mean (bias corrected) | 0.032 | | | | MLE Sd (bias corrected) | | 0.0389 |
| 69 | | | | | | | | | | Adjusted Level of Significance (β) | | 0.0483 |
| 70 | | | | | Approximate Chi Square Value (194.10, α) | 162.9 | | | | Adjusted Chi Square Value (194.10, β) | | 162.6 |
| 71 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.0382 | | | | 95% Gamma Adjusted UCL (use when n<50) | | 0.0382 |
| 72 | | | | | | | | | | | | |
| 73 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 74 | | | | | Shapiro Wilk Test Statistic | 0.919 | | | | **Shapiro Wilk GOF Test** | | |
| 75 | | | | | 5% Shapiro Wilk Critical Value | 0.85 | | | | Detected Data appear Lognormal at 5% Significance Level | | |
| 76 | | | | | Lilliefors Test Statistic | 0.195 | | | | **Lilliefors GOF Test** | | |
| 77 | | | | | 5% Lilliefors Critical Value | 0.267 | | | | Detected Data appear Lognormal at 5% Significance Level | | |
| 78 | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 79 | | | | | | | | | | | | |
| 80 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 81 | | | | | Mean in Original Scale | 0.0354 | | | | Mean in Log Scale | | -4.646 |
| 82 | | | | | SD in Original Scale | 0.0859 | | | | SD in Log Scale | | 1.566 |
| 83 | | | | | 95% t UCL (assumes normality of ROS data) | 0.0473 | | | | 95% Percentile Bootstrap UCL | | 0.0477 |
| 84 | | | | | 95% BCA Bootstrap UCL | 0.0499 | | | | 95% Bootstrap t UCL | | 0.0524 |
| 85 | | | | | 95% H-UCL (Log ROS) | 0.0471 | | | | | | |
| 86 | | | | | | | | | | | | |
| 87 | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | | | | | |
| 88 | | | | | KM Mean (logged) | -2.871 | | | | 95% H-UCL (KM -Log) | | 0.0676 |
| 89 | | | | | KM SD (logged) | 0.461 | | | | 95% Critical H Value (KM-Log) | | 1.806 |
| 90 | | | | | KM Standard Error of Mean (logged) | 0.0417 | | | | | | |
| 91 | | | | | | | | | | | | |
| 92 | **DL/2 Statistics** | | | | | | | | | | | |
| 93 | | | | | **DL/2 Normal** | | | | | **DL/2 Log-Transformed** | | |
| 94 | | | | | Mean in Original Scale | 0.0725 | | | | Mean in Log Scale | | -3.07 |
| 95 | | | | | SD in Original Scale | 0.0907 | | | | SD in Log Scale | | 0.842 |
| 96 | | | | | 95% t UCL (Assumes normality) | 0.085 | | | | 95% H-Stat UCL | | 0.0766 |
| 97 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 98 | | | | | | | | | | | | |
| 99 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 100 | **Detected Data appear Normal Distributed at 5% Significance Level** | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 101 | | | | | | | | | | | | |
| 102 | | | | | | Suggested UCL to Use | | | | | | |
| 103 | | | | | 95% KM (t) UCL | 0.0802 | | | 95% KM (Percentile Bootstrap) UCL | | | 0.0804 |
| 104 | | | | | | | | | | | | |
| 105 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 106 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 107 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 108 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 109 | | | | | | | | | | | | |
| 110 | Benzo(a)pyrene | | | | | | | | | | | |
| 111 | | | | | | | | | | | | |
| 112 | | | | | | General Statistics | | | | | | |
| 113 | | | | | Total Number of Observations | 143 | | | Number of Distinct Observations | | | 11 |
| 114 | | | | | Number of Detects | 8 | | | Number of Non-Detects | | | 135 |
| 115 | | | | | Number of Distinct Detects | 8 | | | Number of Distinct Non-Detects | | | 4 |
| 116 | | | | | Minimum Detect | 0.012 | | | Minimum Non-Detect | | | 0.01 |
| 117 | | | | | Maximum Detect | 0.039 | | | Maximum Non-Detect | | | 0.2 |
| 118 | | | | | Variance Detects | 9.2696E-5 | | | Percent Non-Detects | | | 94.41% |
| 119 | | | | | Mean Detects | 0.0229 | | | SD Detects | | | 0.00963 |
| 120 | | | | | Median Detects | 0.021 | | | CV Detects | | | 0.421 |
| 121 | | | | | Skewness Detects | 0.803 | | | Kurtosis Detects | | | -0.484 |
| 122 | | | | | Mean of Logged Detects | -3.853 | | | SD of Logged Detects | | | 0.412 |
| 123 | | | | | | | | | | | | |
| 124 | | | | | | Normal GOF Test on Detects Only | | | | | | |
| 125 | | | | | Shapiro Wilk Test Statistic | 0.911 | | | Shapiro Wilk GOF Test | | | |
| 126 | | | | | 5% Shapiro Wilk Critical Value | 0.818 | | | Detected Data appear Normal at 5% Significance Level | | | |
| 127 | | | | | Lilliefors Test Statistic | 0.203 | | | Lilliefors GOF Test | | | |
| 128 | | | | | 5% Lilliefors Critical Value | 0.313 | | | Detected Data appear Normal at 5% Significance Level | | | |
| 129 | | | | | | Detected Data appear Normal at 5% Significance Level | | | | | | |
| 130 | | | | | | | | | | | | |
| 131 | | | | | | Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs | | | | | | |
| 132 | | | | | Mean | 0.0107 | | | Standard Error of Mean | | | 3.2985E-4 |
| 133 | | | | | SD | 0.00367 | | | 95% KM (BCA) UCL | | | 0.0113 |
| 134 | | | | | 95% KM (t) UCL | 0.0113 | | | 95% KM (Percentile Bootstrap) UCL | | | 0.0113 |
| 135 | | | | | 95% KM (z) UCL | 0.0113 | | | 95% KM Bootstrap t UCL | | | 0.0115 |
| 136 | | | | | 90% KM Chebyshev UCL | 0.0117 | | | 95% KM Chebyshev UCL | | | 0.0122 |
| 137 | | | | | 97.5% KM Chebyshev UCL | 0.0128 | | | 99% KM Chebyshev UCL | | | 0.014 |
| 138 | | | | | | | | | | | | |
| 139 | | | | | | Gamma GOF Tests on Detected Observations Only | | | | | | |
| 140 | | | | | A-D Test Statistic | 0.25 | | | Anderson-Darling GOF Test | | | |
| 141 | | | | | 5% A-D Critical Value | 0.718 | | | Detected data appear Gamma Distributed at 5% Significance Level | | | |
| 142 | | | | | K-S Test Statistic | 0.157 | | | Kolmogrov-Smirnoff GOF | | | |
| 143 | | | | | 5% K-S Critical Value | 0.295 | | | Detected data appear Gamma Distributed at 5% Significance Level | | | |
| 144 | | | | | | Detected data appear Gamma Distributed at 5% Significance Level | | | | | | |
| 145 | | | | | | | | | | | | |
| 146 | | | | | | Gamma Statistics on Detected Data Only | | | | | | |
| 147 | | | | | k hat (MLE) | 6.835 | | | k star (bias corrected MLE) | | | 4.355 |
| 148 | | | | | Theta hat (MLE) | 0.00335 | | | Theta star (bias corrected MLE) | | | 0.00525 |
| 149 | | | | | nu hat (MLE) | 109.4 | | | nu star (bias corrected) | | | 69.69 |
| 150 | | | | | MLE Mean (bias corrected) | 0.0229 | | | MLE Sd (bias corrected) | | | 0.011 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 151 | | | | | | | | | | | | |
| 152 | | | | | | Gamma Kaplan-Meier (KM) Statistics | | | | | | |
| 153 | | | | | k hat (KM) | 8.572 | | | | nu hat (KM) | | 2451 |
| 154 | | | | | Approximate Chi Square Value (N/A, α) | 2337 | | | | Adjusted Chi Square Value (N/A, β) | | 2336 |
| 155 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.0113 | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | 0.0113 |
| 156 | | | | | | | | | | | | |
| 157 | | | | | | Gamma ROS Statistics using Imputed Non-Detects | | | | | | |
| 158 | | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | |
| 159 | | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | |
| 160 | | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | |
| 161 | | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | |
| 162 | | | | | Minimum | 0.01 | | | | Mean | | 0.0107 |
| 163 | | | | | Maximum | 0.039 | | | | Median | | 0.01 |
| 164 | | | | | SD | 0.00366 | | | | CV | | 0.341 |
| 165 | | | | | k hat (MLE) | 18.38 | | | | k star (bias corrected MLE) | | 18 |
| 166 | | | | | Theta hat (MLE) | 5.8323E-4 | | | | Theta star (bias corrected MLE) | | 5.9557E-4 |
| 167 | | | | | nu hat (MLE) | 5257 | | | | nu star (bias corrected) | | 5149 |
| 168 | | | | | MLE Mean (bias corrected) | 0.0107 | | | | MLE Sd (bias corrected) | | 0.00253 |
| 169 | | | | | | | | | | Adjusted Level of Significance (β) | | 0.0483 |
| 170 | | | | | Approximate Chi Square Value (N/A, α) | 4983 | | | | Adjusted Chi Square Value (N/A, β) | | 4981 |
| 171 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.0111 | | | | 95% Gamma Adjusted UCL (use when n<50) | | 0.0111 |
| 172 | | | | | | | | | | | | |
| 173 | | | | | | Lognormal GOF Test on Detected Observations Only | | | | | | |
| 174 | | | | | Shapiro Wilk Test Statistic | 0.961 | | | | Shapiro Wilk GOF Test | | |
| 175 | | | | | 5% Shapiro Wilk Critical Value | 0.818 | | | | Detected Data appear Lognormal at 5% Significance Level | | |
| 176 | | | | | Lilliefors Test Statistic | 0.138 | | | | Lilliefors GOF Test | | |
| 177 | | | | | 5% Lilliefors Critical Value | 0.313 | | | | Detected Data appear Lognormal at 5% Significance Level | | |
| 178 | | | | | | Detected Data appear Lognormal at 5% Significance Level | | | | | | |
| 179 | | | | | | | | | | | | |
| 180 | | | | | | Lognormal ROS Statistics Using Imputed Non-Detects | | | | | | |
| 181 | | | | | Mean in Original Scale | 0.0039 | | | | Mean in Log Scale | | -6.192 |
| 182 | | | | | SD in Original Scale | 0.00569 | | | | SD in Log Scale | | 1.138 |
| 183 | | | | | 95% t UCL (assumes normality of ROS data) | 0.00469 | | | | 95% Percentile Bootstrap UCL | | 0.00474 |
| 184 | | | | | 95% BCA Bootstrap UCL | 0.00488 | | | | 95% Bootstrap t UCL | | 0.00493 |
| 185 | | | | | 95% H-UCL (Log ROS) | 0.00489 | | | | | | |
| 186 | | | | | | | | | | | | |
| 187 | | | | | | UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed | | | | | | |
| 188 | | | | | KM Mean (logged) | -4.562 | | | | 95% H-UCL (KM -Log) | | 0.0109 |
| 189 | | | | | KM SD (logged) | 0.197 | | | | 95% Critical H Value (KM-Log) | | 1.695 |
| 190 | | | | | KM Standard Error of Mean (logged) | 0.0178 | | | | | | |
| 191 | | | | | | | | | | | | |
| 192 | | | | | | DL/2 Statistics | | | | | | |
| 193 | | | | | DL/2 Normal | | | | | DL/2 Log-Transformed | | |
| 194 | | | | | Mean in Original Scale | 0.00701 | | | | Mean in Log Scale | | -5.152 |
| 195 | | | | | SD in Original Scale | 0.00919 | | | | SD in Log Scale | | 0.453 |
| 196 | | | | | 95% t UCL (Assumes normality) | 0.00829 | | | | 95% H-Stat UCL | | 0.00687 |
| 197 | | | | | | DL/2 is not a recommended method, provided for comparisons and historical reasons | | | | | | |
| 198 | | | | | | | | | | | | |
| 199 | | | | | | Nonparametric Distribution Free UCL Statistics | | | | | | |
| 200 | | | | | | Detected Data appear Normal Distributed at 5% Significance Level | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 201 | | | | | | | | | | | | |
| 202 | | | | | | Suggested UCL to Use | | | | | | |
| 203 | | | | | 95% KM (t) UCL | 0.0113 | | | 95% KM (Percentile Bootstrap) UCL | | | 0.0113 |
| 204 | | | | | | | | | | | | |
| 205 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 206 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 207 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 208 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 209 | | | | | | | | | | | | |
| 210 | Benzo(b)fluoranthene | | | | | | | | | | | |
| 211 | | | | | | | | | | | | |
| 212 | | | | | | General Statistics | | | | | | |
| 213 | | | | | Total Number of Observations | 143 | | | Number of Distinct Observations | | | 3 |
| 214 | | | | | Number of Detects | 1 | | | Number of Non-Detects | | | 142 |
| 215 | | | | | Number of Distinct Detects | 1 | | | Number of Distinct Non-Detects | | | 2 |
| 216 | | | | | | | | | | | | |
| 217 | | | | | Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! | | | | | | | |
| 218 | | | | | It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV). | | | | | | | |
| 219 | | | | | | | | | | | | |
| 220 | | | | | The data set for variable Benzo(b)fluoranthene was not processed! | | | | | | | |
| 221 | | | | | | | | | | | | |
| 222 | | | | | | | | | | | | |
| 223 | Chrysene | | | | | | | | | | | |
| 224 | | | | | | | | | | | | |
| 225 | | | | | | General Statistics | | | | | | |
| 226 | | | | | Total Number of Observations | 143 | | | Number of Distinct Observations | | | 2 |
| 227 | | | | | Number of Detects | 2 | | | Number of Non-Detects | | | 141 |
| 228 | | | | | Number of Distinct Detects | 2 | | | Number of Distinct Non-Detects | | | 1 |
| 229 | | | | | Minimum Detect | 0.05 | | | Minimum Non-Detect | | | 0.05 |
| 230 | | | | | Maximum Detect | 0.059 | | | Maximum Non-Detect | | | 0.05 |
| 231 | | | | | Variance Detects | 4.0500E-5 | | | Percent Non-Detects | | | 98.6% |
| 232 | | | | | Mean Detects | 0.0545 | | | SD Detects | | | 0.00636 |
| 233 | | | | | Median Detects | 0.0545 | | | CV Detects | | | 0.117 |
| 234 | | | | | Skewness Detects | N/A | | | Kurtosis Detects | | | N/A |
| 235 | | | | | Mean of Logged Detects | -2.913 | | | SD of Logged Detects | | | 0.117 |
| 236 | | | | | | | | | | | | |
| 237 | | | | | Warning: Data set has only 2 Detected Values. | | | | | | | |
| 238 | | | | | This is not enough to compute meaningful or reliable statistics and estimates. | | | | | | | |
| 239 | | | | | | | | | | | | |
| 240 | | | | | | | | | | | | |
| 241 | | | | | Normal GOF Test on Detects Only | | | | | | | |
| 242 | | | | | Not Enough Data to Perform GOF Test | | | | | | | |
| 243 | | | | | | | | | | | | |
| 244 | | | | | Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs | | | | | | | |
| 245 | | | | | Mean | 0.0501 | | | Standard Error of Mean | | | 8.8695E-5 |
| 246 | | | | | SD | 7.4998E-4 | | | 95% KM (BCA) UCL | | | N/A |
| 247 | | | | | 95% KM (t) UCL | 0.0502 | | | 95% KM (Percentile Bootstrap) UCL | | | N/A |
| 248 | | | | | 95% KM (z) UCL | 0.0502 | | | 95% KM Bootstrap t UCL | | | N/A |
| 249 | | | | | 90% KM Chebyshev UCL | 0.0503 | | | 95% KM Chebyshev UCL | | | 0.0504 |
| 250 | | | | | 97.5% KM Chebyshev UCL | 0.0506 | | | 99% KM Chebyshev UCL | | | 0.0509 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 251 | | | | | | | | | | | | |
| 252 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 253 | **Not Enough Data to Perform GOF Test** | | | | | | | | | | | |
| 254 | | | | | | | | | | | | |
| 255 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 256 | | | | | k hat (MLE) | 146.3 | | | k star (bias corrected MLE) | | | N/A |
| 257 | | | | | Theta hat (MLE) | 3.7241E-4 | | | Theta star (bias corrected MLE) | | | N/A |
| 258 | | | | | nu hat (MLE) | 585.4 | | | nu star (bias corrected) | | | N/A |
| 259 | | | | | MLE Mean (bias corrected) | N/A | | | MLE Sd (bias corrected) | | | N/A |
| 260 | | | | | | | | | | | | |
| 261 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 262 | | | | | k hat (KM) | 4456 | | | nu hat (KM) | | | 1274375 |
| 263 | | | | | | | | | Adjusted Level of Significance (β) | | | 0.0483 |
| 264 | | | | | Approximate Chi Square Value (N/A, α) | 1271751 | | | Adjusted Chi Square Value (N/A, β) | | | 1271724 |
| 265 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.0502 | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | | 0.0502 |
| 266 | | | | | | | | | | | | |
| 267 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 268 | **Not Enough Data to Perform GOF Test** | | | | | | | | | | | |
| 269 | | | | | | | | | | | | |
| 270 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 271 | | | | | Mean in Original Scale | 0.0128 | | | Mean in Log Scale | | | -4.568 |
| 272 | | | | | SD in Original Scale | 0.00917 | | | SD in Log Scale | | | 0.655 |
| 273 | | | | | 95% t UCL (assumes normality of ROS data) | 0.0141 | | | 95% Percentile Bootstrap UCL | | | 0.0142 |
| 274 | | | | | 95% BCA Bootstrap UCL | 0.0142 | | | 95% Bootstrap t UCL | | | 0.0143 |
| 275 | | | | | 95% H-UCL (Log ROS) | 0.0143 | | | | | | |
| 276 | | | | | | | | | | | | |
| 277 | **DL/2 Statistics** | | | | | | | | | | | |
| 278 | | **DL/2 Normal** | | | | | **DL/2 Log-Transformed** | | | | | |
| 279 | | | | | Mean in Original Scale | 0.0254 | | | Mean in Log Scale | | | -3.678 |
| 280 | | | | | SD in Original Scale | 0.00352 | | | SD in Log Scale | | | 0.092 |
| 281 | | | | | 95% t UCL (Assumes normality) | 0.0259 | | | 95% H-Stat UCL | | | N/A |
| 282 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 283 | | | | | | | | | | | | |
| 284 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 285 | **Data do not follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 286 | | | | | | | | | | | | |
| 287 | **Suggested UCL to Use** | | | | | | | | | | | |
| 288 | | | | | 95% KM (t) UCL | 0.0502 | | | 95% KM (% Bootstrap) UCL | | | N/A |
| 289 | **Warning: One or more Recommended UCL(s) not available!** | | | | | | | | | | | |
| 290 | | | | | | | | | | | | |
| 291 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 292 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 293 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 294 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 295 | | | | | | | | | | | | |
| 296 | **Fluoranthene** | | | | | | | | | | | |
| 297 | | | | | | | | | | | | |
| 298 | **General Statistics** | | | | | | | | | | | |
| 299 | | | | | Total Number of Observations | 143 | | | Number of Distinct Observations | | | 7 |
| 300 | | | | | Number of Detects | 7 | | | Number of Non-Detects | | | 136 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 301 | | | | | Number of Distinct Detects | 6 | | | | | Number of Distinct Non-Detects | 1 |
| 302 | | | | | Minimum Detect | 0.059 | | | | | Minimum Non-Detect | 0.05 |
| 303 | | | | | Maximum Detect | 0.289 | | | | | Maximum Non-Detect | 0.05 |
| 304 | | | | | Variance Detects | 0.0067 | | | | | Percent Non-Detects | 95.1% |
| 305 | | | | | Mean Detects | 0.105 | | | | | SD Detects | 0.0819 |
| 306 | | | | | Median Detects | 0.079 | | | | | CV Detects | 0.782 |
| 307 | | | | | Skewness Detects | 2.564 | | | | | Kurtosis Detects | 6.671 |
| 308 | | | | | Mean of Logged Detects | -2.417 | | | | | SD of Logged Detects | 0.536 |
| 309 | | | | | | | | | | | | |
| 310 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 311 | | | | | Shapiro Wilk Test Statistic | 0.571 | **Shapiro Wilk GOF Test** | | | | | |
| 312 | | | | | 5% Shapiro Wilk Critical Value | 0.803 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 313 | | | | | Lilliefors Test Statistic | 0.428 | **Lilliefors GOF Test** | | | | | |
| 314 | | | | | 5% Lilliefors Critical Value | 0.335 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 315 | | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | | |
| 316 | | | | | | | | | | | | |
| 317 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |
| 318 | | | | | Mean | 0.0527 | | | | | Standard Error of Mean | 0.00185 |
| 319 | | | | | SD | 0.0205 | | | | | 95% KM (BCA) UCL | 0.056 |
| 320 | | | | | 95% KM (t) UCL | 0.0557 | | | | | 95% KM (Percentile Bootstrap) UCL | 0.056 |
| 321 | | | | | 95% KM (z) UCL | 0.0557 | | | | | 95% KM Bootstrap t UCL | 0.0615 |
| 322 | | | | | 90% KM Chebyshev UCL | 0.0582 | | | | | 95% KM Chebyshev UCL | 0.0608 |
| 323 | | | | | 97.5% KM Chebyshev UCL | 0.0642 | | | | | 99% KM Chebyshev UCL | 0.0711 |
| 324 | | | | | | | | | | | | |
| 325 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 326 | | | | | A-D Test Statistic | 1.245 | **Anderson-Darling GOF Test** | | | | | |
| 327 | | | | | 5% A-D Critical Value | 0.712 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 328 | | | | | K-S Test Statistic | 0.389 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 329 | | | | | 5% K-S Critical Value | 0.313 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 330 | | | | | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | |
| 331 | | | | | | | | | | | | |
| 332 | | | | | **Gamma Statistics on Detected Data Only** | | | | | | | |
| 333 | | | | | k hat (MLE) | 3.274 | | | | | k star (bias corrected MLE) | 1.966 |
| 334 | | | | | Theta hat (MLE) | 0.032 | | | | | Theta star (bias corrected MLE) | 0.0533 |
| 335 | | | | | nu hat (MLE) | 45.84 | | | | | nu star (bias corrected) | 27.53 |
| 336 | | | | | MLE Mean (bias corrected) | 0.105 | | | | | MLE Sd (bias corrected) | 0.0747 |
| 337 | | | | | | | | | | | | |
| 338 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 339 | | | | | k hat (KM) | 6.598 | | | | | nu hat (KM) | 1887 |
| 340 | | | | | Approximate Chi Square Value (N/A, α) | 1787 | | | | | Adjusted Chi Square Value (N/A, β) | 1786 |
| 341 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.0556 | | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | 0.0557 |
| 342 | | | | | | | | | | | | |
| 343 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 344 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 345 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 346 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 347 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 348 | | | | | Minimum | 0.01 | | | | | Mean | 0.0146 |
| 349 | | | | | Maximum | 0.289 | | | | | Median | 0.01 |
| 350 | | | | | SD | 0.0265 | | | | | CV | 1.813 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 351 | | | | | k hat (MLE) | 1.977 | | | | | k star (bias corrected MLE) | 1.94 |
| 352 | | | | | Theta hat (MLE) | 0.00741 | | | | | Theta star (bias corrected MLE) | 0.00755 |
| 353 | | | | | nu hat (MLE) | 565.3 | | | | | nu star (bias corrected) | 554.8 |
| 354 | | | | | MLE Mean (bias corrected) | 0.0146 | | | | | MLE Sd (bias corrected) | 0.0105 |
| 355 | | | | | | | | | | | Adjusted Level of Significance (β) | 0.0483 |
| 356 | | | | | Approximate Chi Square Value (554.76, α) | 501.1 | | | | | Adjusted Chi Square Value (554.76, β) | 500.6 |
| 357 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.0162 | | | | | 95% Gamma Adjusted UCL (use when n<50) | 0.0162 |
| 358 | | | | | | | | | | | | |
| 359 | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | | |
| 360 | | | | | Shapiro Wilk Test Statistic | 0.698 | | | **Shapiro Wilk GOF Test** | | | |
| 361 | | | | | 5% Shapiro Wilk Critical Value | 0.803 | | | Detected Data Not Lognormal at 5% Significance Level | | | |
| 362 | | | | | Lilliefors Test Statistic | 0.35 | | | **Lilliefors GOF Test** | | | |
| 363 | | | | | 5% Lilliefors Critical Value | 0.335 | | | Detected Data Not Lognormal at 5% Significance Level | | | |
| 364 | | | | | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | |
| 365 | | | | | | | | | | | | |
| 366 | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | |
| 367 | | | | | Mean in Original Scale | 0.0106 | | | | | Mean in Log Scale | -5.92 |
| 368 | | | | | SD in Original Scale | 0.0284 | | | | | SD in Log Scale | 1.693 |
| 369 | | | | | 95% t UCL (assumes normality of ROS data) | 0.0146 | | | | | 95% Percentile Bootstrap UCL | 0.0148 |
| 370 | | | | | 95% BCA Bootstrap UCL | 0.0169 | | | | | 95% Bootstrap t UCL | 0.0178 |
| 371 | | | | | 95% H-UCL (Log ROS) | 0.0171 | | | | | | |
| 372 | | | | | | | | | | | | |
| 373 | | | | | **DL/2 Statistics** | | | | | | | |
| 374 | | | | | **DL/2 Normal** | | | | **DL/2 Log-Transformed** | | | |
| 375 | | | | | Mean in Original Scale | 0.0289 | | | | | Mean in Log Scale | -3.627 |
| 376 | | | | | SD in Original Scale | 0.0241 | | | | | SD in Log Scale | 0.297 |
| 377 | | | | | 95% t UCL (Assumes normality) | 0.0322 | | | | | 95% H-Stat UCL | 0.029 |
| 378 | | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | |
| 379 | | | | | | | | | | | | |
| 380 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 381 | | | | | **Data do not follow a Discernible Distribution at 5% Significance Level** | | | | | | | |
| 382 | | | | | | | | | | | | |
| 383 | | | | | **Suggested UCL to Use** | | | | | | | |
| 384 | | | | | 95% KM (t) UCL | 0.0557 | | | | | 95% KM (% Bootstrap) UCL | 0.056 |
| 385 | | | | | | | | | | | | |
| 386 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 387 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 388 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 389 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 390 | | | | | | | | | | | | |
| 391 | **Fluorene** | | | | | | | | | | | |
| 392 | | | | | | | | | | | | |
| 393 | | | | | **General Statistics** | | | | | | | |
| 394 | | | | | Total Number of Observations | 143 | | | | | Number of Distinct Observations | 37 |
| 395 | | | | | Number of Detects | 39 | | | | | Number of Non-Detects | 104 |
| 396 | | | | | Number of Distinct Detects | 35 | | | | | Number of Distinct Non-Detects | 3 |
| 397 | | | | | Minimum Detect | 0.055 | | | | | Minimum Non-Detect | 0.05 |
| 398 | | | | | Maximum Detect | 0.873 | | | | | Maximum Non-Detect | 0.3 |
| 399 | | | | | Variance Detects | 0.043 | | | | | Percent Non-Detects | 72.73% |
| 400 | | | | | Mean Detects | 0.278 | | | | | SD Detects | 0.207 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 401 | | | | | Median Detects | 0.229 | | | | | CV Detects | 0.746 |
| 402 | | | | | Skewness Detects | 1.044 | | | | | Kurtosis Detects | 0.541 |
| 403 | | | | | Mean of Logged Detects | -1.567 | | | | | SD of Logged Detects | 0.796 |
| 404 | | | | | | | | | | | | |
| 405 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 406 | | | | | Shapiro Wilk Test Statistic | 0.885 | **Shapiro Wilk GOF Test** | | | | | |
| 407 | | | | | 5% Shapiro Wilk Critical Value | 0.939 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 408 | | | | | Lilliefors Test Statistic | 0.151 | **Lilliefors GOF Test** | | | | | |
| 409 | | | | | 5% Lilliefors Critical Value | 0.142 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 410 | | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | | |
| 411 | | | | | | | | | | | | |
| 412 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |
| 413 | | | | | Mean | 0.112 | Standard Error of Mean | | | | | 0.0125 |
| 414 | | | | | SD | 0.148 | 95% KM (BCA) UCL | | | | | 0.134 |
| 415 | | | | | 95% KM (t) UCL | 0.133 | 95% KM (Percentile Bootstrap) UCL | | | | | 0.133 |
| 416 | | | | | 95% KM (z) UCL | 0.133 | 95% KM Bootstrap t UCL | | | | | 0.138 |
| 417 | | | | | 90% KM Chebyshev UCL | 0.15 | 95% KM Chebyshev UCL | | | | | 0.167 |
| 418 | | | | | 97.5% KM Chebyshev UCL | 0.19 | 99% KM Chebyshev UCL | | | | | 0.237 |
| 419 | | | | | | | | | | | | |
| 420 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 421 | | | | | A-D Test Statistic | 0.503 | **Anderson-Darling GOF Test** | | | | | |
| 422 | | | | | 5% A-D Critical Value | 0.761 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 423 | | | | | K-S Test Statistic | 0.123 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 424 | | | | | 5% K-S Critical Value | 0.143 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 425 | | | | | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | |
| 426 | | | | | | | | | | | | |
| 427 | | | | | **Gamma Statistics on Detected Data Only** | | | | | | | |
| 428 | | | | | k hat (MLE) | 1.891 | k star (bias corrected MLE) | | | | | 1.763 |
| 429 | | | | | Theta hat (MLE) | 0.147 | Theta star (bias corrected MLE) | | | | | 0.158 |
| 430 | | | | | nu hat (MLE) | 147.5 | nu star (bias corrected) | | | | | 137.5 |
| 431 | | | | | MLE Mean (bias corrected) | 0.278 | MLE Sd (bias corrected) | | | | | 0.21 |
| 432 | | | | | | | | | | | | |
| 433 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 434 | | | | | k hat (KM) | 0.58 | nu hat (KM) | | | | | 165.9 |
| 435 | | | | | Approximate Chi Square Value (165.93, α) | 137.1 | Adjusted Chi Square Value (165.93, β) | | | | | 136.9 |
| 436 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.136 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 0.136 |
| 437 | | | | | | | | | | | | |
| 438 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 439 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 440 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 441 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 442 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 443 | | | | | Minimum | 0.01 | Mean | | | | | 0.0837 |
| 444 | | | | | Maximum | 0.873 | Median | | | | | 0.01 |
| 445 | | | | | SD | 0.161 | CV | | | | | 1.919 |
| 446 | | | | | k hat (MLE) | 0.502 | k star (bias corrected MLE) | | | | | 0.496 |
| 447 | | | | | Theta hat (MLE) | 0.167 | Theta star (bias corrected MLE) | | | | | 0.169 |
| 448 | | | | | nu hat (MLE) | 143.6 | nu star (bias corrected) | | | | | 141.9 |
| 449 | | | | | MLE Mean (bias corrected) | 0.0837 | MLE Sd (bias corrected) | | | | | 0.119 |
| 450 | | | | | | | Adjusted Level of Significance (β) | | | | | 0.0483 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 451 | Approximate Chi Square Value (141.88, α) | | | | | 115.4 | Adjusted Chi Square Value (141.88, β) | | | | | 115.1 |
| 452 | 95% Gamma Approximate UCL (use when n>=50) | | | | | 0.103 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 0.103 |
| 453 | | | | | | | | | | | | |
| 454 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 455 | Shapiro Wilk Test Statistic | | | | | 0.95 | **Shapiro Wilk GOF Test** | | | | | |
| 456 | 5% Shapiro Wilk Critical Value | | | | | 0.939 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 457 | Lilliefors Test Statistic | | | | | 0.12 | **Lilliefors GOF Test** | | | | | |
| 458 | 5% Lilliefors Critical Value | | | | | 0.142 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 459 | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 460 | | | | | | | | | | | | |
| 461 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 462 | Mean in Original Scale | | | | | 0.0931 | Mean in Log Scale | | | | | -3.486 |
| 463 | SD in Original Scale | | | | | 0.157 | SD in Log Scale | | | | | 1.563 |
| 464 | 95% t UCL (assumes normality of ROS data) | | | | | 0.115 | 95% Percentile Bootstrap UCL | | | | | 0.115 |
| 465 | 95% BCA Bootstrap UCL | | | | | 0.119 | 95% Bootstrap t UCL | | | | | 0.118 |
| 466 | 95% H-UCL (Log ROS) | | | | | 0.149 | | | | | | |
| 467 | | | | | | | | | | | | |
| 468 | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | | | | | |
| 469 | KM Mean (logged) | | | | | -2.605 | 95% H-UCL (KM -Log) | | | | | 0.112 |
| 470 | KM SD (logged) | | | | | 0.758 | 95% Critical H Value (KM-Log) | | | | | 1.998 |
| 471 | KM Standard Error of Mean (logged) | | | | | 0.0642 | | | | | | |
| 472 | | | | | | | | | | | | |
| 473 | **DL/2 Statistics** | | | | | | | | | | | |
| 474 | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | | | | | |
| 475 | Mean in Original Scale | | | | | 0.095 | Mean in Log Scale | | | | | -3.094 |
| 476 | SD in Original Scale | | | | | 0.156 | SD in Log Scale | | | | | 1.037 |
| 477 | 95% t UCL (Assumes normality) | | | | | 0.117 | 95% H-Stat UCL | | | | | 0.0942 |
| 478 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 479 | | | | | | | | | | | | |
| 480 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 481 | **Detected Data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 482 | | | | | | | | | | | | |
| 483 | **Suggested UCL to Use** | | | | | | | | | | | |
| 484 | 95% KM (t) UCL | | | | | 0.133 | 95% GROS Approximate Gamma UCL | | | | | 0.103 |
| 485 | 95% Approximate Gamma KM-UCL | | | | | 0.136 | | | | | | |
| 486 | | | | | | | | | | | | |
| 487 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 488 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 489 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 490 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 491 | | | | | | | | | | | | |
| 492 | **Naphthalene** | | | | | | | | | | | |
| 493 | | | | | | | | | | | | |
| 494 | **General Statistics** | | | | | | | | | | | |
| 495 | Total Number of Observations | | | | | 143 | Number of Distinct Observations | | | | | 81 |
| 496 | Number of Detects | | | | | 72 | Number of Non-Detects | | | | | 71 |
| 497 | Number of Distinct Detects | | | | | 69 | Number of Distinct Non-Detects | | | | | 13 |
| 498 | Minimum Detect | | | | | 0.051 | Minimum Non-Detect | | | | | 0.05 |
| 499 | Maximum Detect | | | | | 74.8 | Maximum Non-Detect | | | | | 6 |
| 500 | Variance Detects | | | | | 420.6 | Percent Non-Detects | | | | | 49.65% |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 501 | | | | | Mean Detects | 19.5 | | | | | SD Detects | 20.51 |
| 502 | | | | | Median Detects | 6.155 | | | | | CV Detects | 1.052 |
| 503 | | | | | Skewness Detects | 0.689 | | | | | Kurtosis Detects | -0.846 |
| 504 | | | | | Mean of Logged Detects | 1.628 | | | | | SD of Logged Detects | 2.294 |
| 505 | | | | | | | | | | | | |
| 506 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 507 | | | | | Shapiro Wilk Test Statistic | 0.827 | **Normal GOF Test on Detected Observations Only** | | | | | |
| 508 | | | | | 5% Shapiro Wilk P Value | 1.728E-11 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 509 | | | | | Lilliefors Test Statistic | 0.254 | **Lilliefors GOF Test** | | | | | |
| 510 | | | | | 5% Lilliefors Critical Value | 0.104 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 511 | | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | | |
| 512 | | | | | | | | | | | | |
| 513 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |
| 514 | | | | | Mean | 9.853 | Standard Error of Mean | | | | | 1.466 |
| 515 | | | | | SD | 17.41 | 95% KM (BCA) UCL | | | | | 12.18 |
| 516 | | | | | 95% KM (t) UCL | 12.28 | 95% KM (Percentile Bootstrap) UCL | | | | | 12.28 |
| 517 | | | | | 95% KM (z) UCL | 12.27 | 95% KM Bootstrap t UCL | | | | | 12.61 |
| 518 | | | | | 90% KM Chebyshev UCL | 14.25 | 95% KM Chebyshev UCL | | | | | 16.24 |
| 519 | | | | | 97.5% KM Chebyshev UCL | 19.01 | 99% KM Chebyshev UCL | | | | | 24.44 |
| 520 | | | | | | | | | | | | |
| 521 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 522 | | | | | A-D Test Statistic | 2.155 | **Anderson-Darling GOF Test** | | | | | |
| 523 | | | | | 5% A-D Critical Value | 0.823 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 524 | | | | | K-S Test Statistic | 0.14 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 525 | | | | | 5% K-S Critical Value | 0.112 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 526 | | | | | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | |
| 527 | | | | | | | | | | | | |
| 528 | | | | | **Gamma Statistics on Detected Data Only** | | | | | | | |
| 529 | | | | | k hat (MLE) | 0.477 | k star (bias corrected MLE) | | | | | 0.466 |
| 530 | | | | | Theta hat (MLE) | 40.89 | Theta star (bias corrected MLE) | | | | | 41.82 |
| 531 | | | | | nu hat (MLE) | 68.66 | nu star (bias corrected) | | | | | 67.14 |
| 532 | | | | | MLE Mean (bias corrected) | 19.5 | MLE Sd (bias corrected) | | | | | 28.55 |
| 533 | | | | | | | | | | | | |
| 534 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 535 | | | | | k hat (KM) | 0.32 | nu hat (KM) | | | | | 91.6 |
| 536 | | | | | Approximate Chi Square Value (91.60, α) | 70.53 | Adjusted Chi Square Value (91.60, β) | | | | | 70.34 |
| 537 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 12.8 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 12.83 |
| 538 | | | | | | | | | | | | |
| 539 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 540 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 541 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 542 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 543 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 544 | | | | | Minimum | 0.01 | Mean | | | | | 9.848 |
| 545 | | | | | Maximum | 74.8 | Median | | | | | 0.071 |
| 546 | | | | | SD | 17.48 | CV | | | | | 1.774 |
| 547 | | | | | k hat (MLE) | 0.203 | k star (bias corrected MLE) | | | | | 0.204 |
| 548 | | | | | Theta hat (MLE) | 48.48 | Theta star (bias corrected MLE) | | | | | 48.39 |
| 549 | | | | | nu hat (MLE) | 58.1 | nu star (bias corrected) | | | | | 58.21 |
| 550 | | | | | MLE Mean (bias corrected) | 9.848 | MLE Sd (bias corrected) | | | | | 21.83 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 551 | | | | | | | | | | | Adjusted Level of Significance (β) | 0.0483 |
| 552 | | | | | Approximate Chi Square Value (58.21, α) | 41.67 | | | | | Adjusted Chi Square Value (58.21, β) | 41.53 |
| 553 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 13.76 | | | | | 95% Gamma Adjusted UCL (use when n<50) | 13.8 |
| 554 | | | | | | | | | | | | |
| 555 | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | | |
| 556 | | | | | Lilliefors Test Statistic | 0.177 | **Lilliefors GOF Test** | | | | | |
| 557 | | | | | 5% Lilliefors Critical Value | 0.104 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 558 | | | | | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | |
| 559 | | | | | | | | | | | | |
| 560 | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | |
| 561 | | | | | Mean in Original Scale | 9.853 | | | | | Mean in Log Scale | -0.926 |
| 562 | | | | | SD in Original Scale | 17.47 | | | | | SD in Log Scale | 3.282 |
| 563 | | | | | 95% t UCL (assumes normality of ROS data) | 12.27 | | | | | 95% Percentile Bootstrap UCL | 12.29 |
| 564 | | | | | 95% BCA Bootstrap UCL | 12.46 | | | | | 95% Bootstrap t UCL | 12.46 |
| 565 | | | | | 95% H-UCL (Log ROS) | 335.3 | | | | | | |
| 566 | | | | | | | | | | | | |
| 567 | | | | | **DL/2 Statistics** | | | | | | | |
| 568 | | | | | **DL/2 Normal** | | **DL/2 Log-Transformed** | | | | | |
| 569 | | | | | Mean in Original Scale | 9.9 | | | | | Mean in Log Scale | -0.765 |
| 570 | | | | | SD in Original Scale | 17.45 | | | | | SD in Log Scale | 3.029 |
| 571 | | | | | 95% t UCL (Assumes normality) | 12.32 | | | | | 95% H-Stat UCL | 146.6 |
| 572 | | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | |
| 573 | | | | | | | | | | | | |
| 574 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 575 | | | | | **Data do not follow a Discernible Distribution at 5% Significance Level** | | | | | | | |
| 576 | | | | | | | | | | | | |
| 577 | | | | | **Suggested UCL to Use** | | | | | | | |
| 578 | | | | | 97.5% KM (Chebyshev) UCL | 19.01 | | | | | | |
| 579 | | | | | | | | | | | | |
| 580 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 581 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 582 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 583 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 584 | | | | | | | | | | | | |
| 585 | **Phenanthrene** | | | | | | | | | | | |
| 586 | | | | | | | | | | | | |
| 587 | | | | | **General Statistics** | | | | | | | |
| 588 | | | | | Total Number of Observations | 143 | | | | | Number of Distinct Observations | 34 |
| 589 | | | | | Number of Detects | 34 | | | | | Number of Non-Detects | 109 |
| 590 | | | | | Number of Distinct Detects | 31 | | | | | Number of Distinct Non-Detects | 3 |
| 591 | | | | | Minimum Detect | 0.052 | | | | | Minimum Non-Detect | 0.05 |
| 592 | | | | | Maximum Detect | 0.482 | | | | | Maximum Non-Detect | 0.4 |
| 593 | | | | | Variance Detects | 0.0146 | | | | | Percent Non-Detects | 76.22% |
| 594 | | | | | Mean Detects | 0.185 | | | | | SD Detects | 0.121 |
| 595 | | | | | Median Detects | 0.153 | | | | | CV Detects | 0.652 |
| 596 | | | | | Skewness Detects | 1.204 | | | | | Kurtosis Detects | 0.64 |
| 597 | | | | | Mean of Logged Detects | -1.875 | | | | | SD of Logged Detects | 0.624 |
| 598 | | | | | | | | | | | | |
| 599 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 600 | | | | | Shapiro Wilk Test Statistic | 0.857 | **Shapiro Wilk GOF Test** | | | | | |

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| 601 | | | | | 5% Shapiro Wilk Critical Value | 0.933 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 602 | | | | | Lilliefors Test Statistic | 0.188 | **Lilliefors GOF Test** | | | | | |
| 603 | | | | | 5% Lilliefors Critical Value | 0.152 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 604 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 605 | | | | | | | | | | | | |
| 606 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 607 | | | | | Mean | 0.0824 | | | | Standard Error of Mean | | 0.00696 |
| 608 | | | | | SD | 0.0819 | | | | 95% KM (BCA) UCL | | 0.094 |
| 609 | | | | | 95% KM (t) UCL | 0.0939 | | | | 95% KM (Percentile Bootstrap) UCL | | 0.095 |
| 610 | | | | | 95% KM (z) UCL | 0.0938 | | | | 95% KM Bootstrap t UCL | | 0.0971 |
| 611 | | | | | 90% KM Chebyshev UCL | 0.103 | | | | 95% KM Chebyshev UCL | | 0.113 |
| 612 | | | | | 97.5% KM Chebyshev UCL | 0.126 | | | | 99% KM Chebyshev UCL | | 0.152 |
| 613 | | | | | | | | | | | | |
| 614 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 615 | | | | | A-D Test Statistic | 0.498 | **Anderson-Darling GOF Test** | | | | | |
| 616 | | | | | 5% A-D Critical Value | 0.755 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 617 | | | | | K-S Test Statistic | 0.109 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 618 | | | | | 5% K-S Critical Value | 0.152 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 619 | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 620 | | | | | | | | | | | | |
| 621 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 622 | | | | | k hat (MLE) | 2.787 | | | | k star (bias corrected MLE) | | 2.561 |
| 623 | | | | | Theta hat (MLE) | 0.0665 | | | | Theta star (bias corrected MLE) | | 0.0724 |
| 624 | | | | | nu hat (MLE) | 189.5 | | | | nu star (bias corrected) | | 174.1 |
| 625 | | | | | MLE Mean (bias corrected) | 0.185 | | | | MLE Sd (bias corrected) | | 0.116 |
| 626 | | | | | | | | | | | | |
| 627 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 628 | | | | | k hat (KM) | 1.011 | | | | nu hat (KM) | | 289.2 |
| 629 | | | | | Approximate Chi Square Value (289.19, α) | 250.8 | | | | Adjusted Chi Square Value (289.19, β) | | 250.4 |
| 630 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.095 | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | 0.0951 |
| 631 | | | | | | | | | | | | |
| 632 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 633 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 634 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 635 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 636 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 637 | | | | | Minimum | 0.01 | | | | Mean | | 0.053 |
| 638 | | | | | Maximum | 0.482 | | | | Median | | 0.01 |
| 639 | | | | | SD | 0.0945 | | | | CV | | 1.783 |
| 640 | | | | | k hat (MLE) | 0.643 | | | | k star (bias corrected MLE) | | 0.634 |
| 641 | | | | | Theta hat (MLE) | 0.0824 | | | | Theta star (bias corrected MLE) | | 0.0836 |
| 642 | | | | | nu hat (MLE) | 183.9 | | | | nu star (bias corrected) | | 181.4 |
| 643 | | | | | MLE Mean (bias corrected) | 0.053 | | | | MLE Sd (bias corrected) | | 0.0666 |
| 644 | | | | | | | | | | Adjusted Level of Significance (β) | | 0.0483 |
| 645 | | | | | Approximate Chi Square Value (181.38, α) | 151.2 | | | | Adjusted Chi Square Value (181.38, β) | | 150.9 |
| 646 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.0636 | | | | 95% Gamma Adjusted UCL (use when n<50) | | 0.0637 |
| 647 | | | | | | | | | | | | |
| 648 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 649 | | | | | Shapiro Wilk Test Statistic | 0.964 | **Shapiro Wilk GOF Test** | | | | | |
| 650 | | | | | 5% Shapiro Wilk Critical Value | 0.933 | Detected Data appear Lognormal at 5% Significance Level | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 651 | | | | | Lilliefors Test Statistic | 0.0875 | **Lilliefors GOF Test** | | | | | |
| 652 | | | | | 5% Lilliefors Critical Value | 0.152 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 653 | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 654 | | | | | | | | | | | | |
| 655 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 656 | | | | | Mean in Original Scale | 0.0627 | | | | Mean in Log Scale | | -3.535 |
| 657 | | | | | SD in Original Scale | 0.0915 | | | | SD in Log Scale | | 1.265 |
| 658 | | | | | 95% t UCL (assumes normality of ROS data) | 0.0754 | | | | 95% Percentile Bootstrap UCL | | 0.0755 |
| 659 | | | | | 95% BCA Bootstrap UCL | 0.0781 | | | | 95% Bootstrap t UCL | | 0.0778 |
| 660 | | | | | 95% H-UCL (Log ROS) | 0.0842 | | | | | | |
| 661 | | | | | | | | | | | | |
| 662 | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | | | | | |
| 663 | | | | | KM Mean (logged) | -2.728 | | | | 95% H-UCL (KM -Log) | | 0.0837 |
| 664 | | | | | KM SD (logged) | 0.564 | | | | 95% Critical H Value (KM-Log) | | 1.867 |
| 665 | | | | | KM Standard Error of Mean (logged) | 0.048 | | | | | | |
| 666 | | | | | | | | | | | | |
| 667 | **DL/2 Statistics** | | | | | | | | | | | |
| 668 | | | | **DL/2 Normal** | | | **DL/2 Log-Transformed** | | | | | |
| 669 | | | | | Mean in Original Scale | 0.0644 | | | | Mean in Log Scale | | -3.241 |
| 670 | | | | | SD in Original Scale | 0.0906 | | | | SD in Log Scale | | 0.841 |
| 671 | | | | | 95% t UCL (Assumes normality) | 0.077 | | | | 95% H-Stat UCL | | 0.0645 |
| 672 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 673 | | | | | | | | | | | | |
| 674 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 675 | **Detected Data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 676 | | | | | | | | | | | | |
| 677 | **Suggested UCL to Use** | | | | | | | | | | | |
| 678 | | | | | 95% KM (t) UCL | 0.0939 | | | | 95% GROS Approximate Gamma UCL | | 0.0636 |
| 679 | | | | | 95% Approximate Gamma KM-UCL | 0.095 | | | | | | |
| 680 | | | | | | | | | | | | |
| 681 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 682 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 683 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 684 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 685 | | | | | | | | | | | | |
| 686 | **Pyrene** | | | | | | | | | | | |
| 687 | | | | | | | | | | | | |
| 688 | **General Statistics** | | | | | | | | | | | |
| 689 | | | | | Total Number of Observations | 143 | | | | Number of Distinct Observations | | 10 |
| 690 | | | | | Number of Detects | 11 | | | | Number of Non-Detects | | 132 |
| 691 | | | | | Number of Distinct Detects | 9 | | | | Number of Distinct Non-Detects | | 1 |
| 692 | | | | | Minimum Detect | 0.053 | | | | Minimum Non-Detect | | 0.05 |
| 693 | | | | | Maximum Detect | 0.205 | | | | Maximum Non-Detect | | 0.05 |
| 694 | | | | | Variance Detects | 0.0027 | | | | Percent Non-Detects | | 92.31% |
| 695 | | | | | Mean Detects | 0.0944 | | | | SD Detects | | 0.0519 |
| 696 | | | | | Median Detects | 0.073 | | | | CV Detects | | 0.55 |
| 697 | | | | | Skewness Detects | 1.257 | | | | Kurtosis Detects | | 0.472 |
| 698 | | | | | Mean of Logged Detects | -2.478 | | | | SD of Logged Detects | | 0.488 |
| 699 | | | | | | | | | | | | |
| 700 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |

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| 701 | | | | | Shapiro Wilk Test Statistic | 0.798 | **Shapiro Wilk GOF Test** | | | | | |
| 702 | | | | | 5% Shapiro Wilk Critical Value | 0.85 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 703 | | | | | Lilliefors Test Statistic | 0.23 | **Lilliefors GOF Test** | | | | | |
| 704 | | | | | 5% Lilliefors Critical Value | 0.267 | Detected Data appear Normal at 5% Significance Level | | | | | |
| 705 | **Detected Data appear Approximate Normal at 5% Significance Level** | | | | | | | | | | | |
| 706 | | | | | | | | | | | | |
| 707 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 708 | | | | | Mean | 0.0534 | | | Standard Error of Mean | | | 0.00159 |
| 709 | | | | | SD | 0.0181 | | | 95% KM (BCA) UCL | | | 0.0564 |
| 710 | | | | | 95% KM (t) UCL | 0.056 | | | 95% KM (Percentile Bootstrap) UCL | | | 0.0561 |
| 711 | | | | | 95% KM (z) UCL | 0.056 | | | 95% KM Bootstrap t UCL | | | 0.0575 |
| 712 | | | | | 90% KM Chebyshev UCL | 0.0582 | | | 95% KM Chebyshev UCL | | | 0.0603 |
| 713 | | | | | 97.5% KM Chebyshev UCL | 0.0633 | | | 99% KM Chebyshev UCL | | | 0.0692 |
| 714 | | | | | | | | | | | | |
| 715 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 716 | | | | | A-D Test Statistic | 0.811 | **Anderson-Darling GOF Test** | | | | | |
| 717 | | | | | 5% A-D Critical Value | 0.732 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 718 | | | | | K-S Test Statistic | 0.228 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 719 | | | | | 5% K-S Critical Value | 0.256 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 720 | **Detected data follow Appr. Gamma Distribution at 5% Significance Level** | | | | | | | | | | | |
| 721 | | | | | | | | | | | | |
| 722 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 723 | | | | | k hat (MLE) | 4.418 | | | k star (bias corrected MLE) | | | 3.274 |
| 724 | | | | | Theta hat (MLE) | 0.0214 | | | Theta star (bias corrected MLE) | | | 0.0288 |
| 725 | | | | | nu hat (MLE) | 97.2 | | | nu star (bias corrected) | | | 72.03 |
| 726 | | | | | MLE Mean (bias corrected) | 0.0944 | | | MLE Sd (bias corrected) | | | 0.0522 |
| 727 | | | | | | | | | | | | |
| 728 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 729 | | | | | k hat (KM) | 8.692 | | | nu hat (KM) | | | 2486 |
| 730 | | | | | Approximate Chi Square Value (N/A, α) | 2371 | | | Adjusted Chi Square Value (N/A, β) | | | 2370 |
| 731 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.056 | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | | 0.056 |
| 732 | | | | | | | | | | | | |
| 733 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 734 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 735 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 736 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 737 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 738 | | | | | Minimum | 0.01 | | | Mean | | | 0.0167 |
| 739 | | | | | Maximum | 0.205 | | | Median | | | 0.01 |
| 740 | | | | | SD | 0.0264 | | | CV | | | 1.584 |
| 741 | | | | | k hat (MLE) | 1.639 | | | k star (bias corrected MLE) | | | 1.609 |
| 742 | | | | | Theta hat (MLE) | 0.0102 | | | Theta star (bias corrected MLE) | | | 0.0104 |
| 743 | | | | | nu hat (MLE) | 468.7 | | | nu star (bias corrected) | | | 460.2 |
| 744 | | | | | MLE Mean (bias corrected) | 0.0167 | | | MLE Sd (bias corrected) | | | 0.0132 |
| 745 | | | | | | | | | Adjusted Level of Significance (β) | | | 0.0483 |
| 746 | | | | | Approximate Chi Square Value (460.19, α) | 411.5 | | | Adjusted Chi Square Value (460.19, β) | | | 411 |
| 747 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.0187 | | | 95% Gamma Adjusted UCL (use when n<50) | | | 0.0187 |
| 748 | | | | | | | | | | | | |
| 749 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 750 | | | | | Shapiro Wilk Test Statistic | 0.853 | **Shapiro Wilk GOF Test** | | | | | |

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| 751 | | | | | 5% Shapiro Wilk Critical Value | 0.85 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 752 | | | | | Lilliefors Test Statistic | 0.219 | **Lilliefors GOF Test** | | | | | |
| 753 | | | | | 5% Lilliefors Critical Value | 0.267 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 754 | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 755 | | | | | | | | | | | | |
| 756 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 757 | | | | | Mean in Original Scale | 0.0148 | | | | Mean in Log Scale | | -5.237 |
| 758 | | | | | SD in Original Scale | 0.0283 | | | | SD in Log Scale | | 1.468 |
| 759 | | | | | 95% t UCL (assumes normality of ROS data) | 0.0188 | | | | 95% Percentile Bootstrap UCL | | 0.019 |
| 760 | | | | | 95% BCA Bootstrap UCL | 0.0199 | | | | 95% Bootstrap t UCL | | 0.0201 |
| 761 | | | | | 95% H-UCL (Log ROS) | 0.0217 | | | | | | |
| 762 | | | | | | | | | | | | |
| 763 | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | | | | | |
| 764 | | | | | KM Mean (logged) | -2.956 | | | | 95% H-UCL (KM -Log) | | 0.0544 |
| 765 | | | | | KM SD (logged) | 0.189 | | | | 95% Critical H Value (KM-Log) | | 1.692 |
| 766 | | | | | KM Standard Error of Mean (logged) | 0.0166 | | | | | | |
| 767 | | | | | | | | | | | | |
| 768 | **DL/2 Statistics** | | | | | | | | | | | |
| 769 | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | | | | | |
| 770 | | | | | Mean in Original Scale | 0.0303 | | | | Mean in Log Scale | | -3.596 |
| 771 | | | | | SD in Original Scale | 0.0231 | | | | SD in Log Scale | | 0.349 |
| 772 | | | | | 95% t UCL (Assumes normality) | 0.0335 | | | | 95% H-Stat UCL | | 0.0307 |
| 773 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 774 | | | | | | | | | | | | |
| 775 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 776 | **Detected Data appear Approximate Normal Distributed at 5% Significance Level** | | | | | | | | | | | |
| 777 | | | | | | | | | | | | |
| 778 | **Suggested UCL to Use** | | | | | | | | | | | |
| 779 | | | | | 95% KM (t) UCL | 0.056 | | | | 95% KM (Percentile Bootstrap) UCL | | 0.0561 |
| 780 | | | | | | | | | | | | |
| 781 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 782 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 783 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 784 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 785 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General Statistics on Uncensored Full Data | | | | | | | | |
| 2 | | Date/Time of Computation | | 9/24/2015 1:22:31 PM | | | | | | | | |
| 3 | | User Selected Options | | | | | | | | | | |
| 4 | | | From File | PW_EB_Current_MW_Metals_Input.xls | | | | | | | | |
| 5 | | | Full Precision | OFF | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | From File: PW_EB_Current_MW_Metals_Input.xls | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 9 | General Statistics for Uncensored Data Sets | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 11 | Variable | NumObs | # Missing | Minimum | Maximum | Mean | SD | SEM | MAD/0.675 | Skewness | Kurtosis | |
| 12 | LnROS_Aluminum | 134 | 0 | 0.803 | 50 | 11.48 | 10.16 | 0.878 | 7.604 | 1.403 | 2.018 | |
| 13 | LnROS_Antimony | 134 | 0 | 0.019 | 1.58 | 0.185 | 0.198 | 0.0171 | 0.0848 | 3.747 | 19.59 | |
| 14 | LnROS_Arsenic | 134 | 0 | 0.158 | 13.3 | 1.69 | 1.606 | 0.139 | 1.129 | 3.403 | 20.18 | |
| 15 | LnROS_Barium | 134 | 0 | 2.85 | 978 | 163.8 | 182.9 | 15.8 | 124.5 | 2.228 | 6.099 | |
| 16 | LnROS_Beryllium | 134 | 0 | 0.00101 | 0.113 | 0.01 | 0.0118 | 0.00102 | 0.00566 | 5.574 | 44.47 | |
| 17 | LnROS_Bismuth | 134 | 0 | 1.000E-10 | 0.72 | 0.00537 | 0.0622 | 0.00537 | 0 | 11.58 | 134 | |
| 18 | LnROS_Boron | 134 | 0 | 40.9 | 3490 | 775.7 | 731.5 | 63.19 | 495.2 | 1.601 | 2.485 | |
| 19 | LnROS_Cadmium | 134 | 0 | 4.8036E-4 | 1.55 | 0.0885 | 0.177 | 0.0153 | 0.028 | 5.072 | 35.69 | |
| 20 | LnROS_Calcium | 134 | 0 | 2280 | 511000 | 174653 | 138194 | 11938 | 106746 | 0.971 | -0.195 | |
| 21 | LnROS_Chromium | 134 | 0 | 0.00148 | 1.41 | 0.0965 | 0.178 | 0.0154 | 0.0435 | 4.764 | 28.34 | |
| 22 | LnROS_Cobalt | 134 | 0 | 0.00202 | 59.2 | 4.441 | 9.054 | 0.782 | 0.447 | 3.423 | 14.23 | |
| 23 | LnROS_Copper | 134 | 0 | 0.0256 | 7.22 | 0.915 | 1.293 | 0.112 | 0.435 | 2.768 | 8.393 | |
| 24 | LnROS_Iron | 134 | 0 | 1.559 | 46400 | 4986 | 8191 | 707.6 | 1123 | 2.458 | 6.965 | |
| 25 | LnROS_Lead | 134 | 0 | 3.2276E-7 | 3.38 | 0.0443 | 0.305 | 0.0263 | 7.3948E-4 | 10.22 | 110.3 | |
| 26 | LnROS_Lithium | 134 | 0 | 1.44 | 127 | 23.08 | 22.05 | 1.905 | 14.31 | 1.714 | 3.561 | |
| 27 | LnROS_Magnesium | 134 | 0 | 3490 | 894000 | 236446 | 236194 | 20404 | 144403 | 1.193 | 0.319 | |
| 28 | LnROS_Manganese | 134 | 0 | 0.91 | 21000 | 3924 | 3789 | 327.3 | 2891 | 1.553 | 2.954 | |
| 29 | LnROS_Molybdenum | 134 | 0 | 0.00815 | 10.3 | 1.065 | 1.895 | 0.164 | 0.426 | 3.005 | 9.474 | |
| 30 | LnROS_Nickel | 134 | 0 | 0.0865 | 28 | 3.96 | 5.31 | 0.459 | 1.594 | 2.48 | 6.866 | |
| 31 | LnROS_Selenium | 134 | 0 | 0.0817 | 0.773 | 0.282 | 0.139 | 0.012 | 0.121 | 1.13 | 1.226 | |
| 32 | LnROS_Silver | 134 | 0 | 7.1793E-5 | 0.021 | 0.00203 | 0.00285 | 2.4646E-4 | 0.00107 | 3.701 | 18.32 | |
| 33 | LnROS_Sodium | 134 | 0 | 29500 | 7380000 | 1845940 | 1875691 | 162035 | 1180875 | 1.233 | 0.539 | |
| 34 | LnROS_Thallium | 134 | 0 | 9.5437E-6 | 0.355 | 0.0189 | 0.0475 | 0.0041 | 0.0026 | 4.487 | 24.99 | |
| 35 | LnROS_Titanium | 134 | 0 | 0.097 | 3.631 | 0.793 | 0.634 | 0.0548 | 0.467 | 1.668 | 3.25 | |
| 36 | LnROS_Uranium | 134 | 0 | 0.0051 | 9.78 | 1.027 | 1.842 | 0.159 | 0.324 | 3.153 | 10.44 | |
| 37 | LnROS_Vanadium | 134 | 0 | 0.066 | 5.75 | 1.579 | 1.471 | 0.127 | 1.035 | 0.875 | -0.481 | |
| 38 | LnROS_Zinc | 134 | 0 | 0.243 | 886 | 26.62 | 86.96 | 7.512 | 7.394 | 7.983 | 74.1 | |
| 39 | | | | | | | | | | | | |
| 40 | Percentiles for Uncensored Data Sets | | | | | | | | | | | |
| 41 | | | | | | | | | | | | |
| 42 | Variable | NumObs | # Missing | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | |
| 43 | LnROS_Aluminum | 134 | 0 | 2.082 | 3.258 | 3.6 | 7.65 | 16.63 | 19.24 | 25.04 | 28.56 | |
| 44 | LnROS_Antimony | 134 | 0 | 0.0481 | 0.0716 | 0.0795 | 0.132 | 0.201 | 0.221 | 0.346 | 0.564 | |
| 45 | LnROS_Arsenic | 134 | 0 | 0.292 | 0.537 | 0.672 | 1.273 | 2.218 | 2.52 | 3.57 | 3.87 | |
| 46 | LnROS_Barium | 134 | 0 | 13.9 | 24.18 | 35.68 | 115 | 208.5 | 271.8 | 352.5 | 518.8 | |
| 47 | LnROS_Beryllium | 134 | 0 | 0.00243 | 0.0034 | 0.00395 | 0.00708 | 0.0125 | 0.0142 | 0.0189 | 0.0246 | |
| 48 | LnROS_Bismuth | 134 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | |
| 49 | LnROS_Boron | 134 | 0 | 132 | 213.4 | 251 | 525 | 1118 | 1242 | 1734 | 2304 | |
| 50 | LnROS_Cadmium | 134 | 0 | 0.00253 | 0.00515 | 0.00675 | 0.0212 | 0.0944 | 0.123 | 0.255 | 0.349 | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | LnROS_Calcium | | 134 | 0 | 43540 | 59500 | 63800 | 126000 | 269500 | 309000 | 399700 | 472750 |
| 52 | LnROS_Chromium | | 134 | 0 | 0.00722 | 0.0127 | 0.016 | 0.0392 | 0.0995 | 0.124 | 0.221 | 0.355 |
| 53 | LnROS_Cobalt | | 134 | 0 | 0.0556 | 0.0824 | 0.106 | 0.34 | 4.47 | 7.294 | 13.3 | 18.17 |
| 54 | LnROS_Copper | | 134 | 0 | 0.0863 | 0.149 | 0.176 | 0.404 | 1.105 | 1.252 | 2.262 | 3.544 |
| 55 | LnROS_Iron | | 134 | 0 | 14.15 | 45.8 | 73.25 | 767.5 | 7805 | 9520 | 14040 | 21340 |
| 56 | LnROS_Lead | | 134 | 0 | 9.3562E-6 | 3.2957E-5 | 5.6960E-5 | 5.0451E-4 | 0.00419 | 0.00727 | 0.026 | 0.0872 |
| 57 | LnROS_Lithium | | 134 | 0 | 3.256 | 6.382 | 7.394 | 14.94 | 30 | 37 | 58 | 67.7 |
| 58 | LnROS_Magnesium | | 134 | 0 | 29690 | 45160 | 60025 | 134500 | 367750 | 432000 | 642700 | 755750 |
| 59 | LnROS_Manganese | | 134 | 0 | 33.45 | 670 | 1123 | 3165 | 4950 | 5576 | 10300 | 11775 |
| 60 | LnROS_Molybdenum | | 134 | 0 | 0.0493 | 0.075 | 0.102 | 0.339 | 0.917 | 1.277 | 2.635 | 5.09 |
| 61 | LnROS_Nickel | | 134 | 0 | 0.486 | 0.706 | 0.788 | 1.575 | 4.983 | 5.872 | 11.1 | 14.27 |
| 62 | LnROS_Selenium | | 134 | 0 | 0.135 | 0.166 | 0.179 | 0.247 | 0.354 | 0.383 | 0.47 | 0.557 |
| 63 | LnROS_Silver | | 134 | 0 | 2.4647E-4 | 3.9553E-4 | 4.7763E-4 | 0.00106 | 0.00232 | 0.0028 | 0.00502 | 0.00685 |
| 64 | LnROS_Sodium | | 134 | 0 | 199000 | 342600 | 431000 | 1035000 | 2765000 | 3548000 | 4637000 | 6070000 |
| 65 | LnROS_Thallium | | 134 | 0 | 1.0099E-4 | 2.7232E-4 | 4.0146E-4 | 0.00188 | 0.00843 | 0.016 | 0.0622 | 0.101 |
| 66 | LnROS_Titanium | | 134 | 0 | 0.217 | 0.295 | 0.338 | 0.609 | 0.994 | 1.138 | 1.732 | 2.188 |
| 67 | LnROS_Uranium | | 134 | 0 | 0.0382 | 0.0657 | 0.0818 | 0.246 | 1.158 | 1.474 | 2.388 | 4.921 |
| 68 | LnROS_Vanadium | | 134 | 0 | 0.194 | 0.321 | 0.362 | 0.91 | 2.748 | 3.192 | 3.754 | 4.485 |
| 69 | LnROS_Zinc | | 134 | 0 | 1.308 | 2.36 | 3.2 | 6.6 | 16.8 | 21.44 | 45.95 | 79.12 |

| | M |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | **CV** |
| 12 | 0.886 |
| 13 | 1.073 |
| 14 | 0.95 |
| 15 | 1.117 |
| 16 | 1.175 |
| 17 | 11.58 |
| 18 | 0.943 |
| 19 | 1.999 |
| 20 | 0.791 |
| 21 | 1.843 |
| 22 | 2.039 |
| 23 | 1.413 |
| 24 | 1.643 |
| 25 | 6.889 |
| 26 | 0.955 |
| 27 | 0.999 |
| 28 | 0.966 |
| 29 | 1.779 |
| 30 | 1.341 |
| 31 | 0.493 |
| 32 | 1.406 |
| 33 | 1.016 |
| 34 | 2.51 |
| 35 | 0.8 |
| 36 | 1.792 |
| 37 | 0.932 |
| 38 | 3.267 |
| 39 | |
| 40 | |
| 41 | |
| 42 | **99%ile** |
| 43 | 46.17 |
| 44 | 0.827 |
| 45 | 6.405 |
| 46 | 920.9 |
| 47 | 0.0447 |
| 48 | 1.000E-10 |
| 49 | 3315 |
| 50 | 0.627 |

| | M |
|---|---|
| 51 | 507030 |
| 52 | 0.931 |
| 53 | 43.33 |
| 54 | 6.147 |
| 55 | 34567 |
| 56 | 0.782 |
| 57 | 88.04 |
| 58 | 853100 |
| 59 | 14707 |
| 60 | 9.167 |
| 61 | 26.41 |
| 62 | 0.717 |
| 63 | 0.0143 |
| 64 | 6943400 |
| 65 | 0.236 |
| 66 | 2.754 |
| 67 | 9.054 |
| 68 | 4.937 |
| 69 | 316.1 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **UCL Statistics for Data Sets with Non-Detects** | | | | | | | | | | | |
| 2 | | | | | | | | | | | | |
| 3 | User Selected Options | | | | | | | | | | | |
| 4 | Date/Time of Computation | | | 9/24/2015 1:22:44 PM | | | | | | | | |
| 5 | From File | | | PW_EB_Current_MW_Metals_Input.xls | | | | | | | | |
| 6 | Full Precision | | | OFF | | | | | | | | |
| 7 | Confidence Coefficient | | | 95% | | | | | | | | |
| 8 | Number of Bootstrap Operations | | | 2000 | | | | | | | | |
| 9 | | | | | | | | | | | | |
| 10 | **Aluminum** | | | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| 12 | **General Statistics** | | | | | | | | | | | |
| 13 | Total Number of Observations | | | | | 134 | Number of Distinct Observations | | | | | 80 |
| 14 | Number of Detects | | | | | 99 | Number of Non-Detects | | | | | 35 |
| 15 | Number of Distinct Detects | | | | | 78 | Number of Distinct Non-Detects | | | | | 4 |
| 16 | Minimum Detect | | | | | 1.5 | Minimum Non-Detect | | | | | 1 |
| 17 | Maximum Detect | | | | | 50 | Maximum Non-Detect | | | | | 6 |
| 18 | Variance Detects | | | | | 103.4 | Percent Non-Detects | | | | | 26.12% |
| 19 | Mean Detects | | | | | 14.54 | SD Detects | | | | | 10.17 |
| 20 | Median Detects | | | | | 12.3 | CV Detects | | | | | 0.699 |
| 21 | Skewness Detects | | | | | 1.199 | Kurtosis Detects | | | | | 1.592 |
| 22 | Mean of Logged Detects | | | | | 2.42 | SD of Logged Detects | | | | | 0.762 |
| 23 | | | | | | | | | | | | |
| 24 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 25 | Shapiro Wilk Test Statistic | | | | | 0.891 | **Normal GOF Test on Detected Observations Only** | | | | | |
| 26 | 5% Shapiro Wilk P Value | | | | | 7.434E-10 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 27 | Lilliefors Test Statistic | | | | | 0.138 | **Lilliefors GOF Test** | | | | | |
| 28 | 5% Lilliefors Critical Value | | | | | 0.089 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 29 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 30 | | | | | | | | | | | | |
| 31 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 32 | Mean | | | | | 11.35 | Standard Error of Mean | | | | | 0.893 |
| 33 | SD | | | | | 10.23 | 95% KM (BCA) UCL | | | | | 12.96 |
| 34 | 95% KM (t) UCL | | | | | 12.83 | 95% KM (Percentile Bootstrap) UCL | | | | | 12.85 |
| 35 | 95% KM (z) UCL | | | | | 12.82 | 95% KM Bootstrap t UCL | | | | | 13.06 |
| 36 | 90% KM Chebyshev UCL | | | | | 14.03 | 95% KM Chebyshev UCL | | | | | 15.24 |
| 37 | 97.5% KM Chebyshev UCL | | | | | 16.93 | 99% KM Chebyshev UCL | | | | | 20.23 |
| 38 | | | | | | | | | | | | |
| 39 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 40 | A-D Test Statistic | | | | | 0.539 | **Anderson-Darling GOF Test** | | | | | |
| 41 | 5% A-D Critical Value | | | | | 0.764 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 42 | K-S Test Statistic | | | | | 0.086 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 43 | 5% K-S Critical Value | | | | | 0.0911 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 44 | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 45 | | | | | | | | | | | | |
| 46 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 47 | k hat (MLE) | | | | | 2.097 | k star (bias corrected MLE) | | | | | 2.04 |
| 48 | Theta hat (MLE) | | | | | 6.934 | Theta star (bias corrected MLE) | | | | | 7.127 |
| 49 | nu hat (MLE) | | | | | 415.2 | nu star (bias corrected) | | | | | 403.9 |
| 50 | MLE Mean (bias corrected) | | | | | 14.54 | MLE Sd (bias corrected) | | | | | 10.18 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | | | | | | | | | | | | |
| 52 | | | | | | Gamma Kaplan-Meier (KM) Statistics | | | | | | |
| 53 | | | | | k hat (KM) | 1.231 | | | | | nu hat (KM) | 329.8 |
| 54 | | | | | Approximate Chi Square Value (329.84, α) | 288.8 | | | | | Adjusted Chi Square Value (329.84, β) | 288.3 |
| 55 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 12.97 | | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | 12.99 |
| 56 | | | | | | | | | | | | |
| 57 | | | | | | Gamma ROS Statistics using Imputed Non-Detects | | | | | | |
| 58 | | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | |
| 59 | | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | |
| 60 | | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | |
| 61 | | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | |
| 62 | | | | | Minimum | 0.01 | | | | | Mean | 11.1 |
| 63 | | | | | Maximum | 50 | | | | | Median | 7.65 |
| 64 | | | | | SD | 10.52 | | | | | CV | 0.948 |
| 65 | | | | | k hat (MLE) | 0.593 | | | | | k star (bias corrected MLE) | 0.585 |
| 66 | | | | | Theta hat (MLE) | 18.71 | | | | | Theta star (bias corrected MLE) | 18.98 |
| 67 | | | | | nu hat (MLE) | 158.9 | | | | | nu star (bias corrected) | 156.7 |
| 68 | | | | | MLE Mean (bias corrected) | 11.1 | | | | | MLE Sd (bias corrected) | 14.51 |
| 69 | | | | | | | | | | | Adjusted Level of Significance (β) | 0.0482 |
| 70 | | | | | Approximate Chi Square Value (156.72, α) | 128.8 | | | | | Adjusted Chi Square Value (156.72, β) | 128.5 |
| 71 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 13.5 | | | | | 95% Gamma Adjusted UCL (use when n<50) | 13.53 |
| 72 | | | | | | | | | | | | |
| 73 | | | | | | Lognormal GOF Test on Detected Observations Only | | | | | | |
| 74 | | | | | Lilliefors Test Statistic | 0.0807 | | | | | Lilliefors GOF Test | |
| 75 | | | | | 5% Lilliefors Critical Value | 0.089 | | | | | Detected Data appear Lognormal at 5% Significance Level | |
| 76 | | | | | | Detected Data appear Lognormal at 5% Significance Level | | | | | | |
| 77 | | | | | | | | | | | | |
| 78 | | | | | | Lognormal ROS Statistics Using Imputed Non-Detects | | | | | | |
| 79 | | | | | Mean in Original Scale | 11.48 | | | | | Mean in Log Scale | 2.031 |
| 80 | | | | | SD in Original Scale | 10.16 | | | | | SD in Log Scale | 0.96 |
| 81 | | | | | 95% t UCL (assumes normality of ROS data) | 12.93 | | | | | 95% Percentile Bootstrap UCL | 12.97 |
| 82 | | | | | 95% BCA Bootstrap UCL | 13.25 | | | | | 95% Bootstrap t UCL | 12.94 |
| 83 | | | | | 95% H-UCL (Log ROS) | 14.46 | | | | | | |
| 84 | | | | | | | | | | | | |
| 85 | | | | | | UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed | | | | | | |
| 86 | | | | | KM Mean (logged) | 1.974 | | | | | 95% H-UCL (KM -Log) | 14.94 |
| 87 | | | | | KM SD (logged) | 1.031 | | | | | 95% Critical H Value (KM-Log) | 2.223 |
| 88 | | | | | KM Standard Error of Mean (logged) | 0.0975 | | | | | | |
| 89 | | | | | | | | | | | | |
| 90 | | | | | | DL/2 Statistics | | | | | | |
| 91 | | | | | DL/2 Normal | | | | | | DL/2 Log-Transformed | |
| 92 | | | | | Mean in Original Scale | 11.35 | | | | | Mean in Log Scale | 1.991 |
| 93 | | | | | SD in Original Scale | 10.26 | | | | | SD in Log Scale | 1 |
| 94 | | | | | 95% t UCL (Assumes normality) | 12.82 | | | | | 95% H-Stat UCL | 14.59 |
| 95 | | | | | | DL/2 is not a recommended method, provided for comparisons and historical reasons | | | | | | |
| 96 | | | | | | | | | | | | |
| 97 | | | | | | Nonparametric Distribution Free UCL Statistics | | | | | | |
| 98 | | | | | | Detected Data appear Gamma Distributed at 5% Significance Level | | | | | | |
| 99 | | | | | | | | | | | | |
| 100 | | | | | | Suggested UCL to Use | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 101 | | | | 95% KM (Percentile Bootstrap) UCL | | 12.85 | | | | 95% GROS Approximate Gamma UCL | | 13.5 |
| 102 | | | | 95% Approximate Gamma KM-UCL | | 12.97 | | | | | | |
| 103 | | | | | | | | | | | | |
| 104 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 105 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 106 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 107 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 108 | | | | | | | | | | | | |
| 109 | **Antimony** | | | | | | | | | | | |
| 110 | | | | | | | | | | | | |
| 111 | **General Statistics** | | | | | | | | | | | |
| 112 | | | | Total Number of Observations | | 134 | | | | Number of Distinct Observations | | 61 |
| 113 | | | | Number of Detects | | 66 | | | | Number of Non-Detects | | 68 |
| 114 | | | | Number of Distinct Detects | | 60 | | | | Number of Distinct Non-Detects | | 1 |
| 115 | | | | Minimum Detect | | 0.019 | | | | Minimum Non-Detect | | 0.5 |
| 116 | | | | Maximum Detect | | 1.58 | | | | Maximum Non-Detect | | 0.5 |
| 117 | | | | Variance Detects | | 0.0683 | | | | Percent Non-Detects | | 50.75% |
| 118 | | | | Mean Detects | | 0.227 | | | | SD Detects | | 0.261 |
| 119 | | | | Median Detects | | 0.152 | | | | CV Detects | | 1.152 |
| 120 | | | | Skewness Detects | | 2.933 | | | | Kurtosis Detects | | 10.8 |
| 121 | | | | Mean of Logged Detects | | -1.901 | | | | SD of Logged Detects | | 0.891 |
| 122 | | | | | | | | | | | | |
| 123 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 124 | | | | Shapiro Wilk Test Statistic | | 0.654 | | | | **Normal GOF Test on Detected Observations Only** | | |
| 125 | | | | 5% Shapiro Wilk P Value | | 0 | | | | Detected Data Not Normal at 5% Significance Level | | |
| 126 | | | | Lilliefors Test Statistic | | 0.335 | | | | **Lilliefors GOF Test** | | |
| 127 | | | | 5% Lilliefors Critical Value | | 0.109 | | | | Detected Data Not Normal at 5% Significance Level | | |
| 128 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 129 | | | | | | | | | | | | |
| 130 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 131 | | | | Mean | | 0.179 | | | | Standard Error of Mean | | 0.018 |
| 132 | | | | SD | | 0.194 | | | | 95% KM (BCA) UCL | | 0.213 |
| 133 | | | | 95% KM (t) UCL | | 0.209 | | | | 95% KM (Percentile Bootstrap) UCL | | 0.211 |
| 134 | | | | 95% KM (z) UCL | | 0.208 | | | | 95% KM Bootstrap t UCL | | 0.217 |
| 135 | | | | 90% KM Chebyshev UCL | | 0.233 | | | | 95% KM Chebyshev UCL | | 0.257 |
| 136 | | | | 97.5% KM Chebyshev UCL | | 0.291 | | | | 99% KM Chebyshev UCL | | 0.358 |
| 137 | | | | | | | | | | | | |
| 138 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 139 | | | | A-D Test Statistic | | 2.805 | | | | **Anderson-Darling GOF Test** | | |
| 140 | | | | 5% A-D Critical Value | | 0.772 | | | | Detected Data Not Gamma Distributed at 5% Significance Level | | |
| 141 | | | | K-S Test Statistic | | 0.22 | | | | **Kolmogrov-Smirnoff GOF** | | |
| 142 | | | | 5% K-S Critical Value | | 0.112 | | | | Detected Data Not Gamma Distributed at 5% Significance Level | | |
| 143 | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 144 | | | | | | | | | | | | |
| 145 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 146 | | | | k hat (MLE) | | 1.337 | | | | k star (bias corrected MLE) | | 1.287 |
| 147 | | | | Theta hat (MLE) | | 0.17 | | | | Theta star (bias corrected MLE) | | 0.176 |
| 148 | | | | nu hat (MLE) | | 176.5 | | | | nu star (bias corrected) | | 169.8 |
| 149 | | | | MLE Mean (bias corrected) | | 0.227 | | | | MLE Sd (bias corrected) | | 0.2 |
| 150 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 151 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 152 | | | | | k hat (KM) | 0.85 | | | | | nu hat (KM) | 227.9 |
| 153 | | | | | Approximate Chi Square Value (227.86, α) | 193.9 | | | | | Adjusted Chi Square Value (227.86, β) | 193.6 |
| 154 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.21 | | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | 0.211 |
| 155 | | | | | | | | | | | | |
| 156 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 157 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 158 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 159 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 160 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 161 | | | | | Minimum | 0.01 | | | | | Mean | 0.187 |
| 162 | | | | | Maximum | 1.58 | | | | | Median | 0.133 |
| 163 | | | | | SD | 0.209 | | | | | CV | 1.115 |
| 164 | | | | | k hat (MLE) | 1.084 | | | | | k star (bias corrected MLE) | 1.065 |
| 165 | | | | | Theta hat (MLE) | 0.173 | | | | | Theta star (bias corrected MLE) | 0.176 |
| 166 | | | | | nu hat (MLE) | 290.6 | | | | | nu star (bias corrected) | 285.4 |
| 167 | | | | | MLE Mean (bias corrected) | 0.187 | | | | | MLE Sd (bias corrected) | 0.182 |
| 168 | | | | | | | | | | | Adjusted Level of Significance (β) | 0.0482 |
| 169 | | | | | Approximate Chi Square Value (285.45, α) | 247.3 | | | | | Adjusted Chi Square Value (285.45, β) | 246.9 |
| 170 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.216 | | | | | 95% Gamma Adjusted UCL (use when n<50) | 0.217 |
| 171 | | | | | | | | | | | | |
| 172 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 173 | | | | | Lilliefors Test Statistic | 0.154 | **Lilliefors GOF Test** | | | | | |
| 174 | | | | | 5% Lilliefors Critical Value | 0.109 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 175 | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 176 | | | | | | | | | | | | |
| 177 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 178 | | | | | Mean in Original Scale | 0.185 | | | | | Mean in Log Scale | -2.028 |
| 179 | | | | | SD in Original Scale | 0.198 | | | | | SD in Log Scale | 0.802 |
| 180 | | | | | 95% t UCL (assumes normality of ROS data) | 0.213 | | | | | 95% Percentile Bootstrap UCL | 0.214 |
| 181 | | | | | 95% BCA Bootstrap UCL | 0.221 | | | | | 95% Bootstrap t UCL | 0.223 |
| 182 | | | | | 95% H-UCL (Log ROS) | 0.209 | | | | | | |
| 183 | | | | | | | | | | | | |
| 184 | **DL/2 Statistics** | | | | | | | | | | | |
| 185 | | | | | **DL/2 Normal** | | **DL/2 Log-Transformed** | | | | | |
| 186 | | | | | Mean in Original Scale | 0.239 | | | | | Mean in Log Scale | -1.64 |
| 187 | | | | | SD in Original Scale | 0.183 | | | | | SD in Log Scale | 0.675 |
| 188 | | | | | 95% t UCL (Assumes normality) | 0.265 | | | | | 95% H-Stat UCL | 0.273 |
| 189 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 190 | | | | | | | | | | | | |
| 191 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 192 | **Data do not follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 193 | | | | | | | | | | | | |
| 194 | **Suggested UCL to Use** | | | | | | | | | | | |
| 195 | | | | | 95% KM (t) UCL | 0.209 | | | | | 95% KM (% Bootstrap) UCL | 0.211 |
| 196 | | | | | | | | | | | | |
| 197 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 198 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 199 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 200 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 201 | | | | | | | | | | | | |
| 202 | Arsenic | | | | | | | | | | | |
| 203 | | | | | | | | | | | | |
| 204 | General Statistics | | | | | | | | | | | |
| 205 | | | | | Total Number of Observations | 134 | | | Number of Distinct Observations | | | 79 |
| 206 | | | | | Number of Detects | 81 | | | Number of Non-Detects | | | 53 |
| 207 | | | | | Number of Distinct Detects | 74 | | | Number of Distinct Non-Detects | | | 7 |
| 208 | | | | | Minimum Detect | 0.16 | | | Minimum Non-Detect | | | 2 |
| 209 | | | | | Maximum Detect | 13.3 | | | Maximum Non-Detect | | | 9 |
| 210 | | | | | Variance Detects | 3.48 | | | Percent Non-Detects | | | 39.55% |
| 211 | | | | | Mean Detects | 2.195 | | | SD Detects | | | 1.865 |
| 212 | | | | | Median Detects | 2.01 | | | CV Detects | | | 0.85 |
| 213 | | | | | Skewness Detects | 2.887 | | | Kurtosis Detects | | | 14.91 |
| 214 | | | | | Mean of Logged Detects | 0.415 | | | SD of Logged Detects | | | 0.98 |
| 215 | | | | | | | | | | | | |
| 216 | Normal GOF Test on Detects Only | | | | | | | | | | | |
| 217 | | | | | Shapiro Wilk Test Statistic | 0.797 | | | Normal GOF Test on Detected Observations Only | | | |
| 218 | | | | | 5% Shapiro Wilk P Value | 6.661E-16 | | | Detected Data Not Normal at 5% Significance Level | | | |
| 219 | | | | | Lilliefors Test Statistic | 0.138 | | | Lilliefors GOF Test | | | |
| 220 | | | | | 5% Lilliefors Critical Value | 0.0984 | | | Detected Data Not Normal at 5% Significance Level | | | |
| 221 | Detected Data Not Normal at 5% Significance Level | | | | | | | | | | | |
| 222 | | | | | | | | | | | | |
| 223 | Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs | | | | | | | | | | | |
| 224 | | | | | Mean | 1.766 | | | Standard Error of Mean | | | 0.151 |
| 225 | | | | | SD | 1.616 | | | 95% KM (BCA) UCL | | | 2.02 |
| 226 | | | | | 95% KM (t) UCL | 2.015 | | | 95% KM (Percentile Bootstrap) UCL | | | 2.032 |
| 227 | | | | | 95% KM (z) UCL | 2.014 | | | 95% KM Bootstrap t UCL | | | 2.062 |
| 228 | | | | | 90% KM Chebyshev UCL | 2.218 | | | 95% KM Chebyshev UCL | | | 2.422 |
| 229 | | | | | 97.5% KM Chebyshev UCL | 2.706 | | | 99% KM Chebyshev UCL | | | 3.264 |
| 230 | | | | | | | | | | | | |
| 231 | Gamma GOF Tests on Detected Observations Only | | | | | | | | | | | |
| 232 | | | | | A-D Test Statistic | 1.05 | | | Anderson-Darling GOF Test | | | |
| 233 | | | | | 5% A-D Critical Value | 0.771 | | | Detected Data Not Gamma Distributed at 5% Significance Level | | | |
| 234 | | | | | K-S Test Statistic | 0.0829 | | | Kolmogrov-Smirnoff GOF | | | |
| 235 | | | | | 5% K-S Critical Value | 0.101 | | | Detected data appear Gamma Distributed at 5% Significance Level | | | |
| 236 | Detected data follow Appr. Gamma Distribution at 5% Significance Level | | | | | | | | | | | |
| 237 | | | | | | | | | | | | |
| 238 | Gamma Statistics on Detected Data Only | | | | | | | | | | | |
| 239 | | | | | k hat (MLE) | 1.493 | | | k star (bias corrected MLE) | | | 1.446 |
| 240 | | | | | Theta hat (MLE) | 1.47 | | | Theta star (bias corrected MLE) | | | 1.518 |
| 241 | | | | | nu hat (MLE) | 241.9 | | | nu star (bias corrected) | | | 234.3 |
| 242 | | | | | MLE Mean (bias corrected) | 2.195 | | | MLE Sd (bias corrected) | | | 1.825 |
| 243 | | | | | | | | | | | | |
| 244 | Gamma Kaplan-Meier (KM) Statistics | | | | | | | | | | | |
| 245 | | | | | k hat (KM) | 1.194 | | | nu hat (KM) | | | 319.9 |
| 246 | | | | | Approximate Chi Square Value (319.93, α) | 279.5 | | | Adjusted Chi Square Value (319.93, β) | | | 279.1 |
| 247 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 2.022 | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | | 2.025 |
| 248 | | | | | | | | | | | | |
| 249 | Gamma ROS Statistics using Imputed Non-Detects | | | | | | | | | | | |
| 250 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 251 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 252 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 253 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 254 | | | | | Minimum | 0.01 | | | | Mean | | 1.706 |
| 255 | | | | | Maximum | 13.3 | | | | Median | | 1.38 |
| 256 | | | | | SD | 1.618 | | | | CV | | 0.949 |
| 257 | | | | | k hat (MLE) | 1.195 | | | | k star (bias corrected MLE) | | 1.173 |
| 258 | | | | | Theta hat (MLE) | 1.428 | | | | Theta star (bias corrected MLE) | | 1.454 |
| 259 | | | | | nu hat (MLE) | 320.2 | | | | nu star (bias corrected) | | 314.4 |
| 260 | | | | | MLE Mean (bias corrected) | 1.706 | | | | MLE Sd (bias corrected) | | 1.575 |
| 261 | | | | | | | | | | Adjusted Level of Significance (β) | | 0.0482 |
| 262 | | | | | Approximate Chi Square Value (314.36, α) | 274.3 | | | | Adjusted Chi Square Value (314.36, β) | | 273.9 |
| 263 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 1.955 | | | | 95% Gamma Adjusted UCL (use when n<50) | | 1.958 |
| 264 | | | | | | | | | | | | |
| 265 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 266 | | | | | Lilliefors Test Statistic | 0.138 | **Lilliefors GOF Test** | | | | | |
| 267 | | | | | 5% Lilliefors Critical Value | 0.0984 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 268 | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 269 | | | | | | | | | | | | |
| 270 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 271 | | | | | Mean in Original Scale | 1.69 | | | | Mean in Log Scale | | 0.156 |
| 272 | | | | | SD in Original Scale | 1.606 | | | | SD in Log Scale | | 0.906 |
| 273 | | | | | 95% t UCL (assumes normality of ROS data) | 1.92 | | | | 95% Percentile Bootstrap UCL | | 1.928 |
| 274 | | | | | 95% BCA Bootstrap UCL | 1.959 | | | | 95% Bootstrap t UCL | | 1.986 |
| 275 | | | | | 95% H-UCL (Log ROS) | 2.08 | | | | | | |
| 276 | | | | | | | | | | | | |
| 277 | **DL/2 Statistics** | | | | | | | | | | | |
| 278 | | | | **DL/2 Normal** | | | **DL/2 Log-Transformed** | | | | | |
| 279 | | | | | Mean in Original Scale | 1.901 | | | | Mean in Log Scale | | 0.351 |
| 280 | | | | | SD in Original Scale | 1.595 | | | | SD in Log Scale | | 0.813 |
| 281 | | | | | 95% t UCL (Assumes normality) | 2.13 | | | | 95% H-Stat UCL | | 2.283 |
| 282 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 283 | | | | | | | | | | | | |
| 284 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 285 | **Detected Data appear Approximate Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 286 | | | | | | | | | | | | |
| 287 | **Suggested UCL to Use** | | | | | | | | | | | |
| 288 | | | | | 95% KM (Percentile Bootstrap) UCL | 2.032 | | | | 95% GROS Approximate Gamma UCL | | 1.955 |
| 289 | | | | | 95% Approximate Gamma KM-UCL | 2.022 | | | | | | |
| 290 | | | | | | | | | | | | |
| 291 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 292 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 293 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 294 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 295 | | | | | | | | | | | | |
| 296 | | | | | | | | | | | | |
| 297 | **Barium** | | | | | | | | | | | |
| 298 | | | | | | | | | | | | |
| 299 | **General Statistics** | | | | | | | | | | | |
| 300 | | | | | Total Number of Observations | 134 | | | | Number of Distinct Observations | | 126 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 301 | | | | | | | | | | | Number of Missing Observations | 0 |
| 302 | | | | | Minimum | 2.85 | | | | | Mean | 163.8 |
| 303 | | | | | Maximum | 978 | | | | | Median | 115 |
| 304 | | | | | SD | 182.9 | | | | | Std. Error of Mean | 15.8 |
| 305 | | | | | Coefficient of Variation | 1.117 | | | | | Skewness | 2.228 |
| 306 | | | | | | | | | | | | |
| 307 | | | | | **Normal GOF Test** | | | | | | | |
| 308 | | | | | Shapiro Wilk Test Statistic | 0.764 | **Shapiro Wilk GOF Test** | | | | | |
| 309 | | | | | 5% Shapiro Wilk P Value | 0 | Data Not Normal at 5% Significance Level | | | | | |
| 310 | | | | | Lilliefors Test Statistic | 0.189 | **Lilliefors GOF Test** | | | | | |
| 311 | | | | | 5% Lilliefors Critical Value | 0.0765 | Data Not Normal at 5% Significance Level | | | | | |
| 312 | | | | | **Data Not Normal at 5% Significance Level** | | | | | | | |
| 313 | | | | | | | | | | | | |
| 314 | | | | | **Assuming Normal Distribution** | | | | | | | |
| 315 | | | | | **95% Normal UCL** | | **95% UCLs (Adjusted for Skewness)** | | | | | |
| 316 | | | | | 95% Student's-t UCL | 190 | | | | | 95% Adjusted-CLT UCL (Chen-1995) | 193 |
| 317 | | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | 190.5 |
| 318 | | | | | | | | | | | | |
| 319 | | | | | **Gamma GOF Test** | | | | | | | |
| 320 | | | | | A-D Test Statistic | 0.535 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 321 | | | | | 5% A-D Critical Value | 0.788 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 322 | | | | | K-S Test Statistic | 0.0567 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 323 | | | | | 5% K-S Critical Value | 0.0834 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 324 | | | | | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | |
| 325 | | | | | | | | | | | | |
| 326 | | | | | **Gamma Statistics** | | | | | | | |
| 327 | | | | | k hat (MLE) | 0.905 | | | | | k star (bias corrected MLE) | 0.889 |
| 328 | | | | | Theta hat (MLE) | 181.1 | | | | | Theta star (bias corrected MLE) | 184.2 |
| 329 | | | | | nu hat (MLE) | 242.4 | | | | | nu star (bias corrected) | 238.3 |
| 330 | | | | | MLE Mean (bias corrected) | 163.8 | | | | | MLE Sd (bias corrected) | 173.7 |
| 331 | | | | | | | | | | | Approximate Chi Square Value (0.05) | 203.6 |
| 332 | | | | | Adjusted Level of Significance | 0.0482 | | | | | Adjusted Chi Square Value | 203.2 |
| 333 | | | | | | | | | | | | |
| 334 | | | | | **Assuming Gamma Distribution** | | | | | | | |
| 335 | | | | | 95% Approximate Gamma UCL (use when n>=50) | 191.8 | | | | | 95% Adjusted Gamma UCL (use when n<50) | 192.1 |
| 336 | | | | | | | | | | | | |
| 337 | | | | | **Lognormal GOF Test** | | | | | | | |
| 338 | | | | | Shapiro Wilk Test Statistic | 0.953 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 339 | | | | | 5% Shapiro Wilk P Value | 6.0118E-4 | Data Not Lognormal at 5% Significance Level | | | | | |
| 340 | | | | | Lilliefors Test Statistic | 0.112 | **Lilliefors Lognormal GOF Test** | | | | | |
| 341 | | | | | 5% Lilliefors Critical Value | 0.0765 | Data Not Lognormal at 5% Significance Level | | | | | |
| 342 | | | | | **Data Not Lognormal at 5% Significance Level** | | | | | | | |
| 343 | | | | | | | | | | | | |
| 344 | | | | | **Lognormal Statistics** | | | | | | | |
| 345 | | | | | Minimum of Logged Data | 1.047 | | | | | Mean of logged Data | 4.453 |
| 346 | | | | | Maximum of Logged Data | 6.886 | | | | | SD of logged Data | 1.283 |
| 347 | | | | | | | | | | | | |
| 348 | | | | | **Assuming Lognormal Distribution** | | | | | | | |
| 349 | | | | | 95% H-UCL | 257.3 | | | | | 90% Chebyshev (MVUE) UCL | 278 |
| 350 | | | | | 95% Chebyshev (MVUE) UCL | 316.3 | | | | | 97.5% Chebyshev (MVUE) UCL | 369.4 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 351 | | | | | 99% Chebyshev (MVUE) UCL | 473.8 | | | | | | |
| 352 | | | | | | | | | | | | |
| 353 | | | | | Nonparametric Distribution Free UCL Statistics | | | | | | | |
| 354 | | | | | Data appear to follow a Discernible Distribution at 5% Significance Level | | | | | | | |
| 355 | | | | | | | | | | | | |
| 356 | | | | | Nonparametric Distribution Free UCLs | | | | | | | |
| 357 | | | | | 95% CLT UCL | 189.8 | | | | 95% Jackknife UCL | | 190 |
| 358 | | | | | 95% Standard Bootstrap UCL | 189.3 | | | | 95% Bootstrap-t UCL | | 196.3 |
| 359 | | | | | 95% Hall's Bootstrap UCL | 194.5 | | | | 95% Percentile Bootstrap UCL | | 189.3 |
| 360 | | | | | 95% BCA Bootstrap UCL | 190.3 | | | | | | |
| 361 | | | | | 90% Chebyshev(Mean, Sd) UCL | 211.2 | | | | 95% Chebyshev(Mean, Sd) UCL | | 232.7 |
| 362 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 262.5 | | | | 99% Chebyshev(Mean, Sd) UCL | | 321 |
| 363 | | | | | | | | | | | | |
| 364 | | | | | Suggested UCL to Use | | | | | | | |
| 365 | | | | | 95% Approximate Gamma UCL | 191.8 | | | | | | |
| 366 | | | | | | | | | | | | |
| 367 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 368 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | |
| 369 | | | | | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | |
| 370 | | | | | For additional insight the user may want to consult a statistician. | | | | | | | |
| 371 | | | | | | | | | | | | |
| 372 | **Beryllium** | | | | | | | | | | | |
| 373 | | | | | | | | | | | | |
| 374 | | | | | General Statistics | | | | | | | |
| 375 | | | | | Total Number of Observations | 134 | | | | Number of Distinct Observations | | 30 |
| 376 | | | | | Number of Detects | 28 | | | | Number of Non-Detects | | 106 |
| 377 | | | | | Number of Distinct Detects | 27 | | | | Number of Distinct Non-Detects | | 3 |
| 378 | | | | | Minimum Detect | 0.0057 | | | | Minimum Non-Detect | | 0.005 |
| 379 | | | | | Maximum Detect | 0.113 | | | | Maximum Non-Detect | | 0.5 |
| 380 | | | | | Variance Detects | 3.7741E-4 | | | | Percent Non-Detects | | 79.1% |
| 381 | | | | | Mean Detects | 0.0171 | | | | SD Detects | | 0.0194 |
| 382 | | | | | Median Detects | 0.013 | | | | CV Detects | | 1.138 |
| 383 | | | | | Skewness Detects | 4.77 | | | | Kurtosis Detects | | 24.17 |
| 384 | | | | | Mean of Logged Detects | -4.292 | | | | SD of Logged Detects | | 0.553 |
| 385 | | | | | | | | | | | | |
| 386 | | | | | Normal GOF Test on Detects Only | | | | | | | |
| 387 | | | | | Shapiro Wilk Test Statistic | 0.415 | | | | Shapiro Wilk GOF Test | | |
| 388 | | | | | 5% Shapiro Wilk Critical Value | 0.924 | | | | Detected Data Not Normal at 5% Significance Level | | |
| 389 | | | | | Lilliefors Test Statistic | 0.328 | | | | Lilliefors GOF Test | | |
| 390 | | | | | 5% Lilliefors Critical Value | 0.167 | | | | Detected Data Not Normal at 5% Significance Level | | |
| 391 | | | | | Detected Data Not Normal at 5% Significance Level | | | | | | | |
| 392 | | | | | | | | | | | | |
| 393 | | | | | Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs | | | | | | | |
| 394 | | | | | Mean | 0.0111 | | | | Standard Error of Mean | | 0.00194 |
| 395 | | | | | SD | 0.0145 | | | | 95% KM (BCA) UCL | | 0.015 |
| 396 | | | | | 95% KM (t) UCL | 0.0143 | | | | 95% KM (Percentile Bootstrap) UCL | | 0.0147 |
| 397 | | | | | 95% KM (z) UCL | 0.0143 | | | | 95% KM Bootstrap t UCL | | 0.0187 |
| 398 | | | | | 90% KM Chebyshev UCL | 0.0169 | | | | 95% KM Chebyshev UCL | | 0.0196 |
| 399 | | | | | 97.5% KM Chebyshev UCL | 0.0232 | | | | 99% KM Chebyshev UCL | | 0.0304 |
| 400 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 401 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 402 | | | | | A-D Test Statistic | 2.149 | **Anderson-Darling GOF Test** | | | | | |
| 403 | | | | | 5% A-D Critical Value | 0.756 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 404 | | | | | K-S Test Statistic | 0.208 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 405 | | | | | 5% K-S Critical Value | 0.167 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 406 | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 407 | | | | | | | | | | | | |
| 408 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 409 | | | | | k hat (MLE) | 2.416 | k star (bias corrected MLE) | | | | | 2.181 |
| 410 | | | | | Theta hat (MLE) | 0.00706 | Theta star (bias corrected MLE) | | | | | 0.00782 |
| 411 | | | | | nu hat (MLE) | 135.3 | nu star (bias corrected) | | | | | 122.1 |
| 412 | | | | | MLE Mean (bias corrected) | 0.0171 | MLE Sd (bias corrected) | | | | | 0.0116 |
| 413 | | | | | | | | | | | | |
| 414 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 415 | | | | | k hat (KM) | 0.587 | nu hat (KM) | | | | | 157.3 |
| 416 | | | | | Approximate Chi Square Value (157.29, α) | 129.3 | Adjusted Chi Square Value (157.29, β) | | | | | 129 |
| 417 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.0135 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 0.0135 |
| 418 | | | | | | | | | | | | |
| 419 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 420 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 421 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 422 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 423 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 424 | | | | | Minimum | 0.0057 | Mean | | | | | 0.014 |
| 425 | | | | | Maximum | 0.113 | Median | | | | | 0.01 |
| 426 | | | | | SD | 0.0115 | CV | | | | | 0.827 |
| 427 | | | | | k hat (MLE) | 3.891 | k star (bias corrected MLE) | | | | | 3.809 |
| 428 | | | | | Theta hat (MLE) | 0.00359 | Theta star (bias corrected MLE) | | | | | 0.00366 |
| 429 | | | | | nu hat (MLE) | 1043 | nu star (bias corrected) | | | | | 1021 |
| 430 | | | | | MLE Mean (bias corrected) | 0.014 | MLE Sd (bias corrected) | | | | | 0.00715 |
| 431 | | | | | | | Adjusted Level of Significance (β) | | | | | 0.0482 |
| 432 | | | | | Approximate Chi Square Value (N/A, α) | 947.6 | Adjusted Chi Square Value (N/A, β) | | | | | 946.8 |
| 433 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.015 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 0.015 |
| 434 | | | | | | | | | | | | |
| 435 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 436 | | | | | Shapiro Wilk Test Statistic | 0.852 | **Shapiro Wilk GOF Test** | | | | | |
| 437 | | | | | 5% Shapiro Wilk Critical Value | 0.924 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 438 | | | | | Lilliefors Test Statistic | 0.133 | **Lilliefors GOF Test** | | | | | |
| 439 | | | | | 5% Lilliefors Critical Value | 0.167 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 440 | **Detected Data appear Approximate Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 441 | | | | | | | | | | | | |
| 442 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 443 | | | | | Mean in Original Scale | 0.01 | Mean in Log Scale | | | | | -4.964 |
| 444 | | | | | SD in Original Scale | 0.0118 | SD in Log Scale | | | | | 0.828 |
| 445 | | | | | 95% t UCL (assumes normality of ROS data) | 0.0117 | 95% Percentile Bootstrap UCL | | | | | 0.0117 |
| 446 | | | | | 95% BCA Bootstrap UCL | 0.0123 | 95% Bootstrap t UCL | | | | | 0.0126 |
| 447 | | | | | 95% H-UCL (Log ROS) | 0.0114 | | | | | | |
| 448 | | | | | | | | | | | | |
| 449 | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | | | | | |
| 450 | | | | | KM Mean (logged) | -4.771 | 95% H-UCL (KM -Log) | | | | | 0.0113 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 451 | | | | | KM SD (logged) | 0.612 | | | | | 95% Critical H Value (KM-Log) | 1.893 |
| 452 | | | | | KM Standard Error of Mean (logged) | 0.0846 | | | | | | |
| 453 | | | | | | | | | | | | |
| 454 | | | | | DL/2 Statistics | | | | | | | |
| 455 | | | | DL/2 Normal | | | | | | DL/2 Log-Transformed | | |
| 456 | | | | | Mean in Original Scale | 0.146 | | | | | Mean in Log Scale | -2.942 |
| 457 | | | | | SD in Original Scale | 0.12 | | | | | SD in Log Scale | 1.864 |
| 458 | | | | | 95% t UCL (Assumes normality) | 0.163 | | | | | 95% H-Stat UCL | 0.496 |
| 459 | | | | | DL/2 is not a recommended method, provided for comparisons and historical reasons | | | | | | | |
| 460 | | | | | | | | | | | | |
| 461 | | | | | Nonparametric Distribution Free UCL Statistics | | | | | | | |
| 462 | | | | | Detected Data appear Approximate Lognormal Distributed at 5% Significance Level | | | | | | | |
| 463 | | | | | | | | | | | | |
| 464 | | | | | Suggested UCL to Use | | | | | | | |
| 465 | | | | | 95% KM (t) UCL | 0.0143 | | | | | 95% KM (% Bootstrap) UCL | 0.0147 |
| 466 | | | | | | | | | | | | |
| 467 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 468 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 469 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 470 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 471 | | | | | | | | | | | | |
| 472 | Bismuth | | | | | | | | | | | |
| 473 | | | | | | | | | | | | |
| 474 | | | | | General Statistics | | | | | | | |
| 475 | | | | | Total Number of Observations | 134 | | | | | Number of Distinct Observations | 4 |
| 476 | | | | | Number of Detects | 1 | | | | | Number of Non-Detects | 133 |
| 477 | | | | | Number of Distinct Detects | 1 | | | | | Number of Distinct Non-Detects | 3 |
| 478 | | | | | | | | | | | | |
| 479 | | | | | Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! | | | | | | | |
| 480 | | | | | It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV). | | | | | | | |
| 481 | | | | | | | | | | | | |
| 482 | | | | | The data set for variable Bismuth was not processed! | | | | | | | |
| 483 | | | | | | | | | | | | |
| 484 | | | | | | | | | | | | |
| 485 | | | | | | | | | | | | |
| 486 | Boron | | | | | | | | | | | |
| 487 | | | | | | | | | | | | |
| 488 | | | | | General Statistics | | | | | | | |
| 489 | | | | | Total Number of Observations | 134 | | | | | Number of Distinct Observations | 119 |
| 490 | | | | | | | | | | | Number of Missing Observations | 0 |
| 491 | | | | | Minimum | 40.9 | | | | | Mean | 775.7 |
| 492 | | | | | Maximum | 3490 | | | | | Median | 525 |
| 493 | | | | | SD | 731.5 | | | | | Std. Error of Mean | 63.19 |
| 494 | | | | | Coefficient of Variation | 0.943 | | | | | Skewness | 1.601 |
| 495 | | | | | | | | | | | | |
| 496 | | | | | Normal GOF Test | | | | | | | |
| 497 | | | | | Shapiro Wilk Test Statistic | 0.82 | | | | | Shapiro Wilk GOF Test | |
| 498 | | | | | 5% Shapiro Wilk P Value | 0 | | | | | Data Not Normal at 5% Significance Level | |
| 499 | | | | | Lilliefors Test Statistic | 0.162 | | | | | Lilliefors GOF Test | |
| 500 | | | | | 5% Lilliefors Critical Value | 0.0765 | | | | | Data Not Normal at 5% Significance Level | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 501 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 502 | | | | | | | | | | | | |
| 503 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 504 | **95% Normal UCL** | | | | | | **95% UCLs (Adjusted for Skewness)** | | | | | |
| 505 | 95% Student's-t UCL | | | | | 880.4 | 95% Adjusted-CLT UCL (Chen-1995) | | | | | 889 |
| 506 | | | | | | | 95% Modified-t UCL (Johnson-1978) | | | | | 881.8 |
| 507 | | | | | | | | | | | | |
| 508 | **Gamma GOF Test** | | | | | | | | | | | |
| 509 | A-D Test Statistic | | | | | 0.674 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 510 | 5% A-D Critical Value | | | | | 0.777 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 511 | K-S Test Statistic | | | | | 0.0804 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 512 | 5% K-S Critical Value | | | | | 0.0826 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 513 | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 514 | | | | | | | | | | | | |
| 515 | **Gamma Statistics** | | | | | | | | | | | |
| 516 | k hat (MLE) | | | | | 1.256 | k star (bias corrected MLE) | | | | | 1.233 |
| 517 | Theta hat (MLE) | | | | | 617.5 | Theta star (bias corrected MLE) | | | | | 629.1 |
| 518 | nu hat (MLE) | | | | | 336.7 | nu star (bias corrected) | | | | | 330.5 |
| 519 | MLE Mean (bias corrected) | | | | | 775.7 | MLE Sd (bias corrected) | | | | | 698.5 |
| 520 | | | | | | | Approximate Chi Square Value (0.05) | | | | | 289.4 |
| 521 | Adjusted Level of Significance | | | | | 0.0482 | Adjusted Chi Square Value | | | | | 288.9 |
| 522 | | | | | | | | | | | | |
| 523 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 524 | 95% Approximate Gamma UCL (use when n>=50) | | | | | 885.9 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 887.2 |
| 525 | | | | | | | | | | | | |
| 526 | **Lognormal GOF Test** | | | | | | | | | | | |
| 527 | Shapiro Wilk Test Statistic | | | | | 0.967 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 528 | 5% Shapiro Wilk P Value | | | | | 0.0374 | Data Not Lognormal at 5% Significance Level | | | | | |
| 529 | Lilliefors Test Statistic | | | | | 0.0488 | **Lilliefors Lognormal GOF Test** | | | | | |
| 530 | 5% Lilliefors Critical Value | | | | | 0.0765 | Data appear Lognormal at 5% Significance Level | | | | | |
| 531 | **Data appear Approximate Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 532 | | | | | | | | | | | | |
| 533 | **Lognormal Statistics** | | | | | | | | | | | |
| 534 | Minimum of Logged Data | | | | | 3.711 | Mean of logged Data | | | | | 6.206 |
| 535 | Maximum of Logged Data | | | | | 8.158 | SD of logged Data | | | | | 1.014 |
| 536 | | | | | | | | | | | | |
| 537 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 538 | 95% H-UCL | | | | | 1006 | 90% Chebyshev (MVUE) UCL | | | | | 1086 |
| 539 | 95% Chebyshev (MVUE) UCL | | | | | 1204 | 97.5% Chebyshev (MVUE) UCL | | | | | 1369 |
| 540 | 99% Chebyshev (MVUE) UCL | | | | | 1693 | | | | | | |
| 541 | | | | | | | | | | | | |
| 542 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 543 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 544 | | | | | | | | | | | | |
| 545 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 546 | 95% CLT UCL | | | | | 879.6 | 95% Jackknife UCL | | | | | 880.4 |
| 547 | 95% Standard Bootstrap UCL | | | | | 879.2 | 95% Bootstrap-t UCL | | | | | 892.8 |
| 548 | 95% Hall's Bootstrap UCL | | | | | 890.7 | 95% Percentile Bootstrap UCL | | | | | 881.5 |
| 549 | 95% BCA Bootstrap UCL | | | | | 897.5 | | | | | | |
| 550 | 90% Chebyshev(Mean, Sd) UCL | | | | | 965.3 | 95% Chebyshev(Mean, Sd) UCL | | | | | 1051 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 551 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 1170 | | | | | 99% Chebyshev(Mean, Sd) UCL | 1404 |
| 552 | | | | | | | | | | | | |
| 553 | | | | | | **Suggested UCL to Use** | | | | | | |
| 554 | | | | | 95% Approximate Gamma UCL | 885.9 | | | | | | |
| 555 | | | | | | | | | | | | |
| 556 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 557 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | |
| 558 | | | | | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | |
| 559 | | | | | For additional insight the user may want to consult a statistician. | | | | | | | |
| 560 | | | | | | | | | | | | |
| 561 | **Cadmium** | | | | | | | | | | | |
| 562 | | | | | | | | | | | | |
| 563 | | | | | | **General Statistics** | | | | | | |
| 564 | | | | | Total Number of Observations | 134 | | | | | Number of Distinct Observations | 71 |
| 565 | | | | | Number of Detects | 74 | | | | | Number of Non-Detects | 60 |
| 566 | | | | | Number of Distinct Detects | 69 | | | | | Number of Distinct Non-Detects | 3 |
| 567 | | | | | Minimum Detect | 0.007 | | | | | Minimum Non-Detect | 0.005 |
| 568 | | | | | Maximum Detect | 1.55 | | | | | Maximum Non-Detect | 0.05 |
| 569 | | | | | Variance Detects | 0.0476 | | | | | Percent Non-Detects | 44.78% |
| 570 | | | | | Mean Detects | 0.153 | | | | | SD Detects | 0.218 |
| 571 | | | | | Median Detects | 0.0865 | | | | | CV Detects | 1.425 |
| 572 | | | | | Skewness Detects | 4.1 | | | | | Kurtosis Detects | 22.91 |
| 573 | | | | | Mean of Logged Detects | -2.56 | | | | | SD of Logged Detects | 1.241 |
| 574 | | | | | | | | | | | | |
| 575 | | | | | | **Normal GOF Test on Detects Only** | | | | | | |
| 576 | | | | | Shapiro Wilk Test Statistic | 0.619 | | | | | **Normal GOF Test on Detected Observations Only** | |
| 577 | | | | | 5% Shapiro Wilk P Value | 0 | | | | | Detected Data Not Normal at 5% Significance Level | |
| 578 | | | | | Lilliefors Test Statistic | 0.252 | | | | | **Lilliefors GOF Test** | |
| 579 | | | | | 5% Lilliefors Critical Value | 0.103 | | | | | Detected Data Not Normal at 5% Significance Level | |
| 580 | | | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | |
| 581 | | | | | | | | | | | | |
| 582 | | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | |
| 583 | | | | | Mean | 0.0886 | | | | | Standard Error of Mean | 0.0153 |
| 584 | | | | | SD | 0.176 | | | | | 95% KM (BCA) UCL | 0.115 |
| 585 | | | | | 95% KM (t) UCL | 0.114 | | | | | 95% KM (Percentile Bootstrap) UCL | 0.114 |
| 586 | | | | | 95% KM (z) UCL | 0.114 | | | | | 95% KM Bootstrap t UCL | 0.127 |
| 587 | | | | | 90% KM Chebyshev UCL | 0.135 | | | | | 95% KM Chebyshev UCL | 0.155 |
| 588 | | | | | 97.5% KM Chebyshev UCL | 0.184 | | | | | 99% KM Chebyshev UCL | 0.241 |
| 589 | | | | | | | | | | | | |
| 590 | | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | |
| 591 | | | | | A-D Test Statistic | 0.84 | | | | | **Anderson-Darling GOF Test** | |
| 592 | | | | | 5% A-D Critical Value | 0.788 | | | | | Detected Data Not Gamma Distributed at 5% Significance Level | |
| 593 | | | | | K-S Test Statistic | 0.101 | | | | | **Kolmogrov-Smirnoff GOF** | |
| 594 | | | | | 5% K-S Critical Value | 0.107 | | | | | Detected data appear Gamma Distributed at 5% Significance Level | |
| 595 | | | | | | **Detected data follow Appr. Gamma Distribution at 5% Significance Level** | | | | | | |
| 596 | | | | | | | | | | | | |
| 597 | | | | | | **Gamma Statistics on Detected Data Only** | | | | | | |
| 598 | | | | | k hat (MLE) | 0.861 | | | | | k star (bias corrected MLE) | 0.835 |
| 599 | | | | | Theta hat (MLE) | 0.178 | | | | | Theta star (bias corrected MLE) | 0.183 |
| 600 | | | | | nu hat (MLE) | 127.4 | | | | | nu star (bias corrected) | 123.6 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 601 | | | | | MLE Mean (bias corrected) | 0.153 | | | | MLE Sd (bias corrected) | | 0.168 |
| 602 | | | | | | | | | | | | |
| 603 | | | | | Gamma Kaplan-Meier (KM) Statistics | | | | | | | |
| 604 | | | | | k hat (KM) | 0.253 | | | | nu hat (KM) | | 67.69 |
| 605 | | | | | Approximate Chi Square Value (67.69, α) | 49.76 | | | | Adjusted Chi Square Value (67.69, β) | | 49.59 |
| 606 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.121 | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | 0.121 |
| 607 | | | | | | | | | | | | |
| 608 | | | | | Gamma ROS Statistics using Imputed Non-Detects | | | | | | | |
| 609 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 610 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 611 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 612 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 613 | | | | | Minimum | 0.007 | | | | Mean | | 0.0891 |
| 614 | | | | | Maximum | 1.55 | | | | Median | | 0.0117 |
| 615 | | | | | SD | 0.177 | | | | CV | | 1.983 |
| 616 | | | | | k hat (MLE) | 0.589 | | | | k star (bias corrected MLE) | | 0.581 |
| 617 | | | | | Theta hat (MLE) | 0.151 | | | | Theta star (bias corrected MLE) | | 0.153 |
| 618 | | | | | nu hat (MLE) | 157.9 | | | | nu star (bias corrected) | | 155.7 |
| 619 | | | | | MLE Mean (bias corrected) | 0.0891 | | | | MLE Sd (bias corrected) | | 0.117 |
| 620 | | | | | | | | | | Adjusted Level of Significance (β) | | 0.0482 |
| 621 | | | | | Approximate Chi Square Value (155.74, α) | 127.9 | | | | Adjusted Chi Square Value (155.74, β) | | 127.6 |
| 622 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.108 | | | | 95% Gamma Adjusted UCL (use when n<50) | | 0.109 |
| 623 | | | | | | | | | | | | |
| 624 | | | | | Lognormal GOF Test on Detected Observations Only | | | | | | | |
| 625 | | | | | Lilliefors Test Statistic | 0.0982 | | | | Lilliefors GOF Test | | |
| 626 | | | | | 5% Lilliefors Critical Value | 0.103 | | | | Detected Data appear Lognormal at 5% Significance Level | | |
| 627 | | | | | Detected Data appear Approximate Lognormal at 5% Significance Level | | | | | | | |
| 628 | | | | | | | | | | | | |
| 629 | | | | | Lognormal ROS Statistics Using Imputed Non-Detects | | | | | | | |
| 630 | | | | | Mean in Original Scale | 0.0885 | | | | Mean in Log Scale | | -3.744 |
| 631 | | | | | SD in Original Scale | 0.177 | | | | SD in Log Scale | | 1.76 |
| 632 | | | | | 95% t UCL (assumes normality of ROS data) | 0.114 | | | | 95% Percentile Bootstrap UCL | | 0.115 |
| 633 | | | | | 95% BCA Bootstrap UCL | 0.123 | | | | 95% Bootstrap t UCL | | 0.124 |
| 634 | | | | | 95% H-UCL (Log ROS) | 0.176 | | | | | | |
| 635 | | | | | | | | | | | | |
| 636 | | | | | UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed | | | | | | | |
| 637 | | | | | KM Mean (logged) | -3.621 | | | | 95% H-UCL (KM -Log) | | 0.127 |
| 638 | | | | | KM SD (logged) | 1.543 | | | | 95% Critical H Value (KM-Log) | | 2.742 |
| 639 | | | | | KM Standard Error of Mean (logged) | 0.141 | | | | | | |
| 640 | | | | | | | | | | | | |
| 641 | | | | | DL/2 Statistics | | | | | | | |
| 642 | | | | | DL/2 Normal | | | | | DL/2 Log-Transformed | | |
| 643 | | | | | Mean in Original Scale | 0.0919 | | | | Mean in Log Scale | | -3.426 |
| 644 | | | | | SD in Original Scale | 0.176 | | | | SD in Log Scale | | 1.496 |
| 645 | | | | | 95% t UCL (Assumes normality) | 0.117 | | | | 95% H-Stat UCL | | 0.141 |
| 646 | | | | | DL/2 is not a recommended method, provided for comparisons and historical reasons | | | | | | | |
| 647 | | | | | | | | | | | | |
| 648 | | | | | Nonparametric Distribution Free UCL Statistics | | | | | | | |
| 649 | | | | | Detected Data appear Approximate Gamma Distributed at 5% Significance Level | | | | | | | |
| 650 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 651 | **Suggested UCL to Use** | | | | | | | | | | | |
| 652 | | | | | 95% KM (BCA) UCL | 0.115 | | | 95% GROS Approximate Gamma UCL | | | 0.108 |
| 653 | | | | | 95% Approximate Gamma KM-UCL | 0.121 | | | | | | |
| 654 | | | | | | | | | | | | |
| 655 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 656 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 657 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 658 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 659 | | | | | | | | | | | | |
| 660 | | | | | | | | | | | | |
| 661 | **Calcium** | | | | | | | | | | | |
| 662 | | | | | | | | | | | | |
| 663 | **General Statistics** | | | | | | | | | | | |
| 664 | | | | | Total Number of Observations | 134 | | | Number of Distinct Observations | | | 129 |
| 665 | | | | | | | | | Number of Missing Observations | | | 0 |
| 666 | | | | | Minimum | 2280 | | | Mean | | | 174653 |
| 667 | | | | | Maximum | 511000 | | | Median | | | 126000 |
| 668 | | | | | SD | 138194 | | | Std. Error of Mean | | | 11938 |
| 669 | | | | | Coefficient of Variation | 0.791 | | | Skewness | | | 0.971 |
| 670 | | | | | | | | | | | | |
| 671 | **Normal GOF Test** | | | | | | | | | | | |
| 672 | | | | | Shapiro Wilk Test Statistic | 0.85 | | | **Shapiro Wilk GOF Test** | | | |
| 673 | | | | | 5% Shapiro Wilk P Value | 0 | | | Data Not Normal at 5% Significance Level | | | |
| 674 | | | | | Lilliefors Test Statistic | 0.158 | | | **Lilliefors GOF Test** | | | |
| 675 | | | | | 5% Lilliefors Critical Value | 0.0765 | | | Data Not Normal at 5% Significance Level | | | |
| 676 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 677 | | | | | | | | | | | | |
| 678 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 679 | | | | | **95% Normal UCL** | | | | **95% UCLs (Adjusted for Skewness)** | | | |
| 680 | | | | | 95% Student's-t UCL | 194427 | | | 95% Adjusted-CLT UCL (Chen-1995) | | | 195359 |
| 681 | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | | | 194594 |
| 682 | | | | | | | | | | | | |
| 683 | **Gamma GOF Test** | | | | | | | | | | | |
| 684 | | | | | A-D Test Statistic | 1.607 | | | **Anderson-Darling Gamma GOF Test** | | | |
| 685 | | | | | 5% A-D Critical Value | 0.769 | | | Data Not Gamma Distributed at 5% Significance Level | | | |
| 686 | | | | | K-S Test Statistic | 0.099 | | | **Kolmogrov-Smirnoff Gamma GOF Test** | | | |
| 687 | | | | | 5% K-S Critical Value | 0.0821 | | | Data Not Gamma Distributed at 5% Significance Level | | | |
| 688 | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 689 | | | | | | | | | | | | |
| 690 | **Gamma Statistics** | | | | | | | | | | | |
| 691 | | | | | k hat (MLE) | 1.598 | | | k star (bias corrected MLE) | | | 1.567 |
| 692 | | | | | Theta hat (MLE) | 109279 | | | Theta star (bias corrected MLE) | | | 111427 |
| 693 | | | | | nu hat (MLE) | 428.3 | | | nu star (bias corrected) | | | 420.1 |
| 694 | | | | | MLE Mean (bias corrected) | 174653 | | | MLE Sd (bias corrected) | | | 139503 |
| 695 | | | | | | | | | Approximate Chi Square Value (0.05) | | | 373.6 |
| 696 | | | | | Adjusted Level of Significance | 0.0482 | | | Adjusted Chi Square Value | | | 373.1 |
| 697 | | | | | | | | | | | | |
| 698 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 699 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 196399 | | | 95% Adjusted Gamma UCL (use when n<50) | | | 196648 |
| 700 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 701 | **Lognormal GOF Test** | | | | | | | | | | | |
| 702 | | | | | Shapiro Wilk Test Statistic | 0.95 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 703 | | | | | 5% Shapiro Wilk P Value | 2.4120E-4 | Data Not Lognormal at 5% Significance Level | | | | | |
| 704 | | | | | Lilliefors Test Statistic | 0.0621 | **Lilliefors Lognormal GOF Test** | | | | | |
| 705 | | | | | 5% Lilliefors Critical Value | 0.0765 | Data appear Lognormal at 5% Significance Level | | | | | |
| 706 | **Data appear Approximate Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 707 | | | | | | | | | | | | |
| 708 | **Lognormal Statistics** | | | | | | | | | | | |
| 709 | | | | | Minimum of Logged Data | 7.732 | | | | Mean of logged Data | | 11.73 |
| 710 | | | | | Maximum of Logged Data | 13.14 | | | | SD of logged Data | | 0.901 |
| 711 | | | | | | | | | | | | |
| 712 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 713 | | | | | 95% H-UCL | 218985 | | | | 90% Chebyshev (MVUE) UCL | | 235502 |
| 714 | | | | | 95% Chebyshev (MVUE) UCL | 258401 | | | | 97.5% Chebyshev (MVUE) UCL | | 290185 |
| 715 | | | | | 99% Chebyshev (MVUE) UCL | 352617 | | | | | | |
| 716 | | | | | | | | | | | | |
| 717 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 718 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 719 | | | | | | | | | | | | |
| 720 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 721 | | | | | 95% CLT UCL | 194289 | | | | 95% Jackknife UCL | | 194427 |
| 722 | | | | | 95% Standard Bootstrap UCL | 193890 | | | | 95% Bootstrap-t UCL | | 194797 |
| 723 | | | | | 95% Hall's Bootstrap UCL | 195708 | | | | 95% Percentile Bootstrap UCL | | 193696 |
| 724 | | | | | 95% BCA Bootstrap UCL | 195192 | | | | | | |
| 725 | | | | | 90% Chebyshev(Mean, Sd) UCL | 210467 | | | | 95% Chebyshev(Mean, Sd) UCL | | 226690 |
| 726 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 249207 | | | | 99% Chebyshev(Mean, Sd) UCL | | 293436 |
| 727 | | | | | | | | | | | | |
| 728 | **Suggested UCL to Use** | | | | | | | | | | | |
| 729 | | | | | 95% Chebyshev (Mean, Sd) UCL | 226690 | | | | | | |
| 730 | | | | | | | | | | | | |
| 731 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 732 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 733 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |
| 734 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 735 | | | | | | | | | | | | |
| 736 | **Chromium** | | | | | | | | | | | |
| 737 | | | | | | | | | | | | |
| 738 | **General Statistics** | | | | | | | | | | | |
| 739 | | | | | Total Number of Observations | 134 | | | | Number of Distinct Observations | | 5 |
| 740 | | | | | Number of Detects | 3 | | | | Number of Non-Detects | | 131 |
| 741 | | | | | Number of Distinct Detects | 3 | | | | Number of Distinct Non-Detects | | 2 |
| 742 | | | | | Minimum Detect | 0.69 | | | | Minimum Non-Detect | | 0.5 |
| 743 | | | | | Maximum Detect | 1.41 | | | | Maximum Non-Detect | | 1 |
| 744 | | | | | Variance Detects | 0.13 | | | | Percent Non-Detects | | 97.76% |
| 745 | | | | | Mean Detects | 1.05 | | | | SD Detects | | 0.36 |
| 746 | | | | | Median Detects | 1.05 | | | | CV Detects | | 0.343 |
| 747 | | | | | Skewness Detects | 2.677E-15 | | | | Kurtosis Detects | | N/A |
| 748 | | | | | Mean of Logged Detects | 0.00711 | | | | SD of Logged Detects | | 0.359 |
| 749 | | | | | | | | | | | | |
| 750 | **Warning: Data set has only 3 Detected Values.** | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 751 | This is not enough to compute meaningful or reliable statistics and estimates. | | | | | | | | | | | |
| 752 | | | | | | | | | | | | |
| 753 | | | | | | | | | | | | |
| 754 | Normal GOF Test on Detects Only | | | | | | | | | | | |
| 755 | | | | | Shapiro Wilk Test Statistic | 1 | Shapiro Wilk GOF Test | | | | | |
| 756 | | | | | 5% Shapiro Wilk Critical Value | 0.767 | Detected Data appear Normal at 5% Significance Level | | | | | |
| 757 | | | | | Lilliefors Test Statistic | 0.175 | Lilliefors GOF Test | | | | | |
| 758 | | | | | 5% Lilliefors Critical Value | 0.512 | Detected Data appear Normal at 5% Significance Level | | | | | |
| 759 | Detected Data appear Normal at 5% Significance Level | | | | | | | | | | | |
| 760 | | | | | | | | | | | | |
| 761 | Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs | | | | | | | | | | | |
| 762 | | | | | Mean | 0.513 | | | Standard Error of Mean | | | 0.00986 |
| 763 | | | | | SD | 0.0928 | | | 95% KM (BCA) UCL | | | N/A |
| 764 | | | | | 95% KM (t) UCL | 0.529 | | | 95% KM (Percentile Bootstrap) UCL | | | N/A |
| 765 | | | | | 95% KM (z) UCL | 0.529 | | | 95% KM Bootstrap t UCL | | | N/A |
| 766 | | | | | 90% KM Chebyshev UCL | 0.542 | | | 95% KM Chebyshev UCL | | | 0.556 |
| 767 | | | | | 97.5% KM Chebyshev UCL | 0.574 | | | 99% KM Chebyshev UCL | | | 0.611 |
| 768 | | | | | | | | | | | | |
| 769 | Gamma GOF Tests on Detected Observations Only | | | | | | | | | | | |
| 770 | Not Enough Data to Perform GOF Test | | | | | | | | | | | |
| 771 | | | | | | | | | | | | |
| 772 | Gamma Statistics on Detected Data Only | | | | | | | | | | | |
| 773 | | | | | k hat (MLE) | 12.16 | | | k star (bias corrected MLE) | | | N/A |
| 774 | | | | | Theta hat (MLE) | 0.0864 | | | Theta star (bias corrected MLE) | | | N/A |
| 775 | | | | | nu hat (MLE) | 72.95 | | | nu star (bias corrected) | | | N/A |
| 776 | | | | | MLE Mean (bias corrected) | N/A | | | MLE Sd (bias corrected) | | | N/A |
| 777 | | | | | | | | | | | | |
| 778 | Gamma Kaplan-Meier (KM) Statistics | | | | | | | | | | | |
| 779 | | | | | k hat (KM) | 30.52 | | | nu hat (KM) | | | 8180 |
| 780 | | | | | | | | | Adjusted Level of Significance (β) | | | 0.0482 |
| 781 | | | | | Approximate Chi Square Value (N/A, α) | 7971 | | | Adjusted Chi Square Value (N/A, β) | | | 7969 |
| 782 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.526 | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | | 0.526 |
| 783 | | | | | | | | | | | | |
| 784 | Lognormal GOF Test on Detected Observations Only | | | | | | | | | | | |
| 785 | | | | | Shapiro Wilk Test Statistic | 0.99 | Shapiro Wilk GOF Test | | | | | |
| 786 | | | | | 5% Shapiro Wilk Critical Value | 0.767 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 787 | | | | | Lilliefors Test Statistic | 0.213 | Lilliefors GOF Test | | | | | |
| 788 | | | | | 5% Lilliefors Critical Value | 0.512 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 789 | Detected Data appear Lognormal at 5% Significance Level | | | | | | | | | | | |
| 790 | | | | | | | | | | | | |
| 791 | Lognormal ROS Statistics Using Imputed Non-Detects | | | | | | | | | | | |
| 792 | | | | | Mean in Original Scale | 0.0965 | | | Mean in Log Scale | | | -3.223 |
| 793 | | | | | SD in Original Scale | 0.178 | | | SD in Log Scale | | | 1.341 |
| 794 | | | | | 95% t UCL (assumes normality of ROS data) | 0.122 | | | 95% Percentile Bootstrap UCL | | | 0.124 |
| 795 | | | | | 95% BCA Bootstrap UCL | 0.131 | | | 95% Bootstrap t UCL | | | 0.135 |
| 796 | | | | | 95% H-UCL (Log ROS) | 0.131 | | | | | | |
| 797 | | | | | | | | | | | | |
| 798 | UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed | | | | | | | | | | | |
| 799 | | | | | KM Mean (logged) | -0.677 | | | 95% H-UCL (KM -Log) | | | 0.52 |
| 800 | | | | | KM SD (logged) | 0.113 | | | 95% Critical H Value (KM-Log) | | | 1.672 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 801 | | | | | KM Standard Error of Mean (logged) | 0.0121 | | | | | | |
| 802 | | | | | | | | | | | | |
| 803 | | | | | **DL/2 Statistics** | | | | | | | |
| 804 | | | | | **DL/2 Normal** | | | | | **DL/2 Log-Transformed** | | |
| 805 | | | | | Mean in Original Scale | 0.315 | | | | Mean in Log Scale | | -1.226 |
| 806 | | | | | SD in Original Scale | 0.155 | | | | SD in Log Scale | | 0.332 |
| 807 | | | | | 95% t UCL (Assumes normality) | 0.337 | | | | 95% H-Stat UCL | | 0.326 |
| 808 | | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | |
| 809 | | | | | | | | | | | | |
| 810 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 811 | | | | | **Detected Data appear Normal Distributed at 5% Significance Level** | | | | | | | |
| 812 | | | | | | | | | | | | |
| 813 | | | | | **Suggested UCL to Use** | | | | | | | |
| 814 | | | | | 95% KM (t) UCL | 0.529 | | | | 95% KM (Percentile Bootstrap) UCL | | N/A |
| 815 | | | | | **Warning: One or more Recommended UCL(s) not available!** | | | | | | | |
| 816 | | | | | | | | | | | | |
| 817 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 818 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 819 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 820 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 821 | | | | | | | | | | | | |
| 822 | **Cobalt** | | | | | | | | | | | |
| 823 | | | | | | | | | | | | |
| 824 | | | | | **General Statistics** | | | | | | | |
| 825 | | | | | Total Number of Observations | 134 | | | | Number of Distinct Observations | | 114 |
| 826 | | | | | Number of Detects | 118 | | | | Number of Non-Detects | | 16 |
| 827 | | | | | Number of Distinct Detects | 112 | | | | Number of Distinct Non-Detects | | 2 |
| 828 | | | | | Minimum Detect | 0.056 | | | | Minimum Non-Detect | | 0.05 |
| 829 | | | | | Maximum Detect | 59.2 | | | | Maximum Non-Detect | | 0.1 |
| 830 | | | | | Variance Detects | 90.16 | | | | Percent Non-Detects | | 11.94% |
| 831 | | | | | Mean Detects | 5.039 | | | | SD Detects | | 9.495 |
| 832 | | | | | Median Detects | 0.461 | | | | CV Detects | | 1.884 |
| 833 | | | | | Skewness Detects | 3.202 | | | | Kurtosis Detects | | 12.41 |
| 834 | | | | | Mean of Logged Detects | -0.117 | | | | SD of Logged Detects | | 2.025 |
| 835 | | | | | | | | | | | | |
| 836 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 837 | | | | | Shapiro Wilk Test Statistic | 0.59 | | | | **Normal GOF Test on Detected Observations Only** | | |
| 838 | | | | | 5% Shapiro Wilk P Value | 0 | | | | Detected Data Not Normal at 5% Significance Level | | |
| 839 | | | | | Lilliefors Test Statistic | 0.3 | | | | **Lilliefors GOF Test** | | |
| 840 | | | | | 5% Lilliefors Critical Value | 0.0816 | | | | Detected Data Not Normal at 5% Significance Level | | |
| 841 | | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | | |
| 842 | | | | | | | | | | | | |
| 843 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |
| 844 | | | | | Mean | 4.445 | | | | Standard Error of Mean | | 0.782 |
| 845 | | | | | SD | 9.018 | | | | 95% KM (BCA) UCL | | 5.76 |
| 846 | | | | | 95% KM (t) UCL | 5.741 | | | | 95% KM (Percentile Bootstrap) UCL | | 5.803 |
| 847 | | | | | 95% KM (z) UCL | 5.732 | | | | 95% KM Bootstrap t UCL | | 6.114 |
| 848 | | | | | 90% KM Chebyshev UCL | 6.792 | | | | 95% KM Chebyshev UCL | | 7.855 |
| 849 | | | | | 97.5% KM Chebyshev UCL | 9.331 | | | | 99% KM Chebyshev UCL | | 12.23 |
| 850 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 851 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 852 | | | | | A-D Test Statistic | 5.787 | **Anderson-Darling GOF Test** | | | | | |
| 853 | | | | | 5% A-D Critical Value | 0.848 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 854 | | | | | K-S Test Statistic | 0.201 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 855 | | | | | 5% K-S Critical Value | 0.0911 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 856 | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 857 | | | | | | | | | | | | |
| 858 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 859 | | | | | k hat (MLE) | 0.382 | k star (bias corrected MLE) | | | | | 0.378 |
| 860 | | | | | Theta hat (MLE) | 13.19 | Theta star (bias corrected MLE) | | | | | 13.33 |
| 861 | | | | | nu hat (MLE) | 90.19 | nu star (bias corrected) | | | | | 89.23 |
| 862 | | | | | MLE Mean (bias corrected) | 5.039 | MLE Sd (bias corrected) | | | | | 8.196 |
| 863 | | | | | | | | | | | | |
| 864 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 865 | | | | | k hat (KM) | 0.243 | nu hat (KM) | | | | | 65.1 |
| 866 | | | | | Approximate Chi Square Value (65.10, α) | 47.54 | Adjusted Chi Square Value (65.10, β) | | | | | 47.37 |
| 867 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 6.087 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 6.108 |
| 868 | | | | | | | | | | | | |
| 869 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 870 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 871 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 872 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 873 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 874 | | | | | Minimum | 0.01 | Mean | | | | | 4.439 |
| 875 | | | | | Maximum | 59.2 | Median | | | | | 0.34 |
| 876 | | | | | SD | 9.055 | CV | | | | | 2.04 |
| 877 | | | | | k hat (MLE) | 0.319 | k star (bias corrected MLE) | | | | | 0.316 |
| 878 | | | | | Theta hat (MLE) | 13.93 | Theta star (bias corrected MLE) | | | | | 14.03 |
| 879 | | | | | nu hat (MLE) | 85.37 | nu star (bias corrected) | | | | | 84.79 |
| 880 | | | | | MLE Mean (bias corrected) | 4.439 | MLE Sd (bias corrected) | | | | | 7.892 |
| 881 | | | | | | | Adjusted Level of Significance (β) | | | | | 0.0482 |
| 882 | | | | | Approximate Chi Square Value (84.79, α) | 64.57 | Adjusted Chi Square Value (84.79, β) | | | | | 64.38 |
| 883 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 5.829 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 5.847 |
| 884 | | | | | | | | | | | | |
| 885 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 886 | | | | | Lilliefors Test Statistic | 0.136 | **Lilliefors GOF Test** | | | | | |
| 887 | | | | | 5% Lilliefors Critical Value | 0.0816 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 888 | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 889 | | | | | | | | | | | | |
| 890 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 891 | | | | | Mean in Original Scale | 4.441 | Mean in Log Scale | | | | | -0.605 |
| 892 | | | | | SD in Original Scale | 9.054 | SD in Log Scale | | | | | 2.347 |
| 893 | | | | | 95% t UCL (assumes normality of ROS data) | 5.736 | 95% Percentile Bootstrap UCL | | | | | 5.854 |
| 894 | | | | | 95% BCA Bootstrap UCL | 5.987 | 95% Bootstrap t UCL | | | | | 6.166 |
| 895 | | | | | 95% H-UCL (Log ROS) | 18.2 | | | | | | |
| 896 | | | | | | | | | | | | |
| 897 | **DL/2 Statistics** | | | | | | | | | | | |
| 898 | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | | | | | |
| 899 | | | | | Mean in Original Scale | 4.442 | Mean in Log Scale | | | | | -0.497 |
| 900 | | | | | SD in Original Scale | 9.053 | SD in Log Scale | | | | | 2.167 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 901 | | | | | 95% t UCL (Assumes normality) | 5.738 | | | | | 95% H-Stat UCL | 12.2 |
| 902 | | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | |
| 903 | | | | | | | | | | | | |
| 904 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 905 | | | | | **Data do not follow a Discernible Distribution at 5% Significance Level** | | | | | | | |
| 906 | | | | | | | | | | | | |
| 907 | | | | | **Suggested UCL to Use** | | | | | | | |
| 908 | | | | | 97.5% KM (Chebyshev) UCL | 9.331 | | | | | | |
| 909 | | | | | | | | | | | | |
| 910 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 911 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 912 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 913 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 914 | | | | | | | | | | | | |
| 915 | **Copper** | | | | | | | | | | | |
| 916 | | | | | | | | | | | | |
| 917 | | | | | **General Statistics** | | | | | | | |
| 918 | | | | | Total Number of Observations | 134 | | | | | Number of Distinct Observations | 71 |
| 919 | | | | | Number of Detects | 73 | | | | | Number of Non-Detects | 61 |
| 920 | | | | | Number of Distinct Detects | 68 | | | | | Number of Distinct Non-Detects | 4 |
| 921 | | | | | Minimum Detect | 0.21 | | | | | Minimum Non-Detect | 0.2 |
| 922 | | | | | Maximum Detect | 7.22 | | | | | Maximum Non-Detect | 1 |
| 923 | | | | | Variance Detects | 2.257 | | | | | Percent Non-Detects | 45.52% |
| 924 | | | | | Mean Detects | 1.522 | | | | | SD Detects | 1.502 |
| 925 | | | | | Median Detects | 1.05 | | | | | CV Detects | 0.987 |
| 926 | | | | | Skewness Detects | 2.094 | | | | | Kurtosis Detects | 4.22 |
| 927 | | | | | Mean of Logged Detects | 0.0527 | | | | | SD of Logged Detects | 0.847 |
| 928 | | | | | | | | | | | | |
| 929 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 930 | | | | | Shapiro Wilk Test Statistic | 0.739 | | | | | **Normal GOF Test on Detected Observations Only** | |
| 931 | | | | | 5% Shapiro Wilk P Value | 0 | | | | | Detected Data Not Normal at 5% Significance Level | |
| 932 | | | | | Lilliefors Test Statistic | 0.216 | | | | | **Lilliefors GOF Test** | |
| 933 | | | | | 5% Lilliefors Critical Value | 0.104 | | | | | Detected Data Not Normal at 5% Significance Level | |
| 934 | | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | | |
| 935 | | | | | | | | | | | | |
| 936 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |
| 937 | | | | | Mean | 0.938 | | | | | Standard Error of Mean | 0.111 |
| 938 | | | | | SD | 1.274 | | | | | 95% KM (BCA) UCL | 1.126 |
| 939 | | | | | 95% KM (t) UCL | 1.122 | | | | | 95% KM (Percentile Bootstrap) UCL | 1.119 |
| 940 | | | | | 95% KM (z) UCL | 1.121 | | | | | 95% KM Bootstrap t UCL | 1.151 |
| 941 | | | | | 90% KM Chebyshev UCL | 1.271 | | | | | 95% KM Chebyshev UCL | 1.422 |
| 942 | | | | | 97.5% KM Chebyshev UCL | 1.632 | | | | | 99% KM Chebyshev UCL | 2.043 |
| 943 | | | | | | | | | | | | |
| 944 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 945 | | | | | A-D Test Statistic | 1.449 | | | | | **Anderson-Darling GOF Test** | |
| 946 | | | | | 5% A-D Critical Value | 0.769 | | | | | Detected Data Not Gamma Distributed at 5% Significance Level | |
| 947 | | | | | K-S Test Statistic | 0.123 | | | | | **Kolmogrov-Smirnoff GOF** | |
| 948 | | | | | 5% K-S Critical Value | 0.106 | | | | | Detected Data Not Gamma Distributed at 5% Significance Level | |
| 949 | | | | | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | |
| 950 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 951 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 952 | | | | | k hat (MLE) | 1.506 | k star (bias corrected MLE) | | | | | 1.453 |
| 953 | | | | | Theta hat (MLE) | 1.011 | Theta star (bias corrected MLE) | | | | | 1.048 |
| 954 | | | | | nu hat (MLE) | 219.9 | nu star (bias corrected) | | | | | 212.2 |
| 955 | | | | | MLE Mean (bias corrected) | 1.522 | MLE Sd (bias corrected) | | | | | 1.263 |
| 956 | | | | | | | | | | | | |
| 957 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 958 | | | | | k hat (KM) | 0.542 | nu hat (KM) | | | | | 145.3 |
| 959 | | | | | Approximate Chi Square Value (145.35, α) | 118.5 | Adjusted Chi Square Value (145.35, β) | | | | | 118.2 |
| 960 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 1.151 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 1.154 |
| 961 | | | | | | | | | | | | |
| 962 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 963 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 964 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 965 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 966 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 967 | | | | | Minimum | 0.01 | Mean | | | | | 0.838 |
| 968 | | | | | Maximum | 7.22 | Median | | | | | 0.315 |
| 969 | | | | | SD | 1.337 | CV | | | | | 1.596 |
| 970 | | | | | k hat (MLE) | 0.371 | k star (bias corrected MLE) | | | | | 0.367 |
| 971 | | | | | Theta hat (MLE) | 2.26 | Theta star (bias corrected MLE) | | | | | 2.281 |
| 972 | | | | | nu hat (MLE) | 99.35 | nu star (bias corrected) | | | | | 98.46 |
| 973 | | | | | MLE Mean (bias corrected) | 0.838 | MLE Sd (bias corrected) | | | | | 1.382 |
| 974 | | | | | | | Adjusted Level of Significance (β) | | | | | 0.0482 |
| 975 | | | | | Approximate Chi Square Value (98.46, α) | 76.57 | Adjusted Chi Square Value (98.46, β) | | | | | 76.36 |
| 976 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 1.077 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 1.08 |
| 977 | | | | | | | | | | | | |
| 978 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 979 | | | | | Lilliefors Test Statistic | 0.071 | **Lilliefors GOF Test** | | | | | |
| 980 | | | | | 5% Lilliefors Critical Value | 0.104 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 981 | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 982 | | | | | | | | | | | | |
| 983 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 984 | | | | | Mean in Original Scale | 0.915 | Mean in Log Scale | | | | | -0.833 |
| 985 | | | | | SD in Original Scale | 1.293 | SD in Log Scale | | | | | 1.252 |
| 986 | | | | | 95% t UCL (assumes normality of ROS data) | 1.1 | 95% Percentile Bootstrap UCL | | | | | 1.113 |
| 987 | | | | | 95% BCA Bootstrap UCL | 1.13 | 95% Bootstrap t UCL | | | | | 1.132 |
| 988 | | | | | 95% H-UCL (Log ROS) | 1.24 | | | | | | |
| 989 | | | | | | | | | | | | |
| 990 | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | | | | | |
| 991 | | | | | KM Mean (logged) | -0.639 | 95% H-UCL (KM -Log) | | | | | 1.044 |
| 992 | | | | | KM SD (logged) | 0.993 | 95% Critical H Value (KM-Log) | | | | | 2.188 |
| 993 | | | | | KM Standard Error of Mean (logged) | 0.0892 | | | | | | |
| 994 | | | | | | | | | | | | |
| 995 | **DL/2 Statistics** | | | | | | | | | | | |
| 996 | | | | | **DL/2 Normal** | | **DL/2 Log-Transformed** | | | | | |
| 997 | | | | | Mean in Original Scale | 0.929 | Mean in Log Scale | | | | | -0.696 |
| 998 | | | | | SD in Original Scale | 1.284 | SD in Log Scale | | | | | 1.064 |
| 999 | | | | | 95% t UCL (Assumes normality) | 1.112 | 95% H-Stat UCL | | | | | 1.081 |
| 1000 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1001 | | | | | | | | | | | | |
| 1002 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1003 | **Detected Data appear Lognormal Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1004 | | | | | | | | | | | | |
| 1005 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1006 | | | | | 95% KM (t) UCL | 1.122 | | | | 95% KM (% Bootstrap) UCL | | 1.119 |
| 1007 | | | | | | | | | | | | |
| 1008 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1009 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 1010 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 1011 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1012 | | | | | | | | | | | | |
| 1013 | **Iron** | | | | | | | | | | | |
| 1014 | | | | | | | | | | | | |
| 1015 | **General Statistics** | | | | | | | | | | | |
| 1016 | | | | | Total Number of Observations | 134 | | | | Number of Distinct Observations | | 104 |
| 1017 | | | | | Number of Detects | 112 | | | | Number of Non-Detects | | 22 |
| 1018 | | | | | Number of Distinct Detects | 103 | | | | Number of Distinct Non-Detects | | 2 |
| 1019 | | | | | Minimum Detect | 10 | | | | Minimum Non-Detect | | 10 |
| 1020 | | | | | Maximum Detect | 46400 | | | | Maximum Non-Detect | | 30 |
| 1021 | | | | | Variance Detects | 74528286 | | | | Percent Non-Detects | | 16.42% |
| 1022 | | | | | Mean Detects | 5962 | | | | SD Detects | | 8633 |
| 1023 | | | | | Median Detects | 2140 | | | | CV Detects | | 1.448 |
| 1024 | | | | | Skewness Detects | 2.214 | | | | Kurtosis Detects | | 5.604 |
| 1025 | | | | | Mean of Logged Detects | 7.202 | | | | SD of Logged Detects | | 2.163 |
| 1026 | | | | | | | | | | | | |
| 1027 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 1028 | | | | | Shapiro Wilk Test Statistic | 0.716 | **Normal GOF Test on Detected Observations Only** | | | | | |
| 1029 | | | | | 5% Shapiro Wilk P Value | 0 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1030 | | | | | Lilliefors Test Statistic | 0.245 | **Lilliefors GOF Test** | | | | | |
| 1031 | | | | | 5% Lilliefors Critical Value | 0.0837 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1032 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 1033 | | | | | | | | | | | | |
| 1034 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 1035 | | | | | Mean | 4985 | | | | Standard Error of Mean | | 708.1 |
| 1036 | | | | | SD | 8161 | | | | 95% KM (BCA) UCL | | 6215 |
| 1037 | | | | | 95% KM (t) UCL | 6158 | | | | 95% KM (Percentile Bootstrap) UCL | | 6266 |
| 1038 | | | | | 95% KM (z) UCL | 6150 | | | | 95% KM Bootstrap t UCL | | 6413 |
| 1039 | | | | | 90% KM Chebyshev UCL | 7109 | | | | 95% KM Chebyshev UCL | | 8072 |
| 1040 | | | | | 97.5% KM Chebyshev UCL | 9407 | | | | 99% KM Chebyshev UCL | | 12031 |
| 1041 | | | | | | | | | | | | |
| 1042 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 1043 | | | | | A-D Test Statistic | 1.494 | **Anderson-Darling GOF Test** | | | | | |
| 1044 | | | | | 5% A-D Critical Value | 0.835 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1045 | | | | | K-S Test Statistic | 0.111 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 1046 | | | | | 5% K-S Critical Value | 0.0921 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1047 | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1048 | | | | | | | | | | | | |
| 1049 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 1050 | | | | | k hat (MLE) | 0.435 | | | | k star (bias corrected MLE) | | 0.43 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1051 | | | | | Theta hat (MLE) | 13694 | | | | | Theta star (bias corrected MLE) | 13876 |
| 1052 | | | | | nu hat (MLE) | 97.53 | | | | | nu star (bias corrected) | 96.25 |
| 1053 | | | | | MLE Mean (bias corrected) | 5962 | | | | | MLE Sd (bias corrected) | 9096 |
| 1054 | | | | | | | | | | | | |
| 1055 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 1056 | | | | | k hat (KM) | 0.373 | | | | | nu hat (KM) | 100 |
| 1057 | | | | | Approximate Chi Square Value (100.00, α) | 77.93 | | | | | Adjusted Chi Square Value (100.00, β) | 77.72 |
| 1058 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 6397 | | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | 6414 |
| 1059 | | | | | | | | | | | | |
| 1060 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 1061 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 1062 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 1063 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 1064 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 1065 | | | | | Minimum | 0.01 | | | | | Mean | 4983 |
| 1066 | | | | | Maximum | 46400 | | | | | Median | 767.5 |
| 1067 | | | | | SD | 8192 | | | | | CV | 1.644 |
| 1068 | | | | | k hat (MLE) | 0.223 | | | | | k star (bias corrected MLE) | 0.223 |
| 1069 | | | | | Theta hat (MLE) | 22383 | | | | | Theta star (bias corrected MLE) | 22384 |
| 1070 | | | | | nu hat (MLE) | 59.67 | | | | | nu star (bias corrected) | 59.66 |
| 1071 | | | | | MLE Mean (bias corrected) | 4983 | | | | | MLE Sd (bias corrected) | 10562 |
| 1072 | | | | | | | | | | | Adjusted Level of Significance (β) | 0.0482 |
| 1073 | | | | | Approximate Chi Square Value (59.66, α) | 42.9 | | | | | Adjusted Chi Square Value (59.66, β) | 42.75 |
| 1074 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 6930 | | | | | 95% Gamma Adjusted UCL (use when n<50) | 6955 |
| 1075 | | | | | | | | | | | | |
| 1076 | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | | |
| 1077 | | | | | Lilliefors Test Statistic | 0.129 | **Lilliefors GOF Test** | | | | | |
| 1078 | | | | | 5% Lilliefors Critical Value | 0.0837 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 1079 | | | | | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | |
| 1080 | | | | | | | | | | | | |
| 1081 | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | |
| 1082 | | | | | Mean in Original Scale | 4986 | | | | | Mean in Log Scale | 6.434 |
| 1083 | | | | | SD in Original Scale | 8191 | | | | | SD in Log Scale | 2.662 |
| 1084 | | | | | 95% t UCL (assumes normality of ROS data) | 6158 | | | | | 95% Percentile Bootstrap UCL | 6240 |
| 1085 | | | | | 95% BCA Bootstrap UCL | 6372 | | | | | 95% Bootstrap t UCL | 6388 |
| 1086 | | | | | 95% H-UCL (Log ROS) | 55361 | | | | | | |
| 1087 | | | | | | | | | | | | |
| 1088 | | | | | **DL/2 Statistics** | | | | | | | |
| 1089 | | | | | **DL/2 Normal** | | **DL/2 Log-Transformed** | | | | | |
| 1090 | | | | | Mean in Original Scale | 4985 | | | | | Mean in Log Scale | 6.382 |
| 1091 | | | | | SD in Original Scale | 8191 | | | | | SD in Log Scale | 2.721 |
| 1092 | | | | | 95% t UCL (Assumes normality) | 6157 | | | | | 95% H-Stat UCL | 63953 |
| 1093 | | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | |
| 1094 | | | | | | | | | | | | |
| 1095 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 1096 | | | | | **Data do not follow a Discernible Distribution at 5% Significance Level** | | | | | | | |
| 1097 | | | | | | | | | | | | |
| 1098 | | | | | **Suggested UCL to Use** | | | | | | | |
| 1099 | | | | | 97.5% KM (Chebyshev) UCL | 9407 | | | | | | |
| 1100 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1101 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1102 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 1103 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 1104 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1105 | | | | | | | | | | | | |
| 1106 | **Lead** | | | | | | | | | | | |
| 1107 | | | | | | | | | | | | |
| 1108 | **General Statistics** | | | | | | | | | | | |
| 1109 | Total Number of Observations | | | | | 134 | Number of Distinct Observations | | | | | 9 |
| 1110 | Number of Detects | | | | | 6 | Number of Non-Detects | | | | | 128 |
| 1111 | Number of Distinct Detects | | | | | 6 | Number of Distinct Non-Detects | | | | | 3 |
| 1112 | Minimum Detect | | | | | 0.082 | Minimum Non-Detect | | | | | 0.05 |
| 1113 | Maximum Detect | | | | | 3.38 | Maximum Non-Detect | | | | | 0.3 |
| 1114 | Variance Detects | | | | | 1.666 | Percent Non-Detects | | | | | 95.52% |
| 1115 | Mean Detects | | | | | 0.84 | SD Detects | | | | | 1.291 |
| 1116 | Median Detects | | | | | 0.25 | CV Detects | | | | | 1.537 |
| 1117 | Skewness Detects | | | | | 2.104 | Kurtosis Detects | | | | | 4.495 |
| 1118 | Mean of Logged Detects | | | | | -1.121 | SD of Logged Detects | | | | | 1.488 |
| 1119 | | | | | | | | | | | | |
| 1120 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 1121 | Shapiro Wilk Test Statistic | | | | | 0.687 | **Shapiro Wilk GOF Test** | | | | | |
| 1122 | 5% Shapiro Wilk Critical Value | | | | | 0.788 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1123 | Lilliefors Test Statistic | | | | | 0.306 | **Lilliefors GOF Test** | | | | | |
| 1124 | 5% Lilliefors Critical Value | | | | | 0.362 | Detected Data appear Normal at 5% Significance Level | | | | | |
| 1125 | **Detected Data appear Approximate Normal at 5% Significance Level** | | | | | | | | | | | |
| 1126 | | | | | | | | | | | | |
| 1127 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 1128 | Mean | | | | | 0.0878 | Standard Error of Mean | | | | | 0.0283 |
| 1129 | SD | | | | | 0.298 | 95% KM (BCA) UCL | | | | | 0.135 |
| 1130 | 95% KM (t) UCL | | | | | 0.135 | 95% KM (Percentile Bootstrap) UCL | | | | | 0.136 |
| 1131 | 95% KM (z) UCL | | | | | 0.134 | 95% KM Bootstrap t UCL | | | | | 0.301 |
| 1132 | 90% KM Chebyshev UCL | | | | | 0.173 | 95% KM Chebyshev UCL | | | | | 0.211 |
| 1133 | 97.5% KM Chebyshev UCL | | | | | 0.264 | 99% KM Chebyshev UCL | | | | | 0.369 |
| 1134 | | | | | | | | | | | | |
| 1135 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 1136 | A-D Test Statistic | | | | | 0.51 | **Anderson-Darling GOF Test** | | | | | |
| 1137 | 5% A-D Critical Value | | | | | 0.727 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1138 | K-S Test Statistic | | | | | 0.27 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 1139 | 5% K-S Critical Value | | | | | 0.346 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1140 | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1141 | | | | | | | | | | | | |
| 1142 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 1143 | k hat (MLE) | | | | | 0.646 | k star (bias corrected MLE) | | | | | 0.434 |
| 1144 | Theta hat (MLE) | | | | | 1.3 | Theta star (bias corrected MLE) | | | | | 1.935 |
| 1145 | nu hat (MLE) | | | | | 7.752 | nu star (bias corrected) | | | | | 5.21 |
| 1146 | MLE Mean (bias corrected) | | | | | 0.84 | MLE Sd (bias corrected) | | | | | 1.275 |
| 1147 | | | | | | | | | | | | |
| 1148 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 1149 | k hat (KM) | | | | | 0.0867 | nu hat (KM) | | | | | 23.25 |
| 1150 | Approximate Chi Square Value (23.25, α) | | | | | 13.28 | Adjusted Chi Square Value (23.25, β) | | | | | 13.2 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1151 | 95% Gamma Approximate KM-UCL (use when n>=50) | | | | | 0.154 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 0.155 |
| 1152 | Gamma (KM) may not be used when k hat (KM) is < 0.1 | | | | | | | | | | | |
| 1153 | | | | | | | | | | | | |
| 1154 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 1155 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 1156 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 1157 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 1158 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 1159 | Minimum | | | | | 0.01 | Mean | | | | | 0.0501 |
| 1160 | Maximum | | | | | 3.38 | Median | | | | | 0.01 |
| 1161 | SD | | | | | 0.305 | CV | | | | | 6.083 |
| 1162 | k hat (MLE) | | | | | 0.455 | k star (bias corrected MLE) | | | | | 0.449 |
| 1163 | Theta hat (MLE) | | | | | 0.11 | Theta star (bias corrected MLE) | | | | | 0.112 |
| 1164 | nu hat (MLE) | | | | | 121.9 | nu star (bias corrected) | | | | | 120.5 |
| 1165 | MLE Mean (bias corrected) | | | | | 0.0501 | MLE Sd (bias corrected) | | | | | 0.0748 |
| 1166 | | | | | | | Adjusted Level of Significance (β) | | | | | 0.0482 |
| 1167 | Approximate Chi Square Value (120.46, α) | | | | | 96.12 | Adjusted Chi Square Value (120.46, β) | | | | | 95.88 |
| 1168 | 95% Gamma Approximate UCL (use when n>=50) | | | | | 0.0628 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 0.063 |
| 1169 | | | | | | | | | | | | |
| 1170 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 1171 | Shapiro Wilk Test Statistic | | | | | 0.891 | **Shapiro Wilk GOF Test** | | | | | |
| 1172 | 5% Shapiro Wilk Critical Value | | | | | 0.788 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 1173 | Lilliefors Test Statistic | | | | | 0.249 | **Lilliefors GOF Test** | | | | | |
| 1174 | 5% Lilliefors Critical Value | | | | | 0.362 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 1175 | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1176 | | | | | | | | | | | | |
| 1177 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 1178 | Mean in Original Scale | | | | | 0.0443 | Mean in Log Scale | | | | | -7.581 |
| 1179 | SD in Original Scale | | | | | 0.305 | SD in Log Scale | | | | | 3.141 |
| 1180 | 95% t UCL (assumes normality of ROS data) | | | | | 0.0879 | 95% Percentile Bootstrap UCL | | | | | 0.0926 |
| 1181 | 95% BCA Bootstrap UCL | | | | | 0.136 | 95% Bootstrap t UCL | | | | | 0.323 |
| 1182 | 95% H-UCL (Log ROS) | | | | | 0.255 | | | | | | |
| 1183 | | | | | | | | | | | | |
| 1184 | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | | | | | |
| 1185 | KM Mean (logged) | | | | | -2.878 | 95% H-UCL (KM -Log) | | | | | 0.0689 |
| 1186 | KM SD (logged) | | | | | 0.499 | 95% Critical H Value (KM-Log) | | | | | 1.825 |
| 1187 | KM Standard Error of Mean (logged) | | | | | 0.0534 | | | | | | |
| 1188 | | | | | | | | | | | | |
| 1189 | **DL/2 Statistics** | | | | | | | | | | | |
| 1190 | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | | | | | |
| 1191 | Mean in Original Scale | | | | | 0.135 | Mean in Log Scale | | | | | -2.465 |
| 1192 | SD in Original Scale | | | | | 0.299 | SD in Log Scale | | | | | 0.861 |
| 1193 | 95% t UCL (Assumes normality) | | | | | 0.178 | 95% H-Stat UCL | | | | | 0.144 |
| 1194 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 1195 | | | | | | | | | | | | |
| 1196 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1197 | **Detected Data appear Approximate Normal Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1198 | | | | | | | | | | | | |
| 1199 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1200 | 95% KM (t) UCL | | | | | 0.135 | 95% KM (Percentile Bootstrap) UCL | | | | | 0.136 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1201 | | | | | | | | | | | | |
| 1202 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1203 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 1204 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 1205 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1206 | | | | | | | | | | | | |
| 1207 | **Lithium** | | | | | | | | | | | |
| 1208 | | | | | | | | | | | | |
| 1209 | **General Statistics** | | | | | | | | | | | |
| 1210 | Total Number of Observations | | | | | 134 | Number of Distinct Observations | | | | | 83 |
| 1211 | Number of Detects | | | | | 106 | Number of Non-Detects | | | | | 28 |
| 1212 | Number of Distinct Detects | | | | | 82 | Number of Distinct Non-Detects | | | | | 1 |
| 1213 | Minimum Detect | | | | | 1.44 | Minimum Non-Detect | | | | | 20 |
| 1214 | Maximum Detect | | | | | 127 | Maximum Non-Detect | | | | | 20 |
| 1215 | Variance Detects | | | | | 540.7 | Percent Non-Detects | | | | | 20.9% |
| 1216 | Mean Detects | | | | | 26.88 | SD Detects | | | | | 23.25 |
| 1217 | Median Detects | | | | | 21 | CV Detects | | | | | 0.865 |
| 1218 | Skewness Detects | | | | | 1.438 | Kurtosis Detects | | | | | 2.575 |
| 1219 | Mean of Logged Detects | | | | | 2.85 | SD of Logged Detects | | | | | 1.065 |
| 1220 | | | | | | | | | | | | |
| 1221 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 1222 | Shapiro Wilk Test Statistic | | | | | 0.87 | **Normal GOF Test on Detected Observations Only** | | | | | |
| 1223 | 5% Shapiro Wilk P Value | | | | | 1.686E-13 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1224 | Lilliefors Test Statistic | | | | | 0.145 | **Lilliefors GOF Test** | | | | | |
| 1225 | 5% Lilliefors Critical Value | | | | | 0.0861 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1226 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 1227 | | | | | | | | | | | | |
| 1228 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 1229 | Mean | | | | | 23.25 | Standard Error of Mean | | | | | 1.921 |
| 1230 | SD | | | | | 21.91 | 95% KM (BCA) UCL | | | | | 26.6 |
| 1231 | 95% KM (t) UCL | | | | | 26.43 | 95% KM (Percentile Bootstrap) UCL | | | | | 26.54 |
| 1232 | 95% KM (z) UCL | | | | | 26.41 | 95% KM Bootstrap t UCL | | | | | 26.76 |
| 1233 | 90% KM Chebyshev UCL | | | | | 29.01 | 95% KM Chebyshev UCL | | | | | 31.62 |
| 1234 | 97.5% KM Chebyshev UCL | | | | | 35.25 | 99% KM Chebyshev UCL | | | | | 42.36 |
| 1235 | | | | | | | | | | | | |
| 1236 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 1237 | A-D Test Statistic | | | | | 0.294 | **Anderson-Darling GOF Test** | | | | | |
| 1238 | 5% A-D Critical Value | | | | | 0.776 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1239 | K-S Test Statistic | | | | | 0.0402 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 1240 | 5% K-S Critical Value | | | | | 0.09 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1241 | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1242 | | | | | | | | | | | | |
| 1243 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 1244 | k hat (MLE) | | | | | 1.275 | k star (bias corrected MLE) | | | | | 1.245 |
| 1245 | Theta hat (MLE) | | | | | 21.09 | Theta star (bias corrected MLE) | | | | | 21.59 |
| 1246 | nu hat (MLE) | | | | | 270.2 | nu star (bias corrected) | | | | | 263.9 |
| 1247 | MLE Mean (bias corrected) | | | | | 26.88 | MLE Sd (bias corrected) | | | | | 24.09 |
| 1248 | | | | | | | | | | | | |
| 1249 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 1250 | k hat (KM) | | | | | 1.126 | nu hat (KM) | | | | | 301.9 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1251 | Approximate Chi Square Value (301.87, α) | | | | | 262.6 | Adjusted Chi Square Value (301.87, β) | | | | | 262.2 |
| 1252 | 95% Gamma Approximate KM-UCL (use when n>=50) | | | | | 26.73 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 26.77 |
| 1253 | | | | | | | | | | | | |
| 1254 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 1255 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 1256 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 1257 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 1258 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 1259 | Minimum | | | | | 0.01 | Mean | | | | | 23.15 |
| 1260 | Maximum | | | | | 127 | Median | | | | | 15.9 |
| 1261 | SD | | | | | 22.11 | CV | | | | | 0.955 |
| 1262 | k hat (MLE) | | | | | 0.979 | k star (bias corrected MLE) | | | | | 0.962 |
| 1263 | Theta hat (MLE) | | | | | 23.66 | Theta star (bias corrected MLE) | | | | | 24.08 |
| 1264 | nu hat (MLE) | | | | | 262.2 | nu star (bias corrected) | | | | | 257.7 |
| 1265 | MLE Mean (bias corrected) | | | | | 23.15 | MLE Sd (bias corrected) | | | | | 23.61 |
| 1266 | | | | | | | Adjusted Level of Significance (β) | | | | | 0.0482 |
| 1267 | Approximate Chi Square Value (257.71, α) | | | | | 221.5 | Adjusted Chi Square Value (257.71, β) | | | | | 221.2 |
| 1268 | 95% Gamma Approximate UCL (use when n>=50) | | | | | 26.93 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 26.98 |
| 1269 | | | | | | | | | | | | |
| 1270 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 1271 | Lilliefors Test Statistic | | | | | 0.0921 | **Lilliefors GOF Test** | | | | | |
| 1272 | 5% Lilliefors Critical Value | | | | | 0.0861 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 1273 | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1274 | | | | | | | | | | | | |
| 1275 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 1276 | Mean in Original Scale | | | | | 23.08 | Mean in Log Scale | | | | | 2.671 |
| 1277 | SD in Original Scale | | | | | 22.05 | SD in Log Scale | | | | | 1.049 |
| 1278 | 95% t UCL (assumes normality of ROS data) | | | | | 26.24 | 95% Percentile Bootstrap UCL | | | | | 26.24 |
| 1279 | 95% BCA Bootstrap UCL | | | | | 26.66 | 95% Bootstrap t UCL | | | | | 26.53 |
| 1280 | 95% H-UCL (Log ROS) | | | | | 30.73 | | | | | | |
| 1281 | | | | | | | | | | | | |
| 1282 | **DL/2 Statistics** | | | | | | | | | | | |
| 1283 | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | | | | | |
| 1284 | Mean in Original Scale | | | | | 23.35 | Mean in Log Scale | | | | | 2.736 |
| 1285 | SD in Original Scale | | | | | 21.78 | SD in Log Scale | | | | | 0.972 |
| 1286 | 95% t UCL (Assumes normality) | | | | | 26.47 | 95% H-Stat UCL | | | | | 29.71 |
| 1287 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 1288 | | | | | | | | | | | | |
| 1289 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1290 | **Detected Data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1291 | | | | | | | | | | | | |
| 1292 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1293 | 95% KM (BCA) UCL | | | | | 26.6 | 95% GROS Approximate Gamma UCL | | | | | 26.93 |
| 1294 | 95% Approximate Gamma KM-UCL | | | | | 26.73 | | | | | | |
| 1295 | | | | | | | | | | | | |
| 1296 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1297 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 1298 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 1299 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1300 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1301 | | | | | | | | | | | | |
| 1302 | **Magnesium** | | | | | | | | | | | |
| 1303 | | | | | | | | | | | | |
| 1304 | **General Statistics** | | | | | | | | | | | |
| 1305 | Total Number of Observations | | | | | 134 | Number of Distinct Observations | | | | | 128 |
| 1306 | | | | | | | Number of Missing Observations | | | | | 0 |
| 1307 | Minimum | | | | | 3490 | Mean | | | | | 236446 |
| 1308 | Maximum | | | | | 894000 | Median | | | | | 134500 |
| 1309 | SD | | | | | 236194 | Std. Error of Mean | | | | | 20404 |
| 1310 | Coefficient of Variation | | | | | 0.999 | Skewness | | | | | 1.193 |
| 1311 | | | | | | | | | | | | |
| 1312 | **Normal GOF Test** | | | | | | | | | | | |
| 1313 | Shapiro Wilk Test Statistic | | | | | 0.809 | **Shapiro Wilk GOF Test** | | | | | |
| 1314 | 5% Shapiro Wilk P Value | | | | | 0 | Data Not Normal at 5% Significance Level | | | | | |
| 1315 | Lilliefors Test Statistic | | | | | 0.194 | **Lilliefors GOF Test** | | | | | |
| 1316 | 5% Lilliefors Critical Value | | | | | 0.0765 | Data Not Normal at 5% Significance Level | | | | | |
| 1317 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 1318 | | | | | | | | | | | | |
| 1319 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 1320 | **95% Normal UCL** | | | | | | **95% UCLs (Adjusted for Skewness)** | | | | | |
| 1321 | 95% Student's-t UCL | | | | | 270243 | 95% Adjusted-CLT UCL (Chen-1995) | | | | | 272254 |
| 1322 | | | | | | | 95% Modified-t UCL (Johnson-1978) | | | | | 270594 |
| 1323 | | | | | | | | | | | | |
| 1324 | **Gamma GOF Test** | | | | | | | | | | | |
| 1325 | A-D Test Statistic | | | | | 1.809 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 1326 | 5% A-D Critical Value | | | | | 0.783 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1327 | K-S Test Statistic | | | | | 0.0896 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 1328 | 5% K-S Critical Value | | | | | 0.083 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1329 | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1330 | | | | | | | | | | | | |
| 1331 | **Gamma Statistics** | | | | | | | | | | | |
| 1332 | k hat (MLE) | | | | | 1.022 | k star (bias corrected MLE) | | | | | 1.004 |
| 1333 | Theta hat (MLE) | | | | | 231284 | Theta star (bias corrected MLE) | | | | | 235409 |
| 1334 | nu hat (MLE) | | | | | 274 | nu star (bias corrected) | | | | | 269.2 |
| 1335 | MLE Mean (bias corrected) | | | | | 236446 | MLE Sd (bias corrected) | | | | | 235927 |
| 1336 | | | | | | | Approximate Chi Square Value (0.05) | | | | | 232.2 |
| 1337 | Adjusted Level of Significance | | | | | 0.0482 | Adjusted Chi Square Value | | | | | 231.8 |
| 1338 | | | | | | | | | | | | |
| 1339 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 1340 | 95% Approximate Gamma UCL (use when n>=50)) | | | | | 274119 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 274557 |
| 1341 | | | | | | | | | | | | |
| 1342 | **Lognormal GOF Test** | | | | | | | | | | | |
| 1343 | Shapiro Wilk Test Statistic | | | | | 0.957 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 1344 | 5% Shapiro Wilk P Value | | | | | 0.00257 | Data Not Lognormal at 5% Significance Level | | | | | |
| 1345 | Lilliefors Test Statistic | | | | | 0.0687 | **Lilliefors Lognormal GOF Test** | | | | | |
| 1346 | 5% Lilliefors Critical Value | | | | | 0.0765 | Data appear Lognormal at 5% Significance Level | | | | | |
| 1347 | **Data appear Approximate Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1348 | | | | | | | | | | | | |
| 1349 | **Lognormal Statistics** | | | | | | | | | | | |
| 1350 | Minimum of Logged Data | | | | | 8.158 | Mean of logged Data | | | | | 11.81 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1351 | | | | | Maximum of Logged Data | 13.7 | | | | | SD of logged Data | 1.149 |
| 1352 | | | | | | | | | | | | |
| 1353 | | | | | Assuming Lognormal Distribution | | | | | | | |
| 1354 | | | | | 95% H-UCL | 328831 | | | | | 90% Chebyshev (MVUE) UCL | 355644 |
| 1355 | | | | | 95% Chebyshev (MVUE) UCL | 399638 | | | | | 97.5% Chebyshev (MVUE) UCL | 460700 |
| 1356 | | | | | 99% Chebyshev (MVUE) UCL | 580644 | | | | | | |
| 1357 | | | | | | | | | | | | |
| 1358 | | | | | Nonparametric Distribution Free UCL Statistics | | | | | | | |
| 1359 | | | | | Data appear to follow a Discernible Distribution at 5% Significance Level | | | | | | | |
| 1360 | | | | | | | | | | | | |
| 1361 | | | | | Nonparametric Distribution Free UCLs | | | | | | | |
| 1362 | | | | | 95% CLT UCL | 270008 | | | | | 95% Jackknife UCL | 270243 |
| 1363 | | | | | 95% Standard Bootstrap UCL | 269418 | | | | | 95% Bootstrap-t UCL | 271745 |
| 1364 | | | | | 95% Hall's Bootstrap UCL | 271745 | | | | | 95% Percentile Bootstrap UCL | 269863 |
| 1365 | | | | | 95% BCA Bootstrap UCL | 271866 | | | | | | |
| 1366 | | | | | 90% Chebyshev(Mean, Sd) UCL | 297658 | | | | | 95% Chebyshev(Mean, Sd) UCL | 325385 |
| 1367 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 363869 | | | | | 99% Chebyshev(Mean, Sd) UCL | 439464 |
| 1368 | | | | | | | | | | | | |
| 1369 | | | | | Suggested UCL to Use | | | | | | | |
| 1370 | | | | | 95% Chebyshev (Mean, Sd) UCL | 325385 | | | | | | |
| 1371 | | | | | | | | | | | | |
| 1372 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 1373 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | |
| 1374 | | | | | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | |
| 1375 | | | | | For additional insight the user may want to consult a statistician. | | | | | | | |
| 1376 | | | | | | | | | | | | |
| 1377 | | | | | | | | | | | | |
| 1378 | Manganese | | | | | | | | | | | |
| 1379 | | | | | | | | | | | | |
| 1380 | | | | | General Statistics | | | | | | | |
| 1381 | | | | | Total Number of Observations | 134 | | | | | Number of Distinct Observations | 129 |
| 1382 | | | | | | | | | | | Number of Missing Observations | 0 |
| 1383 | | | | | Minimum | 0.91 | | | | | Mean | 3924 |
| 1384 | | | | | Maximum | 21000 | | | | | Median | 3165 |
| 1385 | | | | | SD | 3789 | | | | | Std. Error of Mean | 327.3 |
| 1386 | | | | | Coefficient of Variation | 0.966 | | | | | Skewness | 1.553 |
| 1387 | | | | | | | | | | | | |
| 1388 | | | | | Normal GOF Test | | | | | | | |
| 1389 | | | | | Shapiro Wilk Test Statistic | 0.851 | | | | | Shapiro Wilk GOF Test | |
| 1390 | | | | | 5% Shapiro Wilk P Value | 0 | | | | | Data Not Normal at 5% Significance Level | |
| 1391 | | | | | Lilliefors Test Statistic | 0.152 | | | | | Lilliefors GOF Test | |
| 1392 | | | | | 5% Lilliefors Critical Value | 0.0765 | | | | | Data Not Normal at 5% Significance Level | |
| 1393 | | | | | Data Not Normal at 5% Significance Level | | | | | | | |
| 1394 | | | | | | | | | | | | |
| 1395 | | | | | Assuming Normal Distribution | | | | | | | |
| 1396 | | | | | 95% Normal UCL | | | | | | 95% UCLs (Adjusted for Skewness) | |
| 1397 | | | | | 95% Student's-t UCL | 4466 | | | | | 95% Adjusted-CLT UCL (Chen-1995) | 4509 |
| 1398 | | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | 4473 |
| 1399 | | | | | | | | | | | | |
| 1400 | | | | | Gamma GOF Test | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1401 | | | | | A-D Test Statistic | 4.044 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 1402 | | | | | 5% A-D Critical Value | 0.808 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1403 | | | | | K-S Test Statistic | 0.161 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 1404 | | | | | 5% K-S Critical Value | 0.0846 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1405 | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1406 | | | | | | | | | | | | |
| 1407 | **Gamma Statistics** | | | | | | | | | | | |
| 1408 | | | | | k hat (MLE) | 0.622 | | | | k star (bias corrected MLE) | | 0.613 |
| 1409 | | | | | Theta hat (MLE) | 6307 | | | | Theta star (bias corrected MLE) | | 6399 |
| 1410 | | | | | nu hat (MLE) | 166.7 | | | | nu star (bias corrected) | | 164.3 |
| 1411 | | | | | MLE Mean (bias corrected) | 3924 | | | | MLE Sd (bias corrected) | | 5011 |
| 1412 | | | | | | | | | | Approximate Chi Square Value (0.05) | | 135.7 |
| 1413 | | | | | Adjusted Level of Significance | 0.0482 | | | | Adjusted Chi Square Value | | 135.4 |
| 1414 | | | | | | | | | | | | |
| 1415 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 1416 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 4752 | | | | 95% Adjusted Gamma UCL (use when n<50) | | 4762 |
| 1417 | | | | | | | | | | | | |
| 1418 | **Lognormal GOF Test** | | | | | | | | | | | |
| 1419 | | | | | Shapiro Wilk Test Statistic | 0.767 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 1420 | | | | | 5% Shapiro Wilk P Value | 0 | Data Not Lognormal at 5% Significance Level | | | | | |
| 1421 | | | | | Lilliefors Test Statistic | 0.229 | **Lilliefors Lognormal GOF Test** | | | | | |
| 1422 | | | | | 5% Lilliefors Critical Value | 0.0765 | Data Not Lognormal at 5% Significance Level | | | | | |
| 1423 | **Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1424 | | | | | | | | | | | | |
| 1425 | **Lognormal Statistics** | | | | | | | | | | | |
| 1426 | | | | | Minimum of Logged Data | -0.0943 | | | | Mean of logged Data | | 7.287 |
| 1427 | | | | | Maximum of Logged Data | 9.952 | | | | SD of logged Data | | 2.211 |
| 1428 | | | | | | | | | | | | |
| 1429 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 1430 | | | | | 95% H-UCL | 33084 | | | | 90% Chebyshev (MVUE) UCL | | 31240 |
| 1431 | | | | | 95% Chebyshev (MVUE) UCL | 38210 | | | | 97.5% Chebyshev (MVUE) UCL | | 47885 |
| 1432 | | | | | 99% Chebyshev (MVUE) UCL | 66890 | | | | | | |
| 1433 | | | | | | | | | | | | |
| 1434 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1435 | **Data do not follow a Discernible Distribution (0.05)** | | | | | | | | | | | |
| 1436 | | | | | | | | | | | | |
| 1437 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 1438 | | | | | 95% CLT UCL | 4462 | | | | 95% Jackknife UCL | | 4466 |
| 1439 | | | | | 95% Standard Bootstrap UCL | 4452 | | | | 95% Bootstrap-t UCL | | 4524 |
| 1440 | | | | | 95% Hall's Bootstrap UCL | 4520 | | | | 95% Percentile Bootstrap UCL | | 4470 |
| 1441 | | | | | 95% BCA Bootstrap UCL | 4457 | | | | | | |
| 1442 | | | | | 90% Chebyshev(Mean, Sd) UCL | 4906 | | | | 95% Chebyshev(Mean, Sd) UCL | | 5351 |
| 1443 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 5968 | | | | 99% Chebyshev(Mean, Sd) UCL | | 7181 |
| 1444 | | | | | | | | | | | | |
| 1445 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1446 | | | | | 95% Chebyshev (Mean, Sd) UCL | 5351 | | | | | | |
| 1447 | | | | | | | | | | | | |
| 1448 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1449 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 1450 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1451 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1452 | | | | | | | | | | | | |
| 1453 | **Molybdenum** | | | | | | | | | | | |
| 1454 | | | | | | | | | | | | |
| 1455 | **General Statistics** | | | | | | | | | | | |
| 1456 | Total Number of Observations | | | | | 134 | Number of Distinct Observations | | | | | 63 |
| 1457 | Number of Detects | | | | | 71 | Number of Non-Detects | | | | | 63 |
| 1458 | Number of Distinct Detects | | | | | 62 | Number of Distinct Non-Detects | | | | | 3 |
| 1459 | Minimum Detect | | | | | 0.05 | Minimum Non-Detect | | | | | 0.05 |
| 1460 | Maximum Detect | | | | | 10.3 | Maximum Non-Detect | | | | | 2 |
| 1461 | Variance Detects | | | | | 5.806 | Percent Non-Detects | | | | | 47.01% |
| 1462 | Mean Detects | | | | | 1.708 | SD Detects | | | | | 2.41 |
| 1463 | Median Detects | | | | | 0.67 | CV Detects | | | | | 1.411 |
| 1464 | Skewness Detects | | | | | 2.012 | Kurtosis Detects | | | | | 3.599 |
| 1465 | Mean of Logged Detects | | | | | -0.513 | SD of Logged Detects | | | | | 1.593 |
| 1466 | | | | | | | | | | | | |
| 1467 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 1468 | Shapiro Wilk Test Statistic | | | | | 0.701 | **Normal GOF Test on Detected Observations Only** | | | | | |
| 1469 | 5% Shapiro Wilk P Value | | | | | 0 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1470 | Lilliefors Test Statistic | | | | | 0.26 | **Lilliefors GOF Test** | | | | | |
| 1471 | 5% Lilliefors Critical Value | | | | | 0.105 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1472 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 1473 | | | | | | | | | | | | |
| 1474 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 1475 | Mean | | | | | 1.076 | Standard Error of Mean | | | | | 0.168 |
| 1476 | SD | | | | | 1.887 | 95% KM (BCA) UCL | | | | | 1.371 |
| 1477 | 95% KM (t) UCL | | | | | 1.353 | 95% KM (Percentile Bootstrap) UCL | | | | | 1.356 |
| 1478 | 95% KM (z) UCL | | | | | 1.351 | 95% KM Bootstrap t UCL | | | | | 1.423 |
| 1479 | 90% KM Chebyshev UCL | | | | | 1.578 | 95% KM Chebyshev UCL | | | | | 1.806 |
| 1480 | 97.5% KM Chebyshev UCL | | | | | 2.122 | 99% KM Chebyshev UCL | | | | | 2.743 |
| 1481 | | | | | | | | | | | | |
| 1482 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 1483 | A-D Test Statistic | | | | | 1.556 | **Anderson-Darling GOF Test** | | | | | |
| 1484 | 5% A-D Critical Value | | | | | 0.808 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1485 | K-S Test Statistic | | | | | 0.13 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 1486 | 5% K-S Critical Value | | | | | 0.111 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1487 | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1488 | | | | | | | | | | | | |
| 1489 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 1490 | k hat (MLE) | | | | | 0.591 | k star (bias corrected MLE) | | | | | 0.575 |
| 1491 | Theta hat (MLE) | | | | | 2.889 | Theta star (bias corrected MLE) | | | | | 2.968 |
| 1492 | nu hat (MLE) | | | | | 83.92 | nu star (bias corrected) | | | | | 81.71 |
| 1493 | MLE Mean (bias corrected) | | | | | 1.708 | MLE Sd (bias corrected) | | | | | 2.251 |
| 1494 | | | | | | | | | | | | |
| 1495 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 1496 | k hat (KM) | | | | | 0.325 | nu hat (KM) | | | | | 87.13 |
| 1497 | Approximate Chi Square Value (87.13, α) | | | | | 66.61 | Adjusted Chi Square Value (87.13, β) | | | | | 66.42 |
| 1498 | 95% Gamma Approximate KM-UCL (use when n>=50) | | | | | 1.407 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 1.411 |
| 1499 | | | | | | | | | | | | |
| 1500 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1501 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 1502 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 1503 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 1504 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 1505 | | | | | Minimum | 0.01 | | | | Mean | | 1.103 |
| 1506 | | | | | Maximum | 10.3 | | | | Median | | 0.316 |
| 1507 | | | | | SD | 1.913 | | | | CV | | 1.734 |
| 1508 | | | | | k hat (MLE) | 0.399 | | | | k star (bias corrected MLE) | | 0.395 |
| 1509 | | | | | Theta hat (MLE) | 2.766 | | | | Theta star (bias corrected MLE) | | 2.794 |
| 1510 | | | | | nu hat (MLE) | 106.9 | | | | nu star (bias corrected) | | 105.8 |
| 1511 | | | | | MLE Mean (bias corrected) | 1.103 | | | | MLE Sd (bias corrected) | | 1.756 |
| 1512 | | | | | | | | | | Adjusted Level of Significance (β) | | 0.0482 |
| 1513 | | | | | Approximate Chi Square Value (105.84, α) | 83.1 | | | | Adjusted Chi Square Value (105.84, β) | | 82.88 |
| 1514 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 1.405 | | | | 95% Gamma Adjusted UCL (use when n<50) | | 1.409 |
| 1515 | | | | | | | | | | | | |
| 1516 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 1517 | | | | | Lilliefors Test Statistic | 0.127 | **Lilliefors GOF Test** | | | | | |
| 1518 | | | | | 5% Lilliefors Critical Value | 0.105 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 1519 | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1520 | | | | | | | | | | | | |
| 1521 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 1522 | | | | | Mean in Original Scale | 1.065 | | | | Mean in Log Scale | | -1.122 |
| 1523 | | | | | SD in Original Scale | 1.895 | | | | SD in Log Scale | | 1.626 |
| 1524 | | | | | 95% t UCL (assumes normality of ROS data) | 1.336 | | | | 95% Percentile Bootstrap UCL | | 1.359 |
| 1525 | | | | | 95% BCA Bootstrap UCL | 1.395 | | | | 95% Bootstrap t UCL | | 1.394 |
| 1526 | | | | | 95% H-UCL (Log ROS) | 1.82 | | | | | | |
| 1527 | | | | | | | | | | | | |
| 1528 | **DL/2 Statistics** | | | | | | | | | | | |
| 1529 | | | | | **DL/2 Normal** | | **DL/2 Log-Transformed** | | | | | |
| 1530 | | | | | Mean in Original Scale | 1.332 | | | | Mean in Log Scale | | -0.421 |
| 1531 | | | | | SD in Original Scale | 1.804 | | | | SD in Log Scale | | 1.344 |
| 1532 | | | | | 95% t UCL (Assumes normality) | 1.59 | | | | 95% H-Stat UCL | | 2.175 |
| 1533 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 1534 | | | | | | | | | | | | |
| 1535 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1536 | **Data do not follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 1537 | | | | | | | | | | | | |
| 1538 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1539 | | | | | 97.5% KM (Chebyshev) UCL | 2.122 | | | | | | |
| 1540 | | | | | | | | | | | | |
| 1541 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1542 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 1543 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 1544 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1545 | | | | | | | | | | | | |
| 1546 | **Nickel** | | | | | | | | | | | |
| 1547 | | | | | | | | | | | | |
| 1548 | **General Statistics** | | | | | | | | | | | |
| 1549 | | | | | Total Number of Observations | 134 | | | | Number of Distinct Observations | | 119 |
| 1550 | | | | | Number of Detects | 131 | | | | Number of Non-Detects | | 3 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1551 | | | | | Number of Distinct Detects | 118 | | | | | Number of Distinct Non-Detects | 3 |
| 1552 | | | | | Minimum Detect | 0.22 | | | | | Minimum Non-Detect | 0.2 |
| 1553 | | | | | Maximum Detect | 28 | | | | | Maximum Non-Detect | 0.5 |
| 1554 | | | | | Variance Detects | 28.51 | | | | | Percent Non-Detects | 2.239% |
| 1555 | | | | | Mean Detects | 4.046 | | | | | SD Detects | 5.339 |
| 1556 | | | | | Median Detects | 1.59 | | | | | CV Detects | 1.319 |
| 1557 | | | | | Skewness Detects | 2.455 | | | | | Kurtosis Detects | 6.709 |
| 1558 | | | | | Mean of Logged Detects | 0.738 | | | | | SD of Logged Detects | 1.139 |
| 1559 | | | | | | | | | | | | |
| 1560 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 1561 | | | | | Shapiro Wilk Test Statistic | 0.681 | **Normal GOF Test on Detected Observations Only** | | | | | |
| 1562 | | | | | 5% Shapiro Wilk P Value | 0 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1563 | | | | | Lilliefors Test Statistic | 0.237 | **Lilliefors GOF Test** | | | | | |
| 1564 | | | | | 5% Lilliefors Critical Value | 0.0774 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1565 | | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | | |
| 1566 | | | | | | | | | | | | |
| 1567 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |
| 1568 | | | | | Mean | 3.962 | | | | | Standard Error of Mean | 0.459 |
| 1569 | | | | | SD | 5.288 | | | | | 95% KM (BCA) UCL | 4.724 |
| 1570 | | | | | 95% KM (t) UCL | 4.722 | | | | | 95% KM (Percentile Bootstrap) UCL | 4.745 |
| 1571 | | | | | 95% KM (z) UCL | 4.717 | | | | | 95% KM Bootstrap t UCL | 4.878 |
| 1572 | | | | | 90% KM Chebyshev UCL | 5.338 | | | | | 95% KM Chebyshev UCL | 5.961 |
| 1573 | | | | | 97.5% KM Chebyshev UCL | 6.826 | | | | | 99% KM Chebyshev UCL | 8.525 |
| 1574 | | | | | | | | | | | | |
| 1575 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 1576 | | | | | A-D Test Statistic | 3.84 | **Anderson-Darling GOF Test** | | | | | |
| 1577 | | | | | 5% A-D Critical Value | 0.789 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1578 | | | | | K-S Test Statistic | 0.157 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 1579 | | | | | 5% K-S Critical Value | 0.0842 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1580 | | | | | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | |
| 1581 | | | | | | | | | | | | |
| 1582 | | | | | **Gamma Statistics on Detected Data Only** | | | | | | | |
| 1583 | | | | | k hat (MLE) | 0.887 | | | | | k star (bias corrected MLE) | 0.872 |
| 1584 | | | | | Theta hat (MLE) | 4.562 | | | | | Theta star (bias corrected MLE) | 4.641 |
| 1585 | | | | | nu hat (MLE) | 232.4 | | | | | nu star (bias corrected) | 228.4 |
| 1586 | | | | | MLE Mean (bias corrected) | 4.046 | | | | | MLE Sd (bias corrected) | 4.334 |
| 1587 | | | | | | | | | | | | |
| 1588 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 1589 | | | | | k hat (KM) | 0.561 | | | | | nu hat (KM) | 150.5 |
| 1590 | | | | | Approximate Chi Square Value (150.46, α) | 123.1 | | | | | Adjusted Chi Square Value (150.46, β) | 122.8 |
| 1591 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 4.843 | | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | 4.853 |
| 1592 | | | | | | | | | | | | |
| 1593 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 1594 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 1595 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 1596 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 1597 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 1598 | | | | | Minimum | 0.01 | | | | | Mean | 3.956 |
| 1599 | | | | | Maximum | 28 | | | | | Median | 1.575 |
| 1600 | | | | | SD | 5.313 | | | | | CV | 1.343 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1601 | | | | | k hat (MLE) | 0.786 | | | | | k star (bias corrected MLE) | 0.773 |
| 1602 | | | | | Theta hat (MLE) | 5.036 | | | | | Theta star (bias corrected MLE) | 5.118 |
| 1603 | | | | | nu hat (MLE) | 210.5 | | | | | nu star (bias corrected) | 207.2 |
| 1604 | | | | | MLE Mean (bias corrected) | 3.956 | | | | | MLE Sd (bias corrected) | 4.5 |
| 1605 | | | | | | | | | | | Adjusted Level of Significance (β) | 0.0482 |
| 1606 | | | | | Approximate Chi Square Value (207.16, α) | 174.9 | | | | | Adjusted Chi Square Value (207.16, β) | 174.5 |
| 1607 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 4.687 | | | | | 95% Gamma Adjusted UCL (use when n<50) | 4.696 |
| 1608 | | | | | | | | | | | | |
| 1609 | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | | |
| 1610 | | | | | Lilliefors Test Statistic | 0.1 | | | **Lilliefors GOF Test** | | | |
| 1611 | | | | | 5% Lilliefors Critical Value | 0.0774 | | | Detected Data Not Lognormal at 5% Significance Level | | | |
| 1612 | | | | | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | |
| 1613 | | | | | | | | | | | | |
| 1614 | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | |
| 1615 | | | | | Mean in Original Scale | 3.96 | | | | | Mean in Log Scale | 0.681 |
| 1616 | | | | | SD in Original Scale | 5.31 | | | | | SD in Log Scale | 1.188 |
| 1617 | | | | | 95% t UCL (assumes normality of ROS data) | 4.72 | | | | | 95% Percentile Bootstrap UCL | 4.788 |
| 1618 | | | | | 95% BCA Bootstrap UCL | 4.87 | | | | | 95% Bootstrap t UCL | 4.862 |
| 1619 | | | | | 95% H-UCL (Log ROS) | 5.112 | | | | | | |
| 1620 | | | | | | | | | | | | |
| 1621 | | | | | **DL/2 Statistics** | | | | | | | |
| 1622 | | | | | **DL/2 Normal** | | | | **DL/2 Log-Transformed** | | | |
| 1623 | | | | | Mean in Original Scale | 3.96 | | | | | Mean in Log Scale | 0.682 |
| 1624 | | | | | SD in Original Scale | 5.31 | | | | | SD in Log Scale | 1.187 |
| 1625 | | | | | 95% t UCL (Assumes normality) | 4.72 | | | | | 95% H-Stat UCL | 5.102 |
| 1626 | | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | |
| 1627 | | | | | | | | | | | | |
| 1628 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 1629 | | | | | **Data do not follow a Discernible Distribution at 5% Significance Level** | | | | | | | |
| 1630 | | | | | | | | | | | | |
| 1631 | | | | | **Suggested UCL to Use** | | | | | | | |
| 1632 | | | | | 95% KM (Chebyshev) UCL | 5.961 | | | | | | |
| 1633 | | | | | | | | | | | | |
| 1634 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 1635 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 1636 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 1637 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 1638 | | | | | | | | | | | | |
| 1639 | **Selenium** | | | | | | | | | | | |
| 1640 | | | | | | | | | | | | |
| 1641 | | | | | **General Statistics** | | | | | | | |
| 1642 | | | | | Total Number of Observations | 134 | | | | | Number of Distinct Observations | 23 |
| 1643 | | | | | Number of Detects | 29 | | | | | Number of Non-Detects | 105 |
| 1644 | | | | | Number of Distinct Detects | 22 | | | | | Number of Distinct Non-Detects | 3 |
| 1645 | | | | | Minimum Detect | 0.2 | | | | | Minimum Non-Detect | 0.2 |
| 1646 | | | | | Maximum Detect | 0.74 | | | | | Maximum Non-Detect | 2 |
| 1647 | | | | | Variance Detects | 0.019 | | | | | Percent Non-Detects | 78.36% |
| 1648 | | | | | Mean Detects | 0.368 | | | | | SD Detects | 0.138 |
| 1649 | | | | | Median Detects | 0.35 | | | | | CV Detects | 0.375 |
| 1650 | | | | | Skewness Detects | 0.792 | | | | | Kurtosis Detects | 0.217 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1651 | | | | | Mean of Logged Detects | -1.066 | | | | | SD of Logged Detects | 0.365 |
| 1652 | | | | | | | | | | | | |
| 1653 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 1654 | | | | | Shapiro Wilk Test Statistic | 0.919 | **Shapiro Wilk GOF Test** | | | | | |
| 1655 | | | | | 5% Shapiro Wilk Critical Value | 0.926 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1656 | | | | | Lilliefors Test Statistic | 0.14 | **Lilliefors GOF Test** | | | | | |
| 1657 | | | | | 5% Lilliefors Critical Value | 0.165 | Detected Data appear Normal at 5% Significance Level | | | | | |
| 1658 | | | | | **Detected Data appear Approximate Normal at 5% Significance Level** | | | | | | | |
| 1659 | | | | | | | | | | | | |
| 1660 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |
| 1661 | | | | | Mean | 0.299 | Standard Error of Mean | | | | | 0.0174 |
| 1662 | | | | | SD | 0.123 | 95% KM (BCA) UCL | | | | | 0.327 |
| 1663 | | | | | 95% KM (t) UCL | 0.328 | 95% KM (Percentile Bootstrap) UCL | | | | | 0.329 |
| 1664 | | | | | 95% KM (z) UCL | 0.327 | 95% KM Bootstrap t UCL | | | | | 0.33 |
| 1665 | | | | | 90% KM Chebyshev UCL | 0.351 | 95% KM Chebyshev UCL | | | | | 0.375 |
| 1666 | | | | | 97.5% KM Chebyshev UCL | 0.408 | 99% KM Chebyshev UCL | | | | | 0.472 |
| 1667 | | | | | | | | | | | | |
| 1668 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 1669 | | | | | A-D Test Statistic | 0.565 | **Anderson-Darling GOF Test** | | | | | |
| 1670 | | | | | 5% A-D Critical Value | 0.746 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1671 | | | | | K-S Test Statistic | 0.137 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 1672 | | | | | 5% K-S Critical Value | 0.163 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1673 | | | | | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | |
| 1674 | | | | | | | | | | | | |
| 1675 | | | | | **Gamma Statistics on Detected Data Only** | | | | | | | |
| 1676 | | | | | k hat (MLE) | 7.847 | k star (bias corrected MLE) | | | | | 7.058 |
| 1677 | | | | | Theta hat (MLE) | 0.0468 | Theta star (bias corrected MLE) | | | | | 0.0521 |
| 1678 | | | | | nu hat (MLE) | 455.1 | nu star (bias corrected) | | | | | 409.4 |
| 1679 | | | | | MLE Mean (bias corrected) | 0.368 | MLE Sd (bias corrected) | | | | | 0.138 |
| 1680 | | | | | | | | | | | | |
| 1681 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 1682 | | | | | k hat (KM) | 5.869 | nu hat (KM) | | | | | 1573 |
| 1683 | | | | | Approximate Chi Square Value (N/A, α) | 1482 | Adjusted Chi Square Value (N/A, β) | | | | | 1481 |
| 1684 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.317 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 0.317 |
| 1685 | | | | | | | | | | | | |
| 1686 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 1687 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 1688 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 1689 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 1690 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 1691 | | | | | Minimum | 0.01 | Mean | | | | | 0.268 |
| 1692 | | | | | Maximum | 0.74 | Median | | | | | 0.245 |
| 1693 | | | | | SD | 0.155 | CV | | | | | 0.578 |
| 1694 | | | | | k hat (MLE) | 2.289 | k star (bias corrected MLE) | | | | | 2.243 |
| 1695 | | | | | Theta hat (MLE) | 0.117 | Theta star (bias corrected MLE) | | | | | 0.119 |
| 1696 | | | | | nu hat (MLE) | 613.5 | nu star (bias corrected) | | | | | 601.1 |
| 1697 | | | | | MLE Mean (bias corrected) | 0.268 | MLE Sd (bias corrected) | | | | | 0.179 |
| 1698 | | | | | | | Adjusted Level of Significance (β) | | | | | 0.0482 |
| 1699 | | | | | Approximate Chi Square Value (601.11, α) | 545.2 | Adjusted Chi Square Value (601.11, β) | | | | | 544.7 |
| 1700 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.295 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 0.296 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 1701 | | | | | | | | | | | | |
| 1702 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 1703 | | | | | Shapiro Wilk Test Statistic | 0.942 | **Shapiro Wilk GOF Test** | | | | | |
| 1704 | | | | | 5% Shapiro Wilk Critical Value | 0.926 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 1705 | | | | | Lilliefors Test Statistic | 0.127 | **Lilliefors GOF Test** | | | | | |
| 1706 | | | | | 5% Lilliefors Critical Value | 0.165 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 1707 | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1708 | | | | | | | | | | | | |
| 1709 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 1710 | | | | | Mean in Original Scale | 0.282 | | | Mean in Log Scale | | | -1.379 |
| 1711 | | | | | SD in Original Scale | 0.139 | | | SD in Log Scale | | | 0.479 |
| 1712 | | | | | 95% t UCL (assumes normality of ROS data) | 0.302 | | | 95% Percentile Bootstrap UCL | | | 0.302 |
| 1713 | | | | | 95% BCA Bootstrap UCL | 0.302 | | | 95% Bootstrap t UCL | | | 0.305 |
| 1714 | | | | | 95% H-UCL (Log ROS) | 0.304 | | | | | | |
| 1715 | | | | | | | | | | | | |
| 1716 | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | | | | | |
| 1717 | | | | | KM Mean (logged) | -1.278 | | | 95% H-UCL (KM -Log) | | | 0.314 |
| 1718 | | | | | KM SD (logged) | 0.358 | | | 95% Critical H Value (KM-Log) | | | 1.753 |
| 1719 | | | | | KM Standard Error of Mean (logged) | 0.0523 | | | | | | |
| 1720 | | | | | | | | | | | | |
| 1721 | **DL/2 Statistics** | | | | | | | | | | | |
| 1722 | | | | **DL/2 Normal** | | | **DL/2 Log-Transformed** | | | | | |
| 1723 | | | | | Mean in Original Scale | 0.683 | | | Mean in Log Scale | | | -0.631 |
| 1724 | | | | | SD in Original Scale | 0.377 | | | SD in Log Scale | | | 0.802 |
| 1725 | | | | | 95% t UCL (Assumes normality) | 0.736 | | | 95% H-Stat UCL | | | 0.846 |
| 1726 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 1727 | | | | | | | | | | | | |
| 1728 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1729 | **Detected Data appear Approximate Normal Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1730 | | | | | | | | | | | | |
| 1731 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1732 | | | | | 95% KM (t) UCL | 0.328 | | | 95% KM (Percentile Bootstrap) UCL | | | 0.329 |
| 1733 | | | | | | | | | | | | |
| 1734 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1735 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 1736 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 1737 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1738 | | | | | | | | | | | | |
| 1739 | **Silver** | | | | | | | | | | | |
| 1740 | | | | | | | | | | | | |
| 1741 | **General Statistics** | | | | | | | | | | | |
| 1742 | | | | | Total Number of Observations | 134 | | | Number of Distinct Observations | | | 8 |
| 1743 | | | | | Number of Detects | 5 | | | Number of Non-Detects | | | 129 |
| 1744 | | | | | Number of Distinct Detects | 5 | | | Number of Distinct Non-Detects | | | 3 |
| 1745 | | | | | Minimum Detect | 0.0053 | | | Minimum Non-Detect | | | 0.005 |
| 1746 | | | | | Maximum Detect | 0.021 | | | Maximum Non-Detect | | | 0.1 |
| 1747 | | | | | Variance Detects | 4.4458E-5 | | | Percent Non-Detects | | | 96.27% |
| 1748 | | | | | Mean Detects | 0.00916 | | | SD Detects | | | 0.00667 |
| 1749 | | | | | Median Detects | 0.0061 | | | CV Detects | | | 0.728 |
| 1750 | | | | | Skewness Detects | 2.157 | | | Kurtosis Detects | | | 4.701 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 1751 | | | | | Mean of Logged Detects | -4.846 | | | | | SD of Logged Detects | 0.563 |
| 1752 | | | | | | | | | | | | |
| 1753 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 1754 | | | | | Shapiro Wilk Test Statistic | 0.658 | **Shapiro Wilk GOF Test** | | | | | |
| 1755 | | | | | 5% Shapiro Wilk Critical Value | 0.762 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1756 | | | | | Lilliefors Test Statistic | 0.398 | **Lilliefors GOF Test** | | | | | |
| 1757 | | | | | 5% Lilliefors Critical Value | 0.396 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1758 | | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | | |
| 1759 | | | | | | | | | | | | |
| 1760 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |
| 1761 | | | | | Mean | 0.00541 | Standard Error of Mean | | | | | 3.1601E-4 |
| 1762 | | | | | SD | 0.00212 | 95% KM (BCA) UCL | | | | | 0.00598 |
| 1763 | | | | | 95% KM (t) UCL | 0.00594 | 95% KM (Percentile Bootstrap) UCL | | | | | 0.00599 |
| 1764 | | | | | 95% KM (z) UCL | 0.00593 | 95% KM Bootstrap t UCL | | | | | 0.00685 |
| 1765 | | | | | 90% KM Chebyshev UCL | 0.00636 | 95% KM Chebyshev UCL | | | | | 0.00679 |
| 1766 | | | | | 97.5% KM Chebyshev UCL | 0.00739 | 99% KM Chebyshev UCL | | | | | 0.00856 |
| 1767 | | | | | | | | | | | | |
| 1768 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 1769 | | | | | A-D Test Statistic | 0.84 | **Anderson-Darling GOF Test** | | | | | |
| 1770 | | | | | 5% A-D Critical Value | 0.682 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1771 | | | | | K-S Test Statistic | 0.369 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 1772 | | | | | 5% K-S Critical Value | 0.359 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1773 | | | | | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | |
| 1774 | | | | | | | | | | | | |
| 1775 | | | | | **Gamma Statistics on Detected Data Only** | | | | | | | |
| 1776 | | | | | k hat (MLE) | 3.431 | k star (bias corrected MLE) | | | | | 1.506 |
| 1777 | | | | | Theta hat (MLE) | 0.00267 | Theta star (bias corrected MLE) | | | | | 0.00608 |
| 1778 | | | | | nu hat (MLE) | 34.31 | nu star (bias corrected) | | | | | 15.06 |
| 1779 | | | | | MLE Mean (bias corrected) | 0.00916 | MLE Sd (bias corrected) | | | | | 0.00747 |
| 1780 | | | | | | | | | | | | |
| 1781 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 1782 | | | | | k hat (KM) | 6.539 | nu hat (KM) | | | | | 1752 |
| 1783 | | | | | Approximate Chi Square Value (N/A, α) | 1656 | Adjusted Chi Square Value (N/A, β) | | | | | 1655 |
| 1784 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.00573 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 0.00573 |
| 1785 | | | | | | | | | | | | |
| 1786 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 1787 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 1788 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 1789 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 1790 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 1791 | | | | | Minimum | 0.0053 | Mean | | | | | 0.01 |
| 1792 | | | | | Maximum | 0.021 | Median | | | | | 0.01 |
| 1793 | | | | | SD | 0.00135 | CV | | | | | 0.134 |
| 1794 | | | | | k hat (MLE) | 67.25 | k star (bias corrected MLE) | | | | | 65.75 |
| 1795 | | | | | Theta hat (MLE) | 1.4941E-4 | Theta star (bias corrected MLE) | | | | | 1.5282E-4 |
| 1796 | | | | | nu hat (MLE) | 18023 | nu star (bias corrected) | | | | | 17621 |
| 1797 | | | | | MLE Mean (bias corrected) | 0.01 | MLE Sd (bias corrected) | | | | | 0.00124 |
| 1798 | | | | | | | Adjusted Level of Significance (β) | | | | | 0.0482 |
| 1799 | | | | | Approximate Chi Square Value (N/A, α) | 17313 | Adjusted Chi Square Value (N/A, β) | | | | | 17310 |
| 1800 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.0102 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 0.0102 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 1801 | | | | | | | | | | | | |
| 1802 | | | | | | Lognormal GOF Test on Detected Observations Only | | | | | | |
| 1803 | | | | | Shapiro Wilk Test Statistic | 0.745 | Shapiro Wilk GOF Test | | | | | |
| 1804 | | | | | 5% Shapiro Wilk Critical Value | 0.762 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 1805 | | | | | Lilliefors Test Statistic | 0.333 | Lilliefors GOF Test | | | | | |
| 1806 | | | | | 5% Lilliefors Critical Value | 0.396 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 1807 | | | | | Detected Data appear Approximate Lognormal at 5% Significance Level | | | | | | | |
| 1808 | | | | | | | | | | | | |
| 1809 | | | | | Lognormal ROS Statistics Using Imputed Non-Detects | | | | | | | |
| 1810 | | | | | Mean in Original Scale | 0.00203 | Mean in Log Scale | | | | | -6.839 |
| 1811 | | | | | SD in Original Scale | 0.00285 | SD in Log Scale | | | | | 1.143 |
| 1812 | | | | | 95% t UCL (assumes normality of ROS data) | 0.00244 | 95% Percentile Bootstrap UCL | | | | | 0.00246 |
| 1813 | | | | | 95% BCA Bootstrap UCL | 0.00251 | 95% Bootstrap t UCL | | | | | 0.00256 |
| 1814 | | | | | 95% H-UCL (Log ROS) | 0.00259 | | | | | | |
| 1815 | | | | | | | | | | | | |
| 1816 | | | | | UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed | | | | | | | |
| 1817 | | | | | KM Mean (logged) | -5.25 | 95% H-UCL (KM -Log) | | | | | 0.00551 |
| 1818 | | | | | KM SD (logged) | 0.2 | 95% Critical H Value (KM-Log) | | | | | 1.695 |
| 1819 | | | | | KM Standard Error of Mean (logged) | 0.0308 | | | | | | |
| 1820 | | | | | | | | | | | | |
| 1821 | | | | | DL/2 Statistics | | | | | | | |
| 1822 | | | | | DL/2 Normal | | DL/2 Log-Transformed | | | | | |
| 1823 | | | | | Mean in Original Scale | 0.0301 | Mean in Log Scale | | | | | -4.131 |
| 1824 | | | | | SD in Original Scale | 0.0229 | SD in Log Scale | | | | | 1.335 |
| 1825 | | | | | 95% t UCL (Assumes normality) | 0.0334 | 95% H-Stat UCL | | | | | 0.0524 |
| 1826 | | | | | DL/2 is not a recommended method, provided for comparisons and historical reasons | | | | | | | |
| 1827 | | | | | | | | | | | | |
| 1828 | | | | | Nonparametric Distribution Free UCL Statistics | | | | | | | |
| 1829 | | | | | Detected Data appear Approximate Lognormal Distributed at 5% Significance Level | | | | | | | |
| 1830 | | | | | | | | | | | | |
| 1831 | | | | | Suggested UCL to Use | | | | | | | |
| 1832 | | | | | 95% KM (t) UCL | 0.00594 | | | | 95% KM (% Bootstrap) UCL | | 0.00599 |
| 1833 | | | | | | | | | | | | |
| 1834 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 1835 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 1836 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 1837 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 1838 | | | | | | | | | | | | |
| 1839 | | | | | | | | | | | | |
| 1840 | Sodium | | | | | | | | | | | |
| 1841 | | | | | | | | | | | | |
| 1842 | | | | | General Statistics | | | | | | | |
| 1843 | | | | | Total Number of Observations | 134 | Number of Distinct Observations | | | | | 124 |
| 1844 | | | | | | | Number of Missing Observations | | | | | 0 |
| 1845 | | | | | Minimum | 29500 | Mean | | | | | 1845940 |
| 1846 | | | | | Maximum | 7380000 | Median | | | | | 1035000 |
| 1847 | | | | | SD | 1875691 | Std. Error of Mean | | | | | 162035 |
| 1848 | | | | | Coefficient of Variation | 1.016 | Skewness | | | | | 1.233 |
| 1849 | | | | | | | | | | | | |
| 1850 | | | | | Normal GOF Test | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 1851 | | | | | Shapiro Wilk Test Statistic | 0.817 | **Shapiro Wilk GOF Test** | | | | | |
| 1852 | | | | | 5% Shapiro Wilk P Value | 0 | Data Not Normal at 5% Significance Level | | | | | |
| 1853 | | | | | Lilliefors Test Statistic | 0.174 | **Lilliefors GOF Test** | | | | | |
| 1854 | | | | | 5% Lilliefors Critical Value | 0.0765 | Data Not Normal at 5% Significance Level | | | | | |
| 1855 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 1856 | | | | | | | | | | | | |
| 1857 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 1858 | **95% Normal UCL** | | | | | | **95% UCLs (Adjusted for Skewness)** | | | | | |
| 1859 | | | | | 95% Student's-t UCL | 2114334 | | | | 95% Adjusted-CLT UCL (Chen-1995) | | 2130913 |
| 1860 | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | | 2117211 |
| 1861 | | | | | | | | | | | | |
| 1862 | **Gamma GOF Test** | | | | | | | | | | | |
| 1863 | | | | | A-D Test Statistic | 0.832 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 1864 | | | | | 5% A-D Critical Value | 0.787 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1865 | | | | | K-S Test Statistic | 0.072 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 1866 | | | | | 5% K-S Critical Value | 0.0833 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1867 | **Detected data follow Appr. Gamma Distribution at 5% Significance Level** | | | | | | | | | | | |
| 1868 | | | | | | | | | | | | |
| 1869 | **Gamma Statistics** | | | | | | | | | | | |
| 1870 | | | | | k hat (MLE) | 0.919 | | | | k star (bias corrected MLE) | | 0.904 |
| 1871 | | | | | Theta hat (MLE) | 2007620 | | | | Theta star (bias corrected MLE) | | 2042293 |
| 1872 | | | | | nu hat (MLE) | 246.4 | | | | nu star (bias corrected) | | 242.2 |
| 1873 | | | | | MLE Mean (bias corrected) | 1845940 | | | | MLE Sd (bias corrected) | | 1941636 |
| 1874 | | | | | | | | | | Approximate Chi Square Value (0.05) | | 207.2 |
| 1875 | | | | | Adjusted Level of Significance | 0.0482 | | | | Adjusted Chi Square Value | | 206.9 |
| 1876 | | | | | | | | | | | | |
| 1877 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 1878 | | | | | 95% Approximate Gamma UCL (use when n>=50) | 2158038 | | | | 95% Adjusted Gamma UCL (use when n<50) | | 2161680 |
| 1879 | | | | | | | | | | | | |
| 1880 | **Lognormal GOF Test** | | | | | | | | | | | |
| 1881 | | | | | Shapiro Wilk Test Statistic | 0.949 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 1882 | | | | | 5% Shapiro Wilk P Value | 1.6734E-4 | Data Not Lognormal at 5% Significance Level | | | | | |
| 1883 | | | | | Lilliefors Test Statistic | 0.0631 | **Lilliefors Lognormal GOF Test** | | | | | |
| 1884 | | | | | 5% Lilliefors Critical Value | 0.0765 | Data appear Lognormal at 5% Significance Level | | | | | |
| 1885 | **Data appear Approximate Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1886 | | | | | | | | | | | | |
| 1887 | **Lognormal Statistics** | | | | | | | | | | | |
| 1888 | | | | | Minimum of Logged Data | 10.29 | | | | Mean of logged Data | | 13.79 |
| 1889 | | | | | Maximum of Logged Data | 15.81 | | | | SD of logged Data | | 1.281 |
| 1890 | | | | | | | | | | | | |
| 1891 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 1892 | | | | | 95% H-UCL | 2921950 | | | | 90% Chebyshev (MVUE) UCL | | 3156700 |
| 1893 | | | | | 95% Chebyshev (MVUE) UCL | 3590679 | | | | 97.5% Chebyshev (MVUE) UCL | | 4193025 |
| 1894 | | | | | 99% Chebyshev (MVUE) UCL | 5376216 | | | | | | |
| 1895 | | | | | | | | | | | | |
| 1896 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1897 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 1898 | | | | | | | | | | | | |
| 1899 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 1900 | | | | | 95% CLT UCL | 2112464 | | | | 95% Jackknife UCL | | 2114334 |

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| 1901 | | | | | 95% Standard Bootstrap UCL | 2112662 | | | | | 95% Bootstrap-t UCL | 2138335 |
| 1902 | | | | | 95% Hall's Bootstrap UCL | 2134195 | | | | | 95% Percentile Bootstrap UCL | 2118338 |
| 1903 | | | | | 95% BCA Bootstrap UCL | 2107699 | | | | | | |
| 1904 | | | | | 90% Chebyshev(Mean, Sd) UCL | 2332045 | | | | | 95% Chebyshev(Mean, Sd) UCL | 2552235 |
| 1905 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 2857849 | | | | | 99% Chebyshev(Mean, Sd) UCL | 3458169 |
| 1906 | | | | | | | | | | | | |
| 1907 | | | | | **Suggested UCL to Use** | | | | | | | |
| 1908 | | | | | 95% Approximate Gamma UCL | 2158038 | | | | | | |
| 1909 | | | | | | | | | | | | |
| 1910 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 1911 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | |
| 1912 | | | | | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | |
| 1913 | | | | | For additional insight the user may want to consult a statistician. | | | | | | | |
| 1914 | | | | | | | | | | | | |
| 1915 | **Thallium** | | | | | | | | | | | |
| 1916 | | | | | | | | | | | | |
| 1917 | | | | | **General Statistics** | | | | | | | |
| 1918 | | | | | Total Number of Observations | 134 | | | | | Number of Distinct Observations | 38 |
| 1919 | | | | | Number of Detects | 36 | | | | | Number of Non-Detects | 98 |
| 1920 | | | | | Number of Distinct Detects | 36 | | | | | Number of Distinct Non-Detects | 3 |
| 1921 | | | | | Minimum Detect | 0.002 | | | | | Minimum Non-Detect | 0.002 |
| 1922 | | | | | Maximum Detect | 0.355 | | | | | Maximum Non-Detect | 0.05 |
| 1923 | | | | | Variance Detects | 0.00573 | | | | | Percent Non-Detects | 73.13% |
| 1924 | | | | | Mean Detects | 0.0635 | | | | | SD Detects | 0.0757 |
| 1925 | | | | | Median Detects | 0.0515 | | | | | CV Detects | 1.193 |
| 1926 | | | | | Skewness Detects | 2.336 | | | | | Kurtosis Detects | 6.688 |
| 1927 | | | | | Mean of Logged Detects | -3.552 | | | | | SD of Logged Detects | 1.47 |
| 1928 | | | | | | | | | | | | |
| 1929 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 1930 | | | | | Shapiro Wilk Test Statistic | 0.745 | **Shapiro Wilk GOF Test** | | | | | |
| 1931 | | | | | 5% Shapiro Wilk Critical Value | 0.935 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1932 | | | | | Lilliefors Test Statistic | 0.208 | **Lilliefors GOF Test** | | | | | |
| 1933 | | | | | 5% Lilliefors Critical Value | 0.148 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 1934 | | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | | |
| 1935 | | | | | | | | | | | | |
| 1936 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |
| 1937 | | | | | Mean | 0.0199 | | | | | Standard Error of Mean | 0.00418 |
| 1938 | | | | | SD | 0.0472 | | | | | 95% KM (BCA) UCL | 0.0279 |
| 1939 | | | | | 95% KM (t) UCL | 0.0268 | | | | | 95% KM (Percentile Bootstrap) UCL | 0.0272 |
| 1940 | | | | | 95% KM (z) UCL | 0.0268 | | | | | 95% KM Bootstrap t UCL | 0.03 |
| 1941 | | | | | 90% KM Chebyshev UCL | 0.0324 | | | | | 95% KM Chebyshev UCL | 0.0381 |
| 1942 | | | | | 97.5% KM Chebyshev UCL | 0.046 | | | | | 99% KM Chebyshev UCL | 0.0615 |
| 1943 | | | | | | | | | | | | |
| 1944 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 1945 | | | | | A-D Test Statistic | 0.674 | **Anderson-Darling GOF Test** | | | | | |
| 1946 | | | | | 5% A-D Critical Value | 0.788 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1947 | | | | | K-S Test Statistic | 0.13 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 1948 | | | | | 5% K-S Critical Value | 0.153 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1949 | | | | | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | |
| 1950 | | | | | | | | | | | | |

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| 1951 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 1952 | | | | | k hat (MLE) | 0.753 | k star (bias corrected MLE) | | | | | 0.709 |
| 1953 | | | | | Theta hat (MLE) | 0.0843 | Theta star (bias corrected MLE) | | | | | 0.0895 |
| 1954 | | | | | nu hat (MLE) | 54.22 | nu star (bias corrected) | | | | | 51.03 |
| 1955 | | | | | MLE Mean (bias corrected) | 0.0635 | MLE Sd (bias corrected) | | | | | 0.0754 |
| 1956 | | | | | | | | | | | | |
| 1957 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 1958 | | | | | k hat (KM) | 0.178 | nu hat (KM) | | | | | 47.64 |
| 1959 | | | | | Approximate Chi Square Value (47.64, α) | 32.8 | Adjusted Chi Square Value (47.64, β) | | | | | 32.67 |
| 1960 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.0289 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 0.029 |
| 1961 | | | | | | | | | | | | |
| 1962 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 1963 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 1964 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 1965 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 1966 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 1967 | | | | | Minimum | 0.002 | Mean | | | | | 0.0252 |
| 1968 | | | | | Maximum | 0.355 | Median | | | | | 0.01 |
| 1969 | | | | | SD | 0.0455 | CV | | | | | 1.805 |
| 1970 | | | | | k hat (MLE) | 0.972 | k star (bias corrected MLE) | | | | | 0.955 |
| 1971 | | | | | Theta hat (MLE) | 0.0259 | Theta star (bias corrected MLE) | | | | | 0.0264 |
| 1972 | | | | | nu hat (MLE) | 260.6 | nu star (bias corrected) | | | | | 256.1 |
| 1973 | | | | | MLE Mean (bias corrected) | 0.0252 | MLE Sd (bias corrected) | | | | | 0.0258 |
| 1974 | | | | | | | Adjusted Level of Significance (β) | | | | | 0.0482 |
| 1975 | | | | | Approximate Chi Square Value (256.06, α) | 220 | Adjusted Chi Square Value (256.06, β) | | | | | 219.6 |
| 1976 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.0293 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 0.0294 |
| 1977 | | | | | | | | | | | | |
| 1978 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 1979 | | | | | Shapiro Wilk Test Statistic | 0.918 | **Shapiro Wilk GOF Test** | | | | | |
| 1980 | | | | | 5% Shapiro Wilk Critical Value | 0.935 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 1981 | | | | | Lilliefors Test Statistic | 0.18 | **Lilliefors GOF Test** | | | | | |
| 1982 | | | | | 5% Lilliefors Critical Value | 0.148 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 1983 | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1984 | | | | | | | | | | | | |
| 1985 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 1986 | | | | | Mean in Original Scale | 0.0189 | Mean in Log Scale | | | | | -6.219 |
| 1987 | | | | | SD in Original Scale | 0.0475 | SD in Log Scale | | | | | 2.339 |
| 1988 | | | | | 95% t UCL (assumes normality of ROS data) | 0.0257 | 95% Percentile Bootstrap UCL | | | | | 0.026 |
| 1989 | | | | | 95% BCA Bootstrap UCL | 0.0273 | 95% Bootstrap t UCL | | | | | 0.0295 |
| 1990 | | | | | 95% H-UCL (Log ROS) | 0.0649 | | | | | | |
| 1991 | | | | | | | | | | | | |
| 1992 | **DL/2 Statistics** | | | | | | | | | | | |
| 1993 | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | | | | | |
| 1994 | | | | | Mean in Original Scale | 0.0285 | Mean in Log Scale | | | | | -4.511 |
| 1995 | | | | | SD in Original Scale | 0.0454 | SD in Log Scale | | | | | 1.575 |
| 1996 | | | | | 95% t UCL (Assumes normality) | 0.035 | 95% H-Stat UCL | | | | | 0.0555 |
| 1997 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 1998 | | | | | | | | | | | | |
| 1999 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 2000 | **Detected Data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |

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| 2001 | | | | | | | | | | | | |
| 2002 | **Suggested UCL to Use** | | | | | | | | | | | |
| 2003 | | | | | 95% KM (t) UCL | 0.0268 | | | 95% GROS Approximate Gamma UCL | | | 0.0293 |
| 2004 | | | | | 95% Approximate Gamma KM-UCL | 0.0289 | | | | | | |
| 2005 | | | | | | | | | | | | |
| 2006 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 2007 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 2008 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 2009 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 2010 | | | | | | | | | | | | |
| 2011 | **Titanium** | | | | | | | | | | | |
| 2012 | | | | | | | | | | | | |
| 2013 | **General Statistics** | | | | | | | | | | | |
| 2014 | | | | | Total Number of Observations | 134 | | | Number of Distinct Observations | | | 37 |
| 2015 | | | | | Number of Detects | 37 | | | Number of Non-Detects | | | 97 |
| 2016 | | | | | Number of Distinct Detects | 34 | | | Number of Distinct Non-Detects | | | 3 |
| 2017 | | | | | Minimum Detect | 0.23 | | | Minimum Non-Detect | | | 0.2 |
| 2018 | | | | | Maximum Detect | 2.32 | | | Maximum Non-Detect | | | 5 |
| 2019 | | | | | Variance Detects | 0.328 | | | Percent Non-Detects | | | 72.39% |
| 2020 | | | | | Mean Detects | 1.078 | | | SD Detects | | | 0.573 |
| 2021 | | | | | Median Detects | 0.92 | | | CV Detects | | | 0.531 |
| 2022 | | | | | Skewness Detects | 0.946 | | | Kurtosis Detects | | | -0.0892 |
| 2023 | | | | | Mean of Logged Detects | -0.0596 | | | SD of Logged Detects | | | 0.536 |
| 2024 | | | | | | | | | | | | |
| 2025 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 2026 | | | | | Shapiro Wilk Test Statistic | 0.879 | | | **Shapiro Wilk GOF Test** | | | |
| 2027 | | | | | 5% Shapiro Wilk Critical Value | 0.936 | | | Detected Data Not Normal at 5% Significance Level | | | |
| 2028 | | | | | Lilliefors Test Statistic | 0.196 | | | **Lilliefors GOF Test** | | | |
| 2029 | | | | | 5% Lilliefors Critical Value | 0.146 | | | Detected Data Not Normal at 5% Significance Level | | | |
| 2030 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 2031 | | | | | | | | | | | | |
| 2032 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 2033 | | | | | Mean | 0.764 | | | Standard Error of Mean | | | 0.082 |
| 2034 | | | | | SD | 0.615 | | | 95% KM (BCA) UCL | | | 0.889 |
| 2035 | | | | | 95% KM (t) UCL | 0.899 | | | 95% KM (Percentile Bootstrap) UCL | | | 0.908 |
| 2036 | | | | | 95% KM (z) UCL | 0.899 | | | 95% KM Bootstrap t UCL | | | 0.911 |
| 2037 | | | | | 90% KM Chebyshev UCL | 1.01 | | | 95% KM Chebyshev UCL | | | 1.121 |
| 2038 | | | | | 97.5% KM Chebyshev UCL | 1.276 | | | 99% KM Chebyshev UCL | | | 1.579 |
| 2039 | | | | | | | | | | | | |
| 2040 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 2041 | | | | | A-D Test Statistic | 0.66 | | | **Anderson-Darling GOF Test** | | | |
| 2042 | | | | | 5% A-D Critical Value | 0.753 | | | Detected data appear Gamma Distributed at 5% Significance Level | | | |
| 2043 | | | | | K-S Test Statistic | 0.135 | | | **Kolmogrov-Smirnoff GOF** | | | |
| 2044 | | | | | 5% K-S Critical Value | 0.146 | | | Detected data appear Gamma Distributed at 5% Significance Level | | | |
| 2045 | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 2046 | | | | | | | | | | | | |
| 2047 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 2048 | | | | | k hat (MLE) | 3.867 | | | k star (bias corrected MLE) | | | 3.571 |
| 2049 | | | | | Theta hat (MLE) | 0.279 | | | Theta star (bias corrected MLE) | | | 0.302 |
| 2050 | | | | | nu hat (MLE) | 286.2 | | | nu star (bias corrected) | | | 264.3 |

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| 2051 | | | | | MLE Mean (bias corrected) | 1.078 | | | | MLE Sd (bias corrected) | | 0.57 |
| 2052 | | | | | | | | | | | | |
| 2053 | | | | | Gamma Kaplan-Meier (KM) Statistics | | | | | | | |
| 2054 | | | | | k hat (KM) | 1.543 | | | | nu hat (KM) | | 413.4 |
| 2055 | | | | | Approximate Chi Square Value (413.42, α) | 367.3 | | | | Adjusted Chi Square Value (413.42, β) | | 366.8 |
| 2056 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.86 | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | 0.861 |
| 2057 | | | | | | | | | | | | |
| 2058 | | | | | Gamma ROS Statistics using Imputed Non-Detects | | | | | | | |
| 2059 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 2060 | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | |
| 2061 | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | |
| 2062 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 2063 | | | | | Minimum | 0.01 | | | | Mean | | 0.731 |
| 2064 | | | | | Maximum | 2.778 | | | | Median | | 0.614 |
| 2065 | | | | | SD | 0.65 | | | | CV | | 0.89 |
| 2066 | | | | | k hat (MLE) | 0.752 | | | | k star (bias corrected MLE) | | 0.74 |
| 2067 | | | | | Theta hat (MLE) | 0.972 | | | | Theta star (bias corrected MLE) | | 0.988 |
| 2068 | | | | | nu hat (MLE) | 201.5 | | | | nu star (bias corrected) | | 198.3 |
| 2069 | | | | | MLE Mean (bias corrected) | 0.731 | | | | MLE Sd (bias corrected) | | 0.85 |
| 2070 | | | | | | | | | | Adjusted Level of Significance (β) | | 0.0482 |
| 2071 | | | | | Approximate Chi Square Value (198.34, α) | 166.8 | | | | Adjusted Chi Square Value (198.34, β) | | 166.4 |
| 2072 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.869 | | | | 95% Gamma Adjusted UCL (use when n<50) | | 0.871 |
| 2073 | | | | | | | | | | | | |
| 2074 | | | | | Lognormal GOF Test on Detected Observations Only | | | | | | | |
| 2075 | | | | | Shapiro Wilk Test Statistic | 0.963 | | | | Shapiro Wilk GOF Test | | |
| 2076 | | | | | 5% Shapiro Wilk Critical Value | 0.936 | | | | Detected Data appear Lognormal at 5% Significance Level | | |
| 2077 | | | | | Lilliefors Test Statistic | 0.0999 | | | | Lilliefors GOF Test | | |
| 2078 | | | | | 5% Lilliefors Critical Value | 0.146 | | | | Detected Data appear Lognormal at 5% Significance Level | | |
| 2079 | | | | | Detected Data appear Lognormal at 5% Significance Level | | | | | | | |
| 2080 | | | | | | | | | | | | |
| 2081 | | | | | Lognormal ROS Statistics Using Imputed Non-Detects | | | | | | | |
| 2082 | | | | | Mean in Original Scale | 0.793 | | | | Mean in Log Scale | | -0.52 |
| 2083 | | | | | SD in Original Scale | 0.634 | | | | SD in Log Scale | | 0.776 |
| 2084 | | | | | 95% t UCL (assumes normality of ROS data) | 0.884 | | | | 95% Percentile Bootstrap UCL | | 0.889 |
| 2085 | | | | | 95% BCA Bootstrap UCL | 0.898 | | | | 95% Bootstrap t UCL | | 0.896 |
| 2086 | | | | | 95% H-UCL (Log ROS) | 0.919 | | | | | | |
| 2087 | | | | | | | | | | | | |
| 2088 | | | | | UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed | | | | | | | |
| 2089 | | | | | KM Mean (logged) | -0.607 | | | | 95% H-UCL (KM -Log) | | 0.905 |
| 2090 | | | | | KM SD (logged) | 0.844 | | | | 95% Critical H Value (KM-Log) | | 2.061 |
| 2091 | | | | | KM Standard Error of Mean (logged) | 0.113 | | | | | | |
| 2092 | | | | | | | | | | | | |
| 2093 | | | | | DL/2 Statistics | | | | | | | |
| 2094 | | | | | DL/2 Normal | | | | | DL/2 Log-Transformed | | |
| 2095 | | | | | Mean in Original Scale | 1.74 | | | | Mean in Log Scale | | 0.204 |
| 2096 | | | | | SD in Original Scale | 0.968 | | | | SD in Log Scale | | 1.053 |
| 2097 | | | | | 95% t UCL (Assumes normality) | 1.879 | | | | 95% H-Stat UCL | | 2.621 |
| 2098 | | | | | DL/2 is not a recommended method, provided for comparisons and historical reasons | | | | | | | |
| 2099 | | | | | | | | | | | | |
| 2100 | | | | | Nonparametric Distribution Free UCL Statistics | | | | | | | |

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| 2101 | **Detected Data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 2102 | | | | | | | | | | | | |
| 2103 | **Suggested UCL to Use** | | | | | | | | | | | |
| 2104 | | | | | 95% KM (t) UCL | 0.899 | | | 95% GROS Approximate Gamma UCL | | | 0.869 |
| 2105 | | | | | 95% Approximate Gamma KM-UCL | 0.86 | | | | | | |
| 2106 | | | | | | | | | | | | |
| 2107 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 2108 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 2109 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 2110 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 2111 | | | | | | | | | | | | |
| 2112 | | | | | | | | | | | | |
| 2113 | **Uranium** | | | | | | | | | | | |
| 2114 | | | | | | | | | | | | |
| 2115 | **General Statistics** | | | | | | | | | | | |
| 2116 | | | | | Total Number of Observations | 134 | | | Number of Distinct Observations | | | 130 |
| 2117 | | | | | | | | | Number of Missing Observations | | | 0 |
| 2118 | | | | | Minimum | 0.0051 | | | Mean | | | 1.027 |
| 2119 | | | | | Maximum | 9.78 | | | Median | | | 0.246 |
| 2120 | | | | | SD | 1.842 | | | Std. Error of Mean | | | 0.159 |
| 2121 | | | | | Coefficient of Variation | 1.792 | | | Skewness | | | 3.153 |
| 2122 | | | | | | | | | | | | |
| 2123 | **Normal GOF Test** | | | | | | | | | | | |
| 2124 | | | | | Shapiro Wilk Test Statistic | 0.569 | | | **Shapiro Wilk GOF Test** | | | |
| 2125 | | | | | 5% Shapiro Wilk P Value | 0 | | | Data Not Normal at 5% Significance Level | | | |
| 2126 | | | | | Lilliefors Test Statistic | 0.289 | | | **Lilliefors GOF Test** | | | |
| 2127 | | | | | 5% Lilliefors Critical Value | 0.0765 | | | Data Not Normal at 5% Significance Level | | | |
| 2128 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 2129 | | | | | | | | | | | | |
| 2130 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 2131 | | | | | **95% Normal UCL** | | | | **95% UCLs (Adjusted for Skewness)** | | | |
| 2132 | | | | | 95% Student's-t UCL | 1.291 | | | 95% Adjusted-CLT UCL (Chen-1995) | | | 1.335 |
| 2133 | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | | | 1.298 |
| 2134 | | | | | | | | | | | | |
| 2135 | **Gamma GOF Test** | | | | | | | | | | | |
| 2136 | | | | | A-D Test Statistic | 3.111 | | | **Anderson-Darling Gamma GOF Test** | | | |
| 2137 | | | | | 5% A-D Critical Value | 0.819 | | | Data Not Gamma Distributed at 5% Significance Level | | | |
| 2138 | | | | | K-S Test Statistic | 0.14 | | | **Kolmogrov-Smirnoff Gamma GOF Test** | | | |
| 2139 | | | | | 5% K-S Critical Value | 0.0853 | | | Data Not Gamma Distributed at 5% Significance Level | | | |
| 2140 | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 2141 | | | | | | | | | | | | |
| 2142 | **Gamma Statistics** | | | | | | | | | | | |
| 2143 | | | | | k hat (MLE) | 0.506 | | | k star (bias corrected MLE) | | | 0.5 |
| 2144 | | | | | Theta hat (MLE) | 2.029 | | | Theta star (bias corrected MLE) | | | 2.054 |
| 2145 | | | | | nu hat (MLE) | 135.7 | | | nu star (bias corrected) | | | 134 |
| 2146 | | | | | MLE Mean (bias corrected) | 1.027 | | | MLE Sd (bias corrected) | | | 1.453 |
| 2147 | | | | | | | | | Approximate Chi Square Value (0.05) | | | 108.3 |
| 2148 | | | | | Adjusted Level of Significance | 0.0482 | | | Adjusted Chi Square Value | | | 108 |
| 2149 | | | | | | | | | | | | |
| 2150 | **Assuming Gamma Distribution** | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2151 | 95% Approximate Gamma UCL (use when n>=50)) | | | | | 1.272 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 1.275 |
| 2152 | | | | | | | | | | | | |
| 2153 | **Lognormal GOF Test** | | | | | | | | | | | |
| 2154 | Shapiro Wilk Test Statistic | | | | | 0.966 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 2155 | 5% Shapiro Wilk P Value | | | | | 0.0257 | Data Not Lognormal at 5% Significance Level | | | | | |
| 2156 | Lilliefors Test Statistic | | | | | 0.0709 | **Lilliefors Lognormal GOF Test** | | | | | |
| 2157 | 5% Lilliefors Critical Value | | | | | 0.0765 | Data appear Lognormal at 5% Significance Level | | | | | |
| 2158 | **Data appear Approximate Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 2159 | | | | | | | | | | | | |
| 2160 | **Lognormal Statistics** | | | | | | | | | | | |
| 2161 | Minimum of Logged Data | | | | | -5.279 | Mean of logged Data | | | | | -1.225 |
| 2162 | Maximum of Logged Data | | | | | 2.28 | SD of logged Data | | | | | 1.711 |
| 2163 | | | | | | | | | | | | |
| 2164 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 2165 | 95% H-UCL | | | | | 1.962 | 90% Chebyshev (MVUE) UCL | | | | | 2.056 |
| 2166 | 95% Chebyshev (MVUE) UCL | | | | | 2.427 | 97.5% Chebyshev (MVUE) UCL | | | | | 2.942 |
| 2167 | 99% Chebyshev (MVUE) UCL | | | | | 3.953 | | | | | | |
| 2168 | | | | | | | | | | | | |
| 2169 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 2170 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 2171 | | | | | | | | | | | | |
| 2172 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 2173 | 95% CLT UCL | | | | | 1.289 | 95% Jackknife UCL | | | | | 1.291 |
| 2174 | 95% Standard Bootstrap UCL | | | | | 1.288 | 95% Bootstrap-t UCL | | | | | 1.369 |
| 2175 | 95% Hall's Bootstrap UCL | | | | | 1.34 | 95% Percentile Bootstrap UCL | | | | | 1.302 |
| 2176 | 95% BCA Bootstrap UCL | | | | | 1.335 | | | | | | |
| 2177 | 90% Chebyshev(Mean, Sd) UCL | | | | | 1.505 | 95% Chebyshev(Mean, Sd) UCL | | | | | 1.721 |
| 2178 | 97.5% Chebyshev(Mean, Sd) UCL | | | | | 2.021 | 99% Chebyshev(Mean, Sd) UCL | | | | | 2.61 |
| 2179 | | | | | | | | | | | | |
| 2180 | **Suggested UCL to Use** | | | | | | | | | | | |
| 2181 | 95% Chebyshev (Mean, Sd) UCL | | | | | 1.721 | | | | | | |
| 2182 | | | | | | | | | | | | |
| 2183 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 2184 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 2185 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |
| 2186 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 2187 | | | | | | | | | | | | |
| 2188 | **Vanadium** | | | | | | | | | | | |
| 2189 | | | | | | | | | | | | |
| 2190 | **General Statistics** | | | | | | | | | | | |
| 2191 | Total Number of Observations | | | | | 134 | Number of Distinct Observations | | | | | 98 |
| 2192 | Number of Detects | | | | | 102 | Number of Non-Detects | | | | | 32 |
| 2193 | Number of Distinct Detects | | | | | 98 | Number of Distinct Non-Detects | | | | | 1 |
| 2194 | Minimum Detect | | | | | 0.139 | Minimum Non-Detect | | | | | 0.5 |
| 2195 | Maximum Detect | | | | | 5.75 | Maximum Non-Detect | | | | | 0.5 |
| 2196 | Variance Detects | | | | | 2.186 | Percent Non-Detects | | | | | 23.88% |
| 2197 | Mean Detects | | | | | 1.972 | SD Detects | | | | | 1.479 |
| 2198 | Median Detects | | | | | 1.645 | CV Detects | | | | | 0.75 |
| 2199 | Skewness Detects | | | | | 0.512 | Kurtosis Detects | | | | | -0.92 |
| 2200 | Mean of Logged Detects | | | | | 0.282 | SD of Logged Detects | | | | | 1.012 |

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| 2201 | | | | | | | | | | | | |
| 2202 | | | | | | Normal GOF Test on Detects Only | | | | | | |
| 2203 | | | | | Shapiro Wilk Test Statistic | 0.901 | Normal GOF Test on Detected Observations Only | | | | | |
| 2204 | | | | | 5% Shapiro Wilk P Value | 5.9806E-9 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 2205 | | | | | Lilliefors Test Statistic | 0.144 | Lilliefors GOF Test | | | | | |
| 2206 | | | | | 5% Lilliefors Critical Value | 0.0877 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 2207 | | | | | | Detected Data Not Normal at 5% Significance Level | | | | | | |
| 2208 | | | | | | | | | | | | |
| 2209 | | | | | | Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs | | | | | | |
| 2210 | | | | | Mean | 1.56 | | | Standard Error of Mean | | | 0.129 |
| 2211 | | | | | SD | 1.481 | | | 95% KM (BCA) UCL | | | 1.772 |
| 2212 | | | | | 95% KM (t) UCL | 1.773 | | | 95% KM (Percentile Bootstrap) UCL | | | 1.781 |
| 2213 | | | | | 95% KM (z) UCL | 1.771 | | | 95% KM Bootstrap t UCL | | | 1.778 |
| 2214 | | | | | 90% KM Chebyshev UCL | 1.946 | | | 95% KM Chebyshev UCL | | | 2.121 |
| 2215 | | | | | 97.5% KM Chebyshev UCL | 2.363 | | | 99% KM Chebyshev UCL | | | 2.84 |
| 2216 | | | | | | | | | | | | |
| 2217 | | | | | | Gamma GOF Tests on Detected Observations Only | | | | | | |
| 2218 | | | | | A-D Test Statistic | 1.477 | Anderson-Darling GOF Test | | | | | |
| 2219 | | | | | 5% A-D Critical Value | 0.772 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 2220 | | | | | K-S Test Statistic | 0.0982 | Kolmogrov-Smirnoff GOF | | | | | |
| 2221 | | | | | 5% K-S Critical Value | 0.0908 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 2222 | | | | | | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | | |
| 2223 | | | | | | | | | | | | |
| 2224 | | | | | | Gamma Statistics on Detected Data Only | | | | | | |
| 2225 | | | | | k hat (MLE) | 1.401 | | | k star (bias corrected MLE) | | | 1.367 |
| 2226 | | | | | Theta hat (MLE) | 1.408 | | | Theta star (bias corrected MLE) | | | 1.443 |
| 2227 | | | | | nu hat (MLE) | 285.9 | | | nu star (bias corrected) | | | 278.8 |
| 2228 | | | | | MLE Mean (bias corrected) | 1.972 | | | MLE Sd (bias corrected) | | | 1.687 |
| 2229 | | | | | | | | | | | | |
| 2230 | | | | | | Gamma Kaplan-Meier (KM) Statistics | | | | | | |
| 2231 | | | | | k hat (KM) | 1.11 | | | nu hat (KM) | | | 297.4 |
| 2232 | | | | | Approximate Chi Square Value (297.37, α) | 258.4 | | | Adjusted Chi Square Value (297.37, β) | | | 258 |
| 2233 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 1.795 | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | | 1.797 |
| 2234 | | | | | | | | | | | | |
| 2235 | | | | | | Gamma ROS Statistics using Imputed Non-Detects | | | | | | |
| 2236 | | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | |
| 2237 | | | | | | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | |
| 2238 | | | | | | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | |
| 2239 | | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | |
| 2240 | | | | | Minimum | 0.01 | | | Mean | | | 1.582 |
| 2241 | | | | | Maximum | 5.75 | | | Median | | | 0.91 |
| 2242 | | | | | SD | 1.471 | | | CV | | | 0.93 |
| 2243 | | | | | k hat (MLE) | 0.912 | | | k star (bias corrected MLE) | | | 0.897 |
| 2244 | | | | | Theta hat (MLE) | 1.734 | | | Theta star (bias corrected MLE) | | | 1.764 |
| 2245 | | | | | nu hat (MLE) | 244.5 | | | nu star (bias corrected) | | | 240.3 |
| 2246 | | | | | MLE Mean (bias corrected) | 1.582 | | | MLE Sd (bias corrected) | | | 1.671 |
| 2247 | | | | | | | | | Adjusted Level of Significance (β) | | | 0.0482 |
| 2248 | | | | | Approximate Chi Square Value (240.31, α) | 205.4 | | | Adjusted Chi Square Value (240.31, β) | | | 205.1 |
| 2249 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 1.851 | | | 95% Gamma Adjusted UCL (use when n<50) | | | 1.854 |
| 2250 | | | | | | | | | | | | |

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| 2251 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 2252 | | | | | Lilliefors Test Statistic | 0.125 | **Lilliefors GOF Test** | | | | | |
| 2253 | | | | | 5% Lilliefors Critical Value | 0.0877 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 2254 | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 2255 | | | | | | | | | | | | |
| 2256 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 2257 | | | | | Mean in Original Scale | 1.579 | | | | Mean in Log Scale | | -0.0869 |
| 2258 | | | | | SD in Original Scale | 1.471 | | | | SD in Log Scale | | 1.135 |
| 2259 | | | | | 95% t UCL (assumes normality of ROS data) | 1.789 | | | | 95% Percentile Bootstrap UCL | | 1.784 |
| 2260 | | | | | 95% BCA Bootstrap UCL | 1.81 | | | | 95% Bootstrap t UCL | | 1.799 |
| 2261 | | | | | 95% H-UCL (Log ROS) | 2.195 | | | | | | |
| 2262 | | | | | | | | | | | | |
| 2263 | **DL/2 Statistics** | | | | | | | | | | | |
| 2264 | | | | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | | |
| 2265 | | | | | Mean in Original Scale | 1.561 | | | | Mean in Log Scale | | -0.117 |
| 2266 | | | | | SD in Original Scale | 1.484 | | | | SD in Log Scale | | 1.134 |
| 2267 | | | | | 95% t UCL (Assumes normality) | 1.774 | | | | 95% H-Stat UCL | | 2.128 |
| 2268 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 2269 | | | | | | | | | | | | |
| 2270 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 2271 | **Data do not follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 2272 | | | | | | | | | | | | |
| 2273 | **Suggested UCL to Use** | | | | | | | | | | | |
| 2274 | | | | | 95% KM (Chebyshev) UCL | 2.121 | | | | | | |
| 2275 | | | | | | | | | | | | |
| 2276 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 2277 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 2278 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 2279 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 2280 | | | | | | | | | | | | |
| 2281 | **Zinc** | | | | | | | | | | | |
| 2282 | | | | | | | | | | | | |
| 2283 | **General Statistics** | | | | | | | | | | | |
| 2284 | | | | | Total Number of Observations | 134 | | | | Number of Distinct Observations | | 91 |
| 2285 | | | | | Number of Detects | 115 | | | | Number of Non-Detects | | 19 |
| 2286 | | | | | Number of Distinct Detects | 89 | | | | Number of Distinct Non-Detects | | 3 |
| 2287 | | | | | Minimum Detect | 1.2 | | | | Minimum Non-Detect | | 1 |
| 2288 | | | | | Maximum Detect | 886 | | | | Maximum Non-Detect | | 3 |
| 2289 | | | | | Variance Detects | 8696 | | | | Percent Non-Detects | | 14.18% |
| 2290 | | | | | Mean Detects | 30.82 | | | | SD Detects | | 93.25 |
| 2291 | | | | | Median Detects | 8.4 | | | | CV Detects | | 3.026 |
| 2292 | | | | | Skewness Detects | 7.436 | | | | Kurtosis Detects | | 64.1 |
| 2293 | | | | | Mean of Logged Detects | 2.335 | | | | SD of Logged Detects | | 1.252 |
| 2294 | | | | | | | | | | | | |
| 2295 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 2296 | | | | | Shapiro Wilk Test Statistic | 0.319 | **Normal GOF Test on Detected Observations Only** | | | | | |
| 2297 | | | | | 5% Shapiro Wilk P Value | 0 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 2298 | | | | | Lilliefors Test Statistic | 0.375 | **Lilliefors GOF Test** | | | | | |
| 2299 | | | | | 5% Lilliefors Critical Value | 0.0826 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 2300 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | | |

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| 2301 | | | | | | | | | | | | |
| 2302 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 2303 | | | | | Mean | 26.68 | | | Standard Error of Mean | | | 7.515 |
| 2304 | | | | | SD | 86.61 | | | 95% KM (BCA) UCL | | | 40.81 |
| 2305 | | | | | 95% KM (t) UCL | 39.13 | | | 95% KM (Percentile Bootstrap) UCL | | | 40.49 |
| 2306 | | | | | 95% KM (z) UCL | 39.04 | | | 95% KM Bootstrap t UCL | | | 57.55 |
| 2307 | | | | | 90% KM Chebyshev UCL | 49.23 | | | 95% KM Chebyshev UCL | | | 59.44 |
| 2308 | | | | | 97.5% KM Chebyshev UCL | 73.61 | | | 99% KM Chebyshev UCL | | | 101.5 |
| 2309 | | | | | | | | | | | | |
| 2310 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 2311 | | | | | A-D Test Statistic | 8.396 | **Anderson-Darling GOF Test** | | | | | |
| 2312 | | | | | 5% A-D Critical Value | 0.812 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 2313 | | | | | K-S Test Statistic | 0.218 | **Kolmogrov-Smirnoff GOF** | | | | | |
| 2314 | | | | | 5% K-S Critical Value | 0.0901 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 2315 | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 2316 | | | | | | | | | | | | |
| 2317 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 2318 | | | | | k hat (MLE) | 0.57 | | | k star (bias corrected MLE) | | | 0.561 |
| 2319 | | | | | Theta hat (MLE) | 54.09 | | | Theta star (bias corrected MLE) | | | 54.96 |
| 2320 | | | | | nu hat (MLE) | 131 | | | nu star (bias corrected) | | | 129 |
| 2321 | | | | | MLE Mean (bias corrected) | 30.82 | | | MLE Sd (bias corrected) | | | 41.16 |
| 2322 | | | | | | | | | | | | |
| 2323 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 2324 | | | | | k hat (KM) | 0.0949 | | | nu hat (KM) | | | 25.44 |
| 2325 | | | | | Approximate Chi Square Value (25.44, α) | 14.95 | | | Adjusted Chi Square Value (25.44, β) | | | 14.86 |
| 2326 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 45.41 | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | | 45.68 |
| 2327 | Gamma (KM) may not be used when k hat (KM) is < 0.1 | | | | | | | | | | | |
| 2328 | | | | | | | | | | | | |
| 2329 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 2330 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 2331 | GROS may not be used when kstar of detected data is small such as < 0.1 | | | | | | | | | | | |
| 2332 | For such situations, GROS method tends to yield inflated values of UCLs and BTVs | | | | | | | | | | | |
| 2333 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 2334 | | | | | Minimum | 0.01 | | | Mean | | | 26.45 |
| 2335 | | | | | Maximum | 886 | | | Median | | | 6.6 |
| 2336 | | | | | SD | 87.01 | | | CV | | | 3.29 |
| 2337 | | | | | k hat (MLE) | 0.35 | | | k star (bias corrected MLE) | | | 0.347 |
| 2338 | | | | | Theta hat (MLE) | 75.66 | | | Theta star (bias corrected MLE) | | | 76.29 |
| 2339 | | | | | nu hat (MLE) | 93.68 | | | nu star (bias corrected) | | | 92.92 |
| 2340 | | | | | MLE Mean (bias corrected) | 26.45 | | | MLE Sd (bias corrected) | | | 44.92 |
| 2341 | | | | | | | | | Adjusted Level of Significance (β) | | | 0.0482 |
| 2342 | | | | | Approximate Chi Square Value (92.92, α) | 71.69 | | | Adjusted Chi Square Value (92.92, β) | | | 71.48 |
| 2343 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 34.28 | | | 95% Gamma Adjusted UCL (use when n<50) | | | 34.38 |
| 2344 | | | | | | | | | | | | |
| 2345 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 2346 | | | | | Lilliefors Test Statistic | 0.0814 | **Lilliefors GOF Test** | | | | | |
| 2347 | | | | | 5% Lilliefors Critical Value | 0.0826 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 2348 | **Detected Data appear Approximate Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 2349 | | | | | | | | | | | | |
| 2350 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2351 | | | | | Mean in Original Scale | 26.62 | | | | | Mean in Log Scale | 2.008 |
| 2352 | | | | | SD in Original Scale | 86.96 | | | | | SD in Log Scale | 1.434 |
| 2353 | | | | 95% t UCL (assumes normality of ROS data) | | 39.06 | | | | | 95% Percentile Bootstrap UCL | 41.2 |
| 2354 | | | | | 95% BCA Bootstrap UCL | 46.92 | | | | | 95% Bootstrap t UCL | 55.23 |
| 2355 | | | | | 95% H-UCL (Log ROS) | 28.87 | | | | | | |
| 2356 | | | | | | | | | | | | |
| 2357 | | | | **UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed** | | | | | | | | |
| 2358 | | | | | KM Mean (logged) | 2.07 | | | | | 95% H-UCL (KM -Log) | 25.71 |
| 2359 | | | | | KM SD (logged) | 1.332 | | | | | 95% Critical H Value (KM-Log) | 2.515 |
| 2360 | | | | | KM Standard Error of Mean (logged) | 0.116 | | | | | | |
| 2361 | | | | | | | | | | | | |
| 2362 | | | | | **DL/2 Statistics** | | | | | | | |
| 2363 | | | | **DL/2 Normal** | | | | | **DL/2 Log-Transformed** | | | |
| 2364 | | | | | Mean in Original Scale | 26.64 | | | | | Mean in Log Scale | 2.044 |
| 2365 | | | | | SD in Original Scale | 86.95 | | | | | SD in Log Scale | 1.368 |
| 2366 | | | | | 95% t UCL (Assumes normality) | 39.08 | | | | | 95% H-Stat UCL | 26.63 |
| 2367 | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | |
| 2368 | | | | | | | | | | | | |
| 2369 | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | |
| 2370 | | | | **Detected Data appear Approximate Lognormal Distributed at 5% Significance Level** | | | | | | | | |
| 2371 | | | | | | | | | | | | |
| 2372 | | | | **Suggested UCL to Use** | | | | | | | | |
| 2373 | | | | | 95% KM (Chebyshev) UCL | 59.44 | | | | | | |
| 2374 | | | | | | | | | | | | |
| 2375 | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | |
| 2376 | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | |
| 2377 | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | |
| 2378 | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | |
| 2379 | | | | | | | | | | | | |

From File: Dissolved Metals Input.wst

Summary Statistics for Raw Full Data Sets

| Variable | NumObs | Minimum | Maximum | Mean | Median | Variance | SD | MAD/0.675 | Skewness | Kurtosis | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_Aluminum | 16 | 0.724 | 58.7 | 12.65 | 5.4 | 351.6 | 18.75 | 4.103 | 2.121 | 3.469 | 1.483 |
| LnROS_Antimony | 16 | 0.0709 | 0.733 | 0.277 | 0.229 | 0.0328 | 0.181 | 0.156 | 1.16 | 1.17 | 0.653 |
| LnROS_Arsenic | 16 | 0.286 | 1.098 | 0.598 | 0.563 | 0.0495 | 0.223 | 0.233 | 0.649 | 0.106 | 0.372 |
| LnROS_Barium | 16 | 1.282 | 64 | 31.87 | 39.4 | 586 | 24.21 | 30.39 | -0.118 | -1.801 | 0.76 |
| LnROS_Beryllium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Bismuth | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Boron | 16 | 67.6 | 3560 | 1702 | 1825 | 1340208 | 1158 | 1260 | 0.00842 | -1.337 | 0.68 |
| LnROS_Cadmium | 16 | 0.00911 | 0.274 | 0.0823 | 0.073 | 0.00555 | 0.0745 | 0.0827 | 1.13 | 1.315 | 0.905 |
| LnROS_Calcium | 16 | 6420 | 358000 | 176726 | 200500 | 1.59E+10 | 126094 | 147517 | -0.124 | -1.526 | 0.714 |
| LnROS_Cesium | 16 | 0.00612 | 0.0237 | 0.0129 | 0.0132 | 2.329E-05 | 0.00483 | 0.00483 | 0.555 | 0.134 | 0.374 |
| LnROS_Chromium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Cobalt | 16 | 0.118 | 1.51 | 0.529 | 0.476 | 0.136 | 0.369 | 0.277 | 1.321 | 2.259 | 0.697 |
| LnROS_Copper | 16 | 0.55 | 16.2 | 2.389 | 1.4 | 14.03 | 3.746 | 0.549 | 3.784 | 14.72 | 1.568 |
| LnROS_Gallium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Iron | 16 | 6.573 | 1940 | 412 | 227.5 | 270633 | 520.2 | 307.3 | 1.841 | 4.056 | 1.263 |
| LnROS_Lead | 16 | 0.0324 | 0.33 | 0.108 | 0.0882 | 0.00566 | 0.0752 | 0.0563 | 1.869 | 4.289 | 0.695 |
| LnROS_Lithium | 16 | 3.1 | 116 | 61.71 | 65 | 1602 | 40.03 | 63.75 | -0.0871 | -1.636 | 0.649 |
| LnROS_Magnesium | 16 | 8010 | 931000 | 446213 | 483000 | 1.126E+11 | 335543 | 401779 | -0.0411 | -1.565 | 0.752 |
| LnROS_Manganese | 16 | 0.37 | 562 | 186.8 | 172 | 26085 | 161.5 | 127.3 | 1.105 | 1.023 | 0.864 |
| LnROS_Molybdenum | 16 | 0.589 | 5.1 | 2.613 | 2.65 | 1.302 | 1.141 | 0.882 | 0.157 | 0.423 | 0.437 |
| LnROS_Nickel | 16 | 0.411 | 3.19 | 1.529 | 1.32 | 0.835 | 0.914 | 1.06 | 0.506 | -1.02 | 0.597 |
| LnROS_Phosphorus | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Potassium | 16 | 5200 | 279000 | 133806 | 138500 | 9.262E+09 | 96240 | 117865 | 0.0101 | -1.468 | 0.719 |
| LnROS_Rhenium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Rubidium | 16 | 1.75 | 79.3 | 40.64 | 42.15 | 832.9 | 28.86 | 40.09 | -0.0352 | -1.672 | 0.71 |
| LnROS_Selenium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Silicon | 16 | 2210 | 4730 | 2980 | 2885 | 415560 | 644.6 | 607.9 | 1.301 | 2.436 | 0.216 |
| LnROS_Silver | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Sodium | 16 | 79800 | 7790000 | 3649644 | 3845000 | 7.288E+12 | 2699594 | 3254262 | 0.0002629 | -1.443 | 0.74 |
| LnROS_Strontium | 16 | 63 | 6210 | 2959 | 3270 | 4849082 | 2202 | 3143 | -0.0415 | -1.506 | 0.744 |
| LnROS_Tellurium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Thallium | 16 | 0.0003914 | 0.075 | 0.0135 | 0.0038 | 0.0005301 | 0.023 | 0.00417 | 2.314 | 4.305 | 1.701 |
| LnROS_Thorium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Tin | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Titanium | 16 | 0.151 | 6.1 | 1.234 | 0.746 | 2.177 | 1.476 | 0.667 | 2.673 | 8.254 | 1.196 |
| LnROS_Tungsten | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Uranium | 16 | 0.075 | 1.83 | 0.814 | 0.8 | 0.344 | 0.586 | 0.737 | 0.34 | -0.967 | 0.72 |
| LnROS_Vanadium | 16 | 0.241 | 0.98 | 0.452 | 0.431 | 0.0315 | 0.178 | 0.147 | 1.797 | 4.608 | 0.393 |
| LnROS_Yttrium | 16 | 0.0334 | 0.146 | 0.0759 | 0.0662 | 0.00107 | 0.0328 | 0.0248 | 0.867 | -0.145 | 0.432 |
| LnROS_Zinc | 16 | 2.2 | 36.6 | 12.39 | 10.25 | 100.2 | 10.01 | 6.746 | 1.321 | 1.098 | 0.808 |

Percentiles for Raw Full Data Sets

| Variable | NumObs | 5%ile | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | 99%ile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_Aluminum | 16 | 1.092 | 1.472 | 2.305 | 2.796 | 5.4 | 10.2 | 18.6 | 39.45 | 58.33 | 58.63 |
| LnROS_Antimony | 16 | 0.0919 | 0.112 | 0.125 | 0.142 | 0.229 | 0.362 | 0.417 | 0.482 | 0.578 | 0.702 |
| LnROS_Arsenic | 16 | 0.331 | 0.348 | 0.396 | 0.431 | 0.563 | 0.728 | 0.78 | 0.85 | 0.954 | 1.069 |
| LnROS_Barium | 16 | 2.008 | 2.4 | 3.44 | 5.098 | 39.4 | 53.93 | 57.3 | 59.55 | 61.15 | 63.43 |
| LnROS_Beryllium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Bismuth | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Boron | 16 | 121.9 | 281 | 427 | 527.5 | 1825 | 2485 | 2530 | 3095 | 3418 | 3532 |
| LnROS_Cadmium | 16 | 0.0094 | 0.0114 | 0.0154 | 0.0207 | 0.073 | 0.128 | 0.131 | 0.158 | 0.189 | 0.257 |
| LnROS_Calcium | 16 | 13830 | 18450 | 24600 | 34425 | 200500 | 288250 | 292000 | 325000 | 348250 | 356050 |
| LnROS_Cesium | 16 | 0.00656 | 0.00706 | 0.00849 | 0.00924 | 0.0132 | 0.0155 | 0.016 | 0.0183 | 0.0206 | 0.0231 |
| LnROS_Chromium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Cobalt | 16 | 0.118 | 0.119 | 0.281 | 0.293 | 0.476 | 0.648 | 0.732 | 0.905 | 1.173 | 1.443 |
| LnROS_Copper | 16 | 0.625 | 0.785 | 0.98 | 1.183 | 1.4 | 1.748 | 1.83 | 2.78 | 6.72 | 14.3 |
| LnROS_Gallium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Iron | 16 | 11.76 | 14.47 | 25 | 34 | 227.5 | 767 | 782 | 832.5 | 1141 | 1780 |
| LnROS_Lead | 16 | 0.0406 | 0.0445 | 0.0529 | 0.0601 | 0.0882 | 0.135 | 0.153 | 0.179 | 0.225 | 0.309 |
| LnROS_Lithium | 16 | 11.81 | 14.76 | 16.4 | 18.65 | 65 | 94.25 | 107 | 109 | 110.8 | 115 |
| LnROS_Magnesium | 16 | 10928 | 28700 | 68200 | 79150 | 483000 | 735000 | 741000 | 845500 | 925750 | 929950 |
| LnROS_Manganese | 16 | 2.943 | 10.25 | 53.3 | 74.83 | 172 | 226.8 | 247 | 401 | 508.8 | 551.4 |
| LnROS_Molybdenum | 16 | 0.877 | 1.092 | 2 | 2.038 | 2.65 | 3.21 | 3.24 | 3.725 | 4.2 | 4.92 |
| LnROS_Nickel | 16 | 0.411 | 0.47 | 0.68 | 0.785 | 1.32 | 2.348 | 2.49 | 2.79 | 2.905 | 3.133 |
| LnROS_Phosphorus | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Potassium | 16 | 6550 | 17200 | 27900 | 29025 | 138500 | 213250 | 217000 | 247500 | 276750 | 278550 |
| LnROS_Rhenium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Rubidium | 16 | 3.397 | 6.313 | 8.9 | 9.065 | 42.15 | 63.13 | 63.2 | 77.95 | 79.23 | 79.29 |
| LnROS_Selenium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Silicon | 16 | 2240 | 2305 | 2480 | 2488 | 2885 | 3308 | 3330 | 3555 | 3973 | 4579 |
| LnROS_Silver | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Sodium | 16 | 84075 | 336250 | 660000 | 661500 | 3845000 | 5885000 | 5960000 | 6835000 | 7610000 | 7754000 |
| LnROS_Strontium | 16 | 109.5 | 218 | 455 | 475.3 | 3270 | 4565 | 5090 | 5730 | 5880 | 6144 |
| LnROS_Tellurium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Thallium | 16 | 0.000698 | 0.0009893 | 0.00132 | 0.00183 | 0.0038 | 0.01 | 0.0124 | 0.0431 | 0.069 | 0.0738 |
| LnROS_Thorium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Tin | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Titanium | 16 | 0.217 | 0.251 | 0.33 | 0.406 | 0.746 | 1.471 | 1.793 | 2.309 | 3.413 | 5.563 |
| LnROS_Tungsten | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Uranium | 16 | 0.099 | 0.114 | 0.193 | 0.225 | 0.8 | 1.14 | 1.23 | 1.675 | 1.725 | 1.809 |
| LnROS_Vanadium | 16 | 0.272 | 0.286 | 0.315 | 0.337 | 0.431 | 0.514 | 0.543 | 0.595 | 0.718 | 0.928 |
| LnROS_Yttrium | 16 | 0.0393 | 0.0445 | 0.053 | 0.053 | 0.0662 | 0.0934 | 0.102 | 0.123 | 0.132 | 0.143 |
| LnROS_Zinc | 16 | 2.215 | 2.76 | 4.1 | 6.5 | 10.25 | 13.4 | 16.4 | 27.5 | 30.23 | 35.33 |

## General UCL Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| From File | Dissolved Metals Input.wst |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**Aluminum**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 10 |
| Number of Distinct Detected Data | 8 | Number of Non-Detect Data | 6 |
| | | Percent Non-Detects | 37.50% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 4.2 | Minimum Detected | 1.435 |
| Maximum Detected | 58.7 | Maximum Detected | 4.072 |
| Mean of Detected | 18.97 | Mean of Detected | 2.433 |
| SD of Detected | 21.61 | SD of Detected | 1.015 |
| Minimum Non-Detect | 5 | Minimum Non-Detect | 1.609 |
| Maximum Non-Detect | 5 | Maximum Non-Detect | 1.609 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.684 | Shapiro Wilk Test Statistic | 0.812 |
| 5% Shapiro Wilk Critical Value | 0.842 | 5% Shapiro Wilk Critical Value | 0.842 |
| 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 | 12.79 | Mean | 1.864 |
| SD | 18.65 | SD | 1.092 |
| 95% DL/2 (t) UCL | 20.97 | 95% H-Stat (DL/2) UCL | 26.16 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 4.531 | Mean in Log Scale | 1.749 |
| SD | 26.28 | SD in Log Scale | 1.253 |
| 95% MLE (t) UCL | 16.05 | Mean in Original Scale | 12.65 |
| 95% MLE (Tiku) UCL | 17.92 | SD in Original Scale | 18.75 |
| | | 95% t UCL | 20.86 |
| | | 95% Percentile Bootstrap UCL | 20.83 |
| | | 95% BCA Bootstrap UCL | 23.36 |
| | | 95% H UCL | 34.55 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 0.849 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 22.35 | |
| nu star | 16.97 | |
| | | |
| A-D Test Statistic | 1.06 | **Nonparametric Statistics** |
| 5% A-D Critical Value | 0.746 | Kaplan-Meier (KM) Method |
| K-S Test Statistic | 0.746 | Mean 13.43 |

| | |
|---|---|
| 5% K-S Critical Value | 0.273 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 58.7 |
| Mean | 11.86 |
| Median | 5.4 |
| SD | 19.24 |
| k star | 0.146 |
| Theta star | 81.33 |
| Nu star | 4.665 |
| AppChi2 | 1.001 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 55.27 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 67.03 |

Note: DL/2 is not a recommended method.

| | |
|---|---|
| SD | 17.71 |
| SE of Mean | 4.667 |
| 95% KM (t) UCL | 21.61 |
| 95% KM (z) UCL | 21.11 |
| 95% KM (jackknife) UCL | 21.14 |
| 95% KM (bootstrap t) UCL | 37.85 |
| 95% KM (BCA) UCL | 22.09 |
| 95% KM (Percentile Bootstrap) UCL | 21.36 |
| 95% KM (Chebyshev) UCL | 33.78 |
| 97.5% KM (Chebyshev) UCL | 42.58 |
| 99% KM (Chebyshev) UCL | 59.87 |

**Potential UCLs to Use**

| | |
|---|---|
| 97.5% KM (Chebyshev) UCL | 42.58 |

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

**Antimony**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 4 |
| Number of Distinct Detected Data | 4 | Number of Non-Detect Data | 12 |
| | | Percent Non-Detects | 75.00% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.125 | Minimum Detected | -2.079 |
| Maximum Detected | 0.439 | Maximum Detected | -0.823 |
| Mean of Detected | 0.262 | Mean of Detected | -1.478 |
| SD of Detected | 0.151 | SD of Detected | 0.614 |
| Minimum Non-Detect | 0.5 | Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | 0.5 | Maximum Non-Detect | -0.693 |

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 | 0.891 | Shapiro Wilk Test Statistic | 0.886 |
| 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 | 0.253 |
| SD | 0.0678 |
| 95% DL/2 (t) UCL | 0.283 |

| | |
|---|---|
| Mean | -1.409 |
| SD | 0.278 |
| 95% H-Stat (DL/2) UCL | 0.29 |

| | |
|---|---|
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE method failed to converge properly**

| | |
|---|---|
| Log ROS Method | |
| Mean in Log Scale | -1.478 |
| SD in Log Scale | 0.656 |
| Mean in Original Scale | 0.277 |
| SD in Original Scale | 0.181 |
| 95% t UCL | 0.357 |
| 95% Percentile Bootstrap UCL | 0.357 |
| 95% BCA Bootstrap UCL | 0.365 |
| 95% H-UCL | 0.412 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 1.118 |
| Theta Star | 0.234 |
| nu star | 8.945 |
| A-D Test Statistic | 0.401 |
| 5% A-D Critical Value | 0.659 |
| K-S Test Statistic | 0.659 |
| 5% K-S Critical Value | 0.396 |

Data appear Gamma Distributed at 5% Significance Level

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Assuming Gamma Distribution**

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | 0.014 |
| Maximum | 0.496 |
| Mean | 0.261 |
| Median | 0.263 |
| SD | 0.151 |
| k star | 1.672 |
| Theta star | 0.156 |
| Nu star | 53.52 |
| AppChi2 | 37.71 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.37 |
| 95% Adjusted Gamma UCL (Use when n < 40) | N/A |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.262 |
| SD | 0.131 |
| SE of Mean | 0.0756 |
| 95% KM (t) UCL | 0.394 |
| 95% KM (z) UCL | 0.386 |
| 95% KM (jackknife) UCL | 0.41 |
| 95% KM (bootstrap t) UCL | 0.427 |
| 95% KM (BCA) UCL | 0.387 |
| 95% KM (Percentile Bootstrap) UCL | 0.387 |
| 95% KM (Chebyshev) UCL | 0.591 |
| 97.5% KM (Chebyshev) UCL | 0.734 |
| 99% KM (Chebyshev) UCL | 1.014 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.394 |
| 95% KM (Percentile Bootstrap) UCL | 0.387 |

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 Data | 16 |
| Number of Distinct Detected Data | 4 |

| | |
|---|---|
| Number of Detected Data | 4 |
| Number of Non-Detect Data | 12 |
| Percent Non-Detects | 75.00% |

**Raw Statistics**

| | |
|---|---|
| Minimum Detected | 0.35 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum Detected | -1.05 |

| | | | |
|---|---|---|---|
| Maximum Detected | 0.78 | Maximum Detected | -0.248 |
| Mean of Detected | 0.585 | Mean of Detected | -0.579 |
| SD of Detected | 0.185 | SD of Detected | 0.348 |
| Minimum Non-Detect | 2 | Minimum Non-Detect | 0.693 |
| Maximum Non-Detect | 2 | Maximum Non-Detect | 0.693 |

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**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.983 |
| 5% Shapiro Wilk Critical Value | 0.748 |

Data appear Normal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.896 |
| SD | 0.203 |
| 95% DL/2 (t) UCL | 0.985 |
| Maximum Likelihood Estimate(MLE) Method | N/A |

MLE method failed to converge properly

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.946 |
| 5% Shapiro Wilk Critical Value | 0.748 |

Data appear Lognormal at 5% Significance Level

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -0.145 |
| SD | 0.302 |
| 95% H-Stat (DL/2) UCL | 1.048 |
| Log ROS Method | |
| Mean in Log Scale | -0.579 |
| SD in Log Scale | 0.377 |
| Mean in Original Scale | 0.598 |
| SD in Original Scale | 0.223 |
| 95% t UCL | 0.696 |
| 95% Percentile Bootstrap UCL | 0.69 |
| 95% BCA Bootstrap UCL | 0.697 |
| 95% H-UCL | 0.726 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 3.146 |
| Theta Star | 0.186 |
| nu star | 25.17 |
| A-D Test Statistic | 0.257 |
| 5% A-D Critical Value | 0.657 |
| K-S Test Statistic | 0.657 |
| 5% K-S Critical Value | 0.395 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.174 |
| Maximum | 0.844 |
| Mean | 0.575 |
| Median | 0.605 |
| SD | 0.198 |

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.585 |
| SD | 0.16 |
| SE of Mean | 0.0923 |
| 95% KM (t) UCL | 0.747 |
| 95% KM (z) UCL | 0.737 |
| 95% KM (jackknife) UCL | 0.766 |
| 95% KM (bootstrap t) UCL | 0.764 |
| 95% KM (BCA) UCL | 0.722 |
| 95% KM (Percentile Bootstrap) UCL | 0.725 |
| 95% KM (Chebyshev) UCL | 0.987 |
| 97.5% KM (Chebyshev) UCL | 1.161 |

| | | | |
|---|---|---|---|
| k star | 5.672 | 99% KM (Chebyshev) UCL | 1.504 |
| Theta star | 0.101 | | |
| Nu star | 181.5 | **Potential UCLs to Use** | |
| AppChi2 | 151.4 | 95% KM (t) UCL | 0.747 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.69 | 95% KM (Percentile Bootstrap) UCL | 0.725 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 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.

**Barium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 15 |
| Number of Distinct Detected Data | 15 | Number of Non-Detect Data | 1 |
| | | Percent Non-Detects | 6.25% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 2.25 | Minimum Detected | 0.811 |
| Maximum Detected | 64 | Maximum Detected | 4.159 |
| Mean of Detected | 33.91 | Mean of Detected | 3.038 |
| SD of Detected | 23.59 | SD of Detected | 1.25 |
| Minimum Non-Detect | 1 | Minimum Non-Detect | 0 |
| Maximum Non-Detect | 1 | Maximum Non-Detect | 0 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.871 | Shapiro Wilk Test Statistic | 0.8 |
| 5% Shapiro Wilk Critical Value | 0.881 | 5% 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 | |
|---|---|---|---|
| DL/2 Substitution Method | | DL/2 Substitution Method | |
| Mean | 31.82 | Mean | 2.805 |
| SD | 24.27 | SD | 1.526 |
| 95% DL/2 (t) UCL | 42.46 | 95% H-Stat (DL/2) UCL | 217.7 |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 31.1 | Mean in Log Scale | 2.864 |
| SD | 24.73 | SD in Log Scale | 1.394 |
| 95% MLE (t) UCL | 41.94 | Mean in Original Scale | 31.87 |
| 95% MLE (Tiku) UCL | 41.78 | SD in Original Scale | 24.21 |
| | | 95% t UCL | 42.48 |
| | | 95% Percentile Bootstrap UCL | 41.17 |
| | | 95% BCA Bootstrap UCL | 40.8 |
| | | 95% H UCL | 155.1 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 0.98 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 34.61 | |

| | |
|---|---|
| nu star | 29.39 |

| | |
|---|---|
| A-D Test Statistic | 1.104 |
| 5% A-D Critical Value | 0.76 |
| K-S Test Statistic | 0.76 |
| 5% K-S Critical Value | 0.227 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 64 |
| Mean | 31.79 |
| Median | 39.4 |
| SD | 24.32 |
| k star | 0.399 |
| Theta star | 79.68 |
| Nu star | 12.77 |
| AppChi2 | 5.735 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 70.75 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 77.92 |

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 31.93 |
| SD | 23.36 |
| SE of Mean | 6.045 |
| 95% KM (t) UCL | 42.52 |
| 95% KM (z) UCL | 41.87 |
| 95% KM (jackknife) UCL | 42.49 |
| 95% KM (bootstrap t) UCL | 42.09 |
| 95% KM (BCA) UCL | 41.58 |
| 95% KM (Percentile Bootstrap) UCL | 41.46 |
| 95% KM (Chebyshev) UCL | 58.28 |
| 97.5% KM (Chebyshev) UCL | 69.68 |
| 99% KM (Chebyshev) UCL | 92.07 |

**Potential UCLs to Use**

| | |
|---|---|
| 97.5% KM (Chebyshev) UCL | 69.68 |

Warning: Recommended UCL exceeds the maximum observation

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.

**Beryllium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 1 |
| Number of Distinct Detected Data | 1 | Number of Non-Detect Data | 15 |
| | | Percent Non-Detects | 93.75% |

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 Beryllium was not processed!

**Bismuth**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 15 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 15 |
| | | 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 Bismuth was not processed!

Boron

### General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Observations | 16 | Number of Distinct Observations | 16 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 67.6 | Minimum of Log Data | 4.214 |
| Maximum | 3560 | Maximum of Log Data | 8.178 |
| Mean | 1702 | Mean of log Data | 7.014 |
| Geometric Mean | 1112 | SD of log Data | 1.181 |
| Median | 1825 | | |
| SD | 1158 | | |
| Std. Error of Mean | 289.4 | | |
| Coefficient of Variation | 0.68 | | |
| Skewness | 0.00842 | | |

### Relevant UCL Statistics

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.928 | Shapiro Wilk Test Statistic | 0.845 |
| Shapiro Wilk Critical Value | 0.887 | Shapiro Wilk Critical Value | 0.887 |
| Data appear Normal at 5% Significance Level | | Data not Lognormal at 5% Significance Level | |

| Assuming Normal Distribution | | Assuming Lognormal Distribution | |
|---|---|---|---|
| 95% Student's-t UCL | 2209 | 95% H-UCL | 5569 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 5111 |
| 95% Adjusted-CLT UCL (Chen-1995) | 2178 | 97.5% Chebyshev (MVUE) UCL | 6418 |
| 95% Modified-t UCL (Johnson-1978) | 2209 | 99% Chebyshev (MVUE) UCL | 8986 |

| Gamma Distribution Test | | Data Distribution |
|---|---|---|
| k star (bias corrected) | 1.113 | Data appear Normal at 5% Significance Level |
| Theta Star | 1530 | |
| MLE of Mean | 1702 | |
| MLE of Standard Deviation | 1613 | |
| nu star | 35.6 | |
| Approximate Chi Square Value (.05) | 22.95 | **Nonparametric Statistics** |
| Adjusted Level of Significance | 0.0335 | 95% CLT UCL 2178 |
| Adjusted Chi Square Value | 21.8 | 95% Jackknife UCL 2209 |
| | | 95% Standard Bootstrap UCL 2154 |
| Anderson-Darling Test Statistic | 0.708 | 95% Bootstrap-t UCL 2198 |
| Anderson-Darling 5% Critical Value | 0.758 | 95% Hall's Bootstrap UCL 2157 |
| Kolmogorov-Smirnov Test Statistic | 0.221 | 95% Percentile Bootstrap UCL 2195 |
| Kolmogorov-Smirnov 5% Critical Value | 0.22 | 95% BCA Bootstrap UCL 2162 |
| Data follow Appr. Gamma Distribution at 5% Significance Level | | 95% Chebyshev(Mean, Sd) UCL 2963 |
| | | 97.5% Chebyshev(Mean, Sd) UCL 3509 |
| **Assuming Gamma Distribution** | | 99% Chebyshev(Mean, Sd) UCL 4581 |
| 95% Approximate Gamma UCL (Use when n >= 40) | 2640 | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 2780 | |

| Potential UCL to Use | | Use 95% Student's-t UCL | 2209 |
|---|---|---|---|

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 Data | 16 | Number of Detected Data | 10 |
| Number of Distinct Detected Data | 10 | Number of Non-Detect Data | 6 |
| | | Percent Non-Detects | 37.50% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.0095 | Minimum Detected | -4.656 |
| Maximum Detected | 0.274 | Maximum Detected | -1.295 |
| Mean of Detected | 0.12 | Mean of Detected | -2.366 |
| SD of Detected | 0.0706 | SD of Detected | 0.908 |
| Minimum Non-Detect | 0.01 | Minimum Non-Detect | -4.605 |
| Maximum Non-Detect | 0.05 | Maximum Non-Detect | -2.996 |

| | | |
|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | Number treated as Non-Detect | 7 |
| For all methods (except KM, DL/2, and ROS Methods), | Number treated as Detected | 9 |
| Observations < Largest ND are treated as NDs | Single DL Non-Detect Percentage | 43.75% |

### UCL Statistics

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.938 | Shapiro Wilk Test Statistic | 0.801 |
| 5% Shapiro Wilk Critical Value | 0.842 | 5% Shapiro Wilk Critical Value | 0.842 |
| Data appear 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 | 0.082 | Mean | -3.063 |
| SD | 0.0749 | SD | 1.261 |
| 95% DL/2 (t) UCL | 0.115 | 95% H-Stat (DL/2) UCL | 0.287 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 0.0657 | Mean in Log Scale | -2.989 |
| SD | 0.0947 | SD in Log Scale | 1.12 |
| 95% MLE (t) UCL | 0.107 | Mean in Original Scale | 0.0823 |
| 95% MLE (Tiku) UCL | 0.114 | SD in Original Scale | 0.0745 |
| | | 95% t UCL | 0.115 |
| | | 95% Percentile Bootstrap UCL | 0.114 |
| | | 95% BCA Bootstrap UCL | 0.119 |
| | | 95% H UCL | 0.217 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 1.592 | Data appear Normal at 5% Significance Level |
| Theta Star | 0.0755 | |
| nu star | 31.84 | |
| | | |
| A-D Test Statistic | 0.518 | Nonparametric Statistics |
| 5% A-D Critical Value | 0.735 | Kaplan-Meier (KM) Method |
| K-S Test Statistic | 0.735 | Mean 0.0787 |

| | |
|---|---|
| 5% K-S Critical Value | 0.27 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 0.274 |
| Mean | 0.0772 |
| Median | 0.073 |
| SD | 0.0794 |
| k star | 0.241 |
| Theta star | 0.321 |
| Nu star | 7.709 |
| AppChi2 | 2.568 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.232 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.266 |

Note: DL/2 is not a recommended method.

| | |
|---|---|
| SD | 0.0753 |
| SE of Mean | 0.0198 |
| 95% KM (t) UCL | 0.113 |
| 95% KM (z) UCL | 0.111 |
| 95% KM (jackknife) UCL | 0.112 |
| 95% KM (bootstrap t) UCL | 0.119 |
| 95% KM (BCA) UCL | 0.138 |
| 95% KM (Percentile Bootstrap) UCL | 0.129 |
| 95% KM (Chebyshev) UCL | 0.165 |
| 97.5% KM (Chebyshev) UCL | 0.203 |
| 99% KM (Chebyshev) UCL | 0.276 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.113 |
| 95% KM (Percentile Bootstrap) UCL | 0.129 |

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.

**Calcium**

**General Statistics**

| | |
|---|---|
| Number of Valid Observations | 16 |
| Number of Distinct Observations | 16 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 6420 |
| Maximum | 358000 |
| Mean | 176726 |
| Geometric Mean | 105434 |
| Median | 200500 |
| SD | 126094 |
| Std. Error of Mean | 31524 |
| Coefficient of Variation | 0.714 |
| Skewness | -0.124 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 8.767 |
| Maximum of Log Data | 12.79 |
| Mean of log Data | 11.57 |
| SD of log Data | 1.304 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.903 |
| Shapiro Wilk Critical Value | 0.887 |

Data appear Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.829 |
| Shapiro Wilk Critical Value | 0.887 |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 231989 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 227537 |
| 95% Modified-t UCL (Johnson-1978) | 231826 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 724799 |
| 95% Chebyshev (MVUE) UCL | 591423 |
| 97.5% Chebyshev (MVUE) UCL | 749451 |
| 99% Chebyshev (MVUE) UCL | 1059866 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 0.939 |
| Theta Star | 188129 |

**Data Distribution**

Data appear Normal at 5% Significance Level

| | |
|---|---|
| MLE of Mean | 176726 |
| MLE of Standard Deviation | 182338 |
| nu star | 30.06 |
| Approximate Chi Square Value (.05) | 18.54 |
| Adjusted Level of Significance | 0.0335 |
| Adjusted Chi Square Value | 17.51 |
| Anderson-Darling Test Statistic | 0.987 |
| Anderson-Darling 5% Critical Value | 0.761 |
| Kolmogorov-Smirnov Test Statistic | 0.219 |
| Kolmogorov-Smirnov 5% Critical Value | 0.221 |

Data follow Appr. Gamma Distribution at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 286536 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 303315 |

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 228578 |
| 95% Jackknife UCL | 231989 |
| 95% Standard Bootstrap UCL | 225940 |
| 95% Bootstrap-t UCL | 232020 |
| 95% Hall's Bootstrap UCL | 225352 |
| 95% Percentile Bootstrap UCL | 226581 |
| 95% BCA Bootstrap UCL | 226733 |
| 95% Chebyshev(Mean, Sd) UCL | 314134 |
| 97.5% Chebyshev(Mean, Sd) UCL | 373591 |
| 99% Chebyshev(Mean, Sd) UCL | 490382 |

Potential UCL to Use

Use 95% Student's-t UCL 231989

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 positvely skewed data sets.

Cesium

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 4 |
| Number of Distinct Detected Data | 3 | Number of Non-Detect Data | 12 |
| | | Percent Non-Detects | 75.00% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.0067 | Minimum Detected | -5.006 |
| Maximum Detected | 0.016 | Maximum Detected | -4.135 |
| Mean of Detected | 0.0127 | Mean of Detected | -4.42 |
| SD of Detected | 0.00409 | SD of Detected | 0.396 |
| Minimum Non-Detect | 0.5 | Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | 0.5 | Maximum Non-Detect | -0.693 |

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

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.813 |
| 5% Shapiro Wilk Critical Value | 0.748 |

Data appear Normal at 5% Significance Level

### Lognormal Distribution Test with Detected Values Only

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.762 |
| 5% Shapiro Wilk Critical Value | 0.748 |

Data appear Lognormal at 5% Significance Level

### Assuming Normal Distribution

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.191 |
| SD | 0.106 |
| 95% DL/2 (t) UCL | 0.237 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |

MLE method failed to converge properly

### Assuming Lognormal Distribution

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -2.145 |
| SD | 1.368 |
| 95% H-Stat (DL/2) UCL | 0.961 |
| | |
| Log ROS Method | |
| Mean in Log Scale | -4.42 |
| SD in Log Scale | 0.388 |
| Mean in Original Scale | 0.0129 |
| SD in Original Scale | 0.00483 |
| 95% t UCL | 0.015 |
| 95% Percentile Bootstrap UCL | 0.0148 |
| 95% BCA Bootstrap UCL | 0.0149 |
| 95% H-UCL | 0.0158 |

### Gamma Distribution Test with Detected Values Only

| | |
|---|---|
| k star (bias corrected) | 2.638 |
| Theta Star | 0.0048 |
| nu star | 21.11 |
| | |
| A-D Test Statistic | 0.645 |
| 5% A-D Critical Value | 0.657 |
| K-S Test Statistic | 0.657 |
| 5% K-S Critical Value | 0.395 |

Data follow Appr. Gamma Distribution at 5% Significance Level

### Assuming Gamma Distribution

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.00457 |
| Maximum | 0.018 |
| Mean | 0.0125 |
| Median | 0.0138 |
| SD | 0.00407 |
| k star | 6.525 |
| Theta star | 0.00192 |
| Nu star | 208.8 |
| AppChi2 | 176.4 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.0148 |
| 95% Adjusted Gamma UCL (Use when n < 40) | N/A |

### Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

### Nonparametric Statistics

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.0127 |
| SD | 0.00354 |
| SE of Mean | 0.00205 |
| 95% KM (t) UCL | 0.0163 |
| 95% KM (z) UCL | 0.016 |
| 95% KM (jackknife) UCL | 0.0167 |
| 95% KM (bootstrap t) UCL | 0.0159 |
| 95% KM (BCA) UCL | 0.015 |
| 95% KM (Percentile Bootstrap) UCL | 0.0153 |
| 95% KM (Chebyshev) UCL | 0.0216 |
| 97.5% KM (Chebyshev) UCL | 0.0255 |
| 99% KM (Chebyshev) UCL | 0.033 |

### Potential UCLs to Use

| | |
|---|---|
| 95% KM (t) UCL | 0.0163 |
| 95% KM (Percentile Bootstrap) UCL | 0.0153 |

Warning: Recommended UCL exceeds the maximum observation

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.

**Chromium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 16 |
| | | 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 Chromium was not processed!**

**Cobalt**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 14 |
| Number of Distinct Detected Data | 14 | Number of Non-Detect Data | 2 |
| | | Percent Non-Detects | 12.50% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.12 | Minimum Detected | -2.12 |
| Maximum Detected | 1.51 | Maximum Detected | 0.412 |
| Mean of Detected | 0.587 | Mean of Detected | -0.702 |
| SD of Detected | 0.357 | SD of Detected | 0.628 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.1 | Maximum Non-Detect | -2.303 |

| | | | |
|---|---|---|---|
| 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 | 14 |
| Observations < Largest ND are treated as NDs | | Single DL Non-Detect Percentage | 12.50% |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.89 | Shapiro Wilk Test Statistic | 0.968 |
| 5% Shapiro Wilk Critical Value | 0.874 | 5% 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 | |
|---|---|---|---|
| DL/2 Substitution Method | | DL/2 Substitution Method | |
| Mean | 0.519 | Mean | -1.032 |
| SD | 0.381 | SD | 1.082 |
| 95% DL/2 (t) UCL | 0.686 | 95% H-Stat (DL/2) UCL | 1.413 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 0.5 | Mean in Log Scale | -0.881 |
| SD | 0.401 | SD in Log Scale | 0.762 |
| 95% MLE (t) UCL | 0.676 | Mean in Original Scale | 0.529 |
| 95% MLE (Tiku) UCL | 0.676 | SD in Original Scale | 0.369 |
| | | 95% t UCL | 0.69 |
| | | 95% Percentile Bootstrap UCL | 0.695 |
| | | 95% BCA Bootstrap UCL | 0.709 |

| | |
|---|---|
| 95% H UCL | 0.882 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 2.493 |
| Theta Star | 0.236 |
| nu star | 69.8 |
| | |
| A-D Test Statistic | 0.219 |
| 5% A-D Critical Value | 0.742 |
| K-S Test Statistic | 0.742 |
| 5% K-S Critical Value | 0.23 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 1.51 |
| Mean | 0.514 |
| Median | 0.476 |
| SD | 0.388 |
| k star | 0.362 |
| Theta star | 1.421 |
| Nu star | 11.57 |
| AppChi2 | 4.948 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 1.202 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 1.332 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.529 |
| SD | 0.357 |
| SE of Mean | 0.0925 |
| 95% KM (t) UCL | 0.691 |
| 95% KM (z) UCL | 0.681 |
| 95% KM (jackknife) UCL | 0.684 |
| 95% KM (bootstrap t) UCL | 0.734 |
| 95% KM (BCA) UCL | 0.719 |
| 95% KM (Percentile Bootstrap) UCL | 0.695 |
| 95% KM (Chebyshev) UCL | 0.932 |
| 97.5% KM (Chebyshev) UCL | 1.107 |
| 99% KM (Chebyshev) UCL | 1.449 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.691 |
| 95% KM (Percentile Bootstrap) UCL | 0.695 |

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.

**Copper**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 16 | Number of Distinct Observations | 16 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 0.55 |
| Maximum | 16.2 |
| Mean | 2.389 |
| Geometric Mean | 1.558 |
| Median | 1.4 |
| SD | 3.746 |
| Std. Error of Mean | 0.937 |
| Coefficient of Variation | 1.568 |
| Skewness | 3.784 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | -0.598 |
| Maximum of Log Data | 2.785 |
| Mean of log Data | 0.444 |
| SD of log Data | 0.763 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.421 |
| Shapiro Wilk Critical Value | 0.887 |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.811 |
| Shapiro Wilk Critical Value | 0.887 |

Data not Lognormal at 5% Significance Level

| Assuming Normal Distribution | |
|---|---|
| 95% Student's-t UCL | 4.031 |
| **95% UCLs (Adjusted for Skewness)** | |
| 95% Adjusted-CLT UCL (Chen-1995) | 4.876 |
| 95% Modified-t UCL (Johnson-1978) | 4.178 |

| Assuming Lognormal Distribution | |
|---|---|
| 95% H-UCL | 3.322 |
| 95% Chebyshev (MVUE) UCL | 3.847 |
| 97.5% Chebyshev (MVUE) UCL | 4.63 |
| 99% Chebyshev (MVUE) UCL | 6.166 |

| Gamma Distribution Test | |
|---|---|
| k star (bias corrected) | 1.108 |
| Theta Star | 2.156 |
| MLE of Mean | 2.389 |
| MLE of Standard Deviation | 2.269 |
| nu star | 35.45 |
| Approximate Chi Square Value (.05) | 22.83 |
| Adjusted Level of Significance | 0.0335 |
| Adjusted Chi Square Value | 21.68 |
| Anderson-Darling Test Statistic | 2.08 |
| Anderson-Darling 5% Critical Value | 0.758 |
| Kolmogorov-Smirnov Test Statistic | 0.335 |
| Kolmogorov-Smirnov 5% Critical Value | 0.22 |

Data not Gamma Distributed at 5% Significance Level

| Assuming Gamma Distribution | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 3.71 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 3.906 |

**Data Distribution**

Data do not follow a Discernable Distribution (0.05)

| Nonparametric Statistics | |
|---|---|
| 95% CLT UCL | 3.929 |
| 95% Jackknife UCL | 4.031 |
| 95% Standard Bootstrap UCL | 3.954 |
| 95% Bootstrap-t UCL | 12.72 |
| 95% Hall's Bootstrap UCL | 12.37 |
| 95% Percentile Bootstrap UCL | 4.244 |
| 95% BCA Bootstrap UCL | 5.189 |
| 95% Chebyshev(Mean, Sd) UCL | 6.471 |
| 97.5% Chebyshev(Mean, Sd) UCL | 8.237 |
| 99% Chebyshev(Mean, Sd) UCL | 11.71 |

| Potential UCL to Use | Use 95% Chebyshev (Mean, Sd) UCL 6.471 |
|---|---|

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.

## Gallium

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 16 |
| | | 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 Gallium was not processed!

## Iron

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 13 |
| Number of Distinct Detected Data | 13 | Number of Non-Detect Data | 3 |

| | |
|---|---|
| Percent Non-Detects | 18.75% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 25 | Minimum Detected | 3.219 |
| Maximum Detected | 1940 | Maximum Detected | 7.57 |
| Mean of Detected | 504.3 | Mean of Detected | 5.528 |
| SD of Detected | 537.6 | SD of Detected | 1.405 |
| Minimum Non-Detect | 10 | Minimum Non-Detect | 2.303 |
| Maximum Non-Detect | 30 | Maximum Non-Detect | 3.401 |

| | | | |
|---|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | | Number treated as Non-Detect | 4 |
| 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 | 25.00% |

## 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 | 0.921 |
| 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 | | Assuming Lognormal Distribution | |
|---|---|---|---|
| DL/2 Substitution Method | | DL/2 Substitution Method | |
| Mean | 411.3 | Mean | 4.862 |
| SD | 520.8 | SD | 1.919 |
| 95% DL/2 (t) UCL | 639.5 | 95% H-Stat (DL/2) UCL | 6919 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 314.2 | Mean in Log Scale | 4.943 |
| SD | 621.8 | SD in Log Scale | 1.786 |
| 95% MLE (t) UCL | 586.7 | Mean in Original Scale | 412 |
| 95% MLE (Tiku) UCL | 593.3 | SD in Original Scale | 520.2 |
| | | 95% t UCL | 640 |
| | | 95% Percentile Bootstrap UCL | 629.8 |
| | | 95% BCA Bootstrap UCL | 713.3 |
| | | 95% H UCL | 4503 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 0.703 | Data appear Gamma Distributed at 5% Significance Level |
| Theta Star | 717.4 | |
| nu star | 18.28 | |
| | | |
| A-D Test Statistic | 0.386 | |
| 5% A-D Critical Value | 0.765 | |
| K-S Test Statistic | 0.765 | |
| 5% K-S Critical Value | 0.245 | |
| Data appear Gamma Distributed at 5% Significance Level | | |

| Assuming Gamma Distribution | | Nonparametric Statistics | |
|---|---|---|---|
| Gamma ROS Statistics using Extrapolated Data | | Kaplan-Meier (KM) Method | |
| Minimum | 0.000001 | Mean | 414.4 |
| Maximum | 1940 | SD | 501.8 |
| Mean | 409.8 | SE of Mean | 130.6 |
| Median | 227.5 | 95% KM (t) UCL | 643.3 |
| SD | 522.1 | 95% KM (z) UCL | 629.2 |
| | | 95% KM (jackknife) UCL | 640.1 |
| | | 95% KM (bootstrap t) UCL | 760.1 |
| | | 95% KM (BCA) UCL | 646.1 |
| | | 95% KM (Percentile Bootstrap) UCL | 646 |
| | | 95% KM (Chebyshev) UCL | 983.5 |
| | | 97.5% KM (Chebyshev) UCL | 1230 |

| | | | |
|---|---|---|---|
| k star | 0.189 | 99% KM (Chebyshev) UCL | 1714 |
| Theta star | 2166 | | |
| Nu star | 6.054 | Potential UCLs to Use | |
| AppChi2 | 1.667 | 95% KM (Chebyshev) UCL | 983.5 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 1488 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 1747 | | |

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.

**Lead**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 2 |
| Number of Distinct Detected Data | 2 | Number of Non-Detect Data | 14 |
| | | Percent Non-Detects | 87.50% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.169 | Minimum Detected | -1.778 |
| Maximum Detected | 0.33 | Maximum Detected | -1.109 |
| Mean of Detected | 0.25 | Mean of Detected | -1.443 |
| SD of Detected | 0.114 | SD of Detected | 0.473 |
| Minimum Non-Detect | 0.1 | Minimum Non-Detect | -2.303 |
| Maximum Non-Detect | 0.3 | Maximum Non-Detect | -1.204 |

| | | |
|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | Number treated as Non-Detect | 15 |
| For all methods (except KM, DL/2, and ROS Methods), | Number treated as Detected | 1 |
| Observations < Largest ND are treated as NDs | Single DL Non-Detect Percentage | 93.75% |

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

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 | N/A | Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A | 5% Shapiro Wilk Critical Value | N/A |
| 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 | 0.144 |
| SD | 0.0644 |
| 95% DL/2 (t) UCL | 0.172 |

| | |
|---|---|
| Mean | -2.046 |
| SD | 0.51 |
| 95% H-Stat (DL/2) UCL | 0.193 |

| | |
|---|---|
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE method failed to converge properly**

| | |
|---|---|
| Log ROS Method | |
| Mean in Log Scale | N/A |
| SD in Log Scale | N/A |
| Mean in Original Scale | N/A |
| SD in Original Scale | N/A |
| 95% t UCL | N/A |
| 95% Percentile Bootstrap UCL | N/A |
| 95% BCA Bootstrap UCL | N/A |
| 95% H-UCL | N/A |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | N/A |
| Theta Star | N/A |
| nu star | N/A |
| A-D Test Statistic | N/A |
| 5% A-D Critical Value | N/A |
| K-S Test Statistic | N/A |
| 5% K-S Critical Value | N/A |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | N/A |
| Maximum | N/A |
| Mean | N/A |
| Median | N/A |
| SD | N/A |
| k star | N/A |
| Theta star | N/A |
| Nu star | N/A |
| AppChi2 | N/A |
| 95% Gamma Approximate UCL (Use when n >= 40) | N/A |
| 95% Adjusted Gamma UCL (Use when n < 40) | N/A |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

Kaplan-Meier (KM) Method

| | |
|---|---|
| Mean | 0.179 |
| SD | 0.039 |
| SE of Mean | 0.0138 |
| 95% KM (t) UCL | 0.203 |
| 95% KM (z) UCL | 0.202 |
| 95% KM (jackknife) UCL | 0.287 |
| 95% KM (bootstrap t) UCL | N/A |
| 95% KM (BCA) UCL | 0.33 |
| 95% KM (Percentile Bootstrap) UCL | 0.33 |
| 95% KM (Chebyshev) UCL | 0.239 |
| 97.5% KM (Chebyshev) UCL | 0.265 |
| 99% KM (Chebyshev) UCL | 0.316 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.203 |
| 95% KM (% Bootstrap) UCL | 0.33 |

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

**Lithium**

**General Statistics**

| | |
|---|---|
| Number of Valid Data | 16 |
| Number of Distinct Detected Data | 14 |

| | |
|---|---|
| Number of Detected Data | 15 |
| Number of Non-Detect Data | 1 |
| Percent Non-Detects | 6.25% |

**Raw Statistics**

| | |
|---|---|
| Minimum Detected | 3.1 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum Detected | 1.131 |

| | |
|---|---|
| Maximum Detected | 116 |
| Mean of Detected | 64.85 |
| SD of Detected | 39.35 |
| Minimum Non-Detect | 20 |
| Maximum Non-Detect | 20 |

| | |
|---|---|
| Maximum Detected | 4.754 |
| Mean of Detected | 3.844 |
| SD of Detected | 1.033 |
| Minimum Non-Detect | 2.996 |
| Maximum Non-Detect | 2.996 |

## UCL Statistics

### Normal Distribution Test with Detected Values Only

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.909 |
| 5% Shapiro Wilk Critical Value | 0.881 |

Data appear Normal at 5% Significance Level

### Lognormal Distribution Test with Detected Values Only

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.82 |
| 5% Shapiro Wilk Critical Value | 0.881 |

Data not Lognormal at 5% Significance Level

### Assuming Normal Distribution

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 61.42 |
| SD | 40.41 |
| 95% DL/2 (t) UCL | 79.13 |
| | |
| Maximum Likelihood Estimate(MLE) Method | |
| Mean | 54.43 |
| SD | 49.96 |
| 95% MLE (t) UCL | 76.32 |
| 95% MLE (Tiku) UCL | 78.39 |

### Assuming Lognormal Distribution

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 3.747 |
| SD | 1.07 |
| 95% H-Stat (DL/2) UCL | 163.4 |
| | |
| Log ROS Method | |
| Mean in Log Scale | 3.772 |
| SD in Log Scale | 1.039 |
| Mean in Original Scale | 61.71 |
| SD in Original Scale | 40.03 |
| 95% t UCL | 79.26 |
| 95% Percentile Bootstrap UCL | 76.91 |
| 95% BCA Bootstrap UCL | 76.96 |
| 95% H UCL | 156.4 |

### Gamma Distribution Test with Detected Values Only

| | |
|---|---|
| k star (bias corrected) | 1.381 |
| Theta Star | 46.97 |
| nu star | 41.42 |
| | |
| A-D Test Statistic | 0.761 |
| 5% A-D Critical Value | 0.751 |
| K-S Test Statistic | 0.751 |
| 5% K-S Critical Value | 0.225 |

Data follow Appr. Gamma Distribution at 5% Significance Level

### Assuming Gamma Distribution

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 3.1 |
| Maximum | 116 |
| Mean | 61.64 |
| Median | 65 |
| SD | 40.12 |
| k star | 1.305 |
| Theta star | 47.23 |
| Nu star | 41.76 |
| AppChi2 | 27.95 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 92.11 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 96.54 |

Note: DL/2 is not a recommended method.

### Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

### Nonparametric Statistics

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 61.63 |
| SD | 38.89 |
| SE of Mean | 10.07 |
| 95% KM (t) UCL | 79.29 |
| 95% KM (z) UCL | 78.2 |
| 95% KM (jackknife) UCL | 79.26 |
| 95% KM (bootstrap t) UCL | 79.01 |
| 95% KM (BCA) UCL | 76.43 |
| 95% KM (Percentile Bootstrap) UCL | 77.41 |
| 95% KM (Chebyshev) UCL | 105.5 |
| 97.5% KM (Chebyshev) UCL | 124.5 |
| 99% KM (Chebyshev) UCL | 161.9 |

### Potential UCLs to Use

| | |
|---|---|
| 95% KM (t) UCL | 79.29 |
| 95% KM (Percentile Bootstrap) UCL | 77.41 |

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

Magnesium

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 16 | Number of Distinct Observations | 16 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 8010 |
| Maximum | 931000 |
| Mean | 446213 |
| Geometric Mean | 231582 |
| Median | 483000 |
| SD | 335543 |
| Std. Error of Mean | 83886 |
| Coefficient of Variation | 0.752 |
| Skewness | -0.0411 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 8.988 |
| Maximum of Log Data | 13.74 |
| Mean of log Data | 12.35 |
| SD of log Data | 1.562 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.901 |
| Shapiro Wilk Critical Value | 0.887 |

Data appear Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.816 |
| Shapiro Wilk Critical Value | 0.887 |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 593269 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 583272 |
| 95% Modified-t UCL (Johnson-1978) | 593125 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 3421071 |
| 95% Chebyshev (MVUE) UCL | 2018682 |
| 97.5% Chebyshev (MVUE) UCL | 2598132 |
| 99% Chebyshev (MVUE) UCL | 3736349 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 0.767 |
| Theta Star | 582013 |
| MLE of Mean | 446213 |
| MLE of Standard Deviation | 509610 |
| nu star | 24.53 |
| Approximate Chi Square Value (.05) | 14.26 |
| Adjusted Level of Significance | 0.0335 |
| Adjusted Chi Square Value | 13.37 |
| Anderson-Darling Test Statistic | 0.916 |
| Anderson-Darling 5% Critical Value | 0.768 |
| Kolmogorov-Smirnov Test Statistic | 0.215 |
| Kolmogorov-Smirnov 5% Critical Value | 0.222 |

Data follow Appr. Gamma Distribution at 5% Significance Level

**Data Distribution**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 584193 |
| 95% Jackknife UCL | 593269 |
| 95% Standard Bootstrap UCL | 579228 |
| 95% Bootstrap-t UCL | 596609 |
| 95% Hall's Bootstrap UCL | 574284 |
| 95% Percentile Bootstrap UCL | 570864 |
| 95% BCA Bootstrap UCL | 585388 |
| 95% Chebyshev(Mean, Sd) UCL | 811862 |
| 97.5% Chebyshev(Mean, Sd) UCL | 970079 |
| 99% Chebyshev(Mean, Sd) UCL | 1280865 |

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 767949 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 818894 |

Potential UCL to Use | Use 95% Student's-t UCL 593269

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 positvely skewed data sets.

Manganese

**General Statistics**

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

**Raw Statistics**

| | |
|---|---|
| Minimum | 0.37 |
| Maximum | 562 |
| Mean | 186.8 |
| Geometric Mean | 85.66 |
| Median | 172 |
| SD | 161.5 |
| Std. Error of Mean | 40.38 |
| Coefficient of Variation | 0.864 |
| Skewness | 1.105 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | -0.994 |
| Maximum of Log Data | 6.332 |
| Mean of log Data | 4.45 |
| SD of log Data | 1.922 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.893 |
| Shapiro Wilk Critical Value | 0.887 |

Data appear Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.783 |
| Shapiro Wilk Critical Value | 0.887 |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 257.6 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 265.2 |
| 95% Modified-t UCL (Johnson-1978) | 259.5 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 4632 |
| 95% Chebyshev (MVUE) UCL | 1445 |
| 97.5% Chebyshev (MVUE) UCL | 1889 |
| 99% Chebyshev (MVUE) UCL | 2762 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 0.664 |
| Theta Star | 281.5 |
| MLE of Mean | 186.8 |
| MLE of Standard Deviation | 229.4 |
| nu star | 21.24 |
| Approximate Chi Square Value (.05) | 11.77 |
| Adjusted Level of Significance | 0.0335 |
| Adjusted Chi Square Value | 10.97 |

| | |
|---|---|
| Anderson-Darling Test Statistic | 0.633 |
| Anderson-Darling 5% Critical Value | 0.774 |
| Kolmogorov-Smirnov Test Statistic | 0.221 |
| Kolmogorov-Smirnov 5% Critical Value | 0.223 |

**Data Distribution**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 253.3 |
| 95% Jackknife UCL | 257.6 |
| 95% Standard Bootstrap UCL | 251.6 |
| 95% Bootstrap-t UCL | 276.7 |
| 95% Hall's Bootstrap UCL | 330.7 |
| 95% Percentile Bootstrap UCL | 251.1 |
| 95% BCA Bootstrap UCL | 262.9 |

Data appear Gamma Distributed at 5% Significance Level

| | |
|---|---|
| 95% Chebyshev(Mean, Sd) UCL | 362.8 |
| 97.5% Chebyshev(Mean, Sd) UCL | 439 |
| 99% Chebyshev(Mean, Sd) UCL | 588.6 |

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 337.2 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 361.7 |

**Potential UCL to Use**

Use 95% Student's-t UCL 257.6

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.

**Molybdenum**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 14 |
| Number of Distinct Detected Data | 12 | Number of Non-Detect Data | 2 |
| | | Percent Non-Detects | 12.50% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.589 | Minimum Detected | -0.529 |
| Maximum Detected | 5.1 | Maximum Detected | 1.629 |
| Mean of Detected | 2.831 | Mean of Detected | 0.951 |
| SD of Detected | 1.046 | SD of Detected | 0.498 |
| Minimum Non-Detect | 2 | Minimum Non-Detect | 0.693 |
| Maximum Non-Detect | 2 | Maximum Non-Detect | 0.693 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.962 | Shapiro Wilk Test Statistic | 0.804 |
| 5% Shapiro Wilk Critical Value | 0.874 | 5% Shapiro Wilk Critical Value | 0.874 |
| Data appear 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 | 2.602 | Mean | 0.832 |
| SD | 1.157 | SD | 0.566 |
| 95% DL/2 (t) UCL | 3.109 | 95% H-Stat (DL/2) UCL | 3.68 |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 2.706 | Mean in Log Scale | 0.843 |
| SD | 0.987 | SD in Log Scale | 0.552 |
| 95% MLE (t) UCL | 3.139 | Mean in Original Scale | 2.613 |
| 95% MLE (Tiku) UCL | 3.143 | SD in Original Scale | 1.141 |
| | | 95% t UCL | 3.113 |
| | | 95% Percentile Bootstrap UCL | 3.063 |
| | | 95% BCA Bootstrap UCL | 3.031 |
| | | 95% H UCL | 3.651 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 4.585 | Data appear Normal at 5% Significance Level |
| Theta Star | 0.617 | |

| | |
|---|---|
| nu star | 128.4 |

| | |
|---|---|
| A-D Test Statistic | 0.601 |
| 5% A-D Critical Value | 0.737 |
| K-S Test Statistic | 0.737 |
| 5% K-S Critical Value | 0.229 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | 0.158 |
| Maximum | 5.1 |
| Mean | 2.539 |
| Median | 2.65 |
| SD | 1.264 |
| k star | 1.967 |
| Theta star | 1.291 |
| Nu star | 62.94 |
| AppChi2 | 45.69 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 3.498 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 3.631 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

Kaplan-Meier (KM) Method

| | |
|---|---|
| Mean | 2.55 |
| SD | 1.199 |
| SE of Mean | 0.311 |
| 95% KM (t) UCL | 3.096 |
| 95% KM (z) UCL | 3.062 |
| 95% KM (jackknife) UCL | 3.103 |
| 95% KM (bootstrap t) UCL | 3.051 |
| 95% KM (BCA) UCL | 3.189 |
| 95% KM (Percentile Bootstrap) UCL | 3.115 |
| 95% KM (Chebyshev) UCL | 3.907 |
| 97.5% KM (Chebyshev) UCL | 4.493 |
| 99% KM (Chebyshev) UCL | 5.646 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 3.096 |
| 95% KM (Percentile Bootstrap) UCL | 3.115 |

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.

**Nickel**

**General Statistics**

| | |
|---|---|
| Number of Valid Data | 16 |
| Number of Distinct Detected Data | 14 |

| | |
|---|---|
| Number of Detected Data | 14 |
| Number of Non-Detect Data | 2 |
| Percent Non-Detects | 12.50% |

**Raw Statistics**

| | |
|---|---|
| Minimum Detected | 0.53 |
| Maximum Detected | 3.19 |
| Mean of Detected | 1.689 |
| SD of Detected | 0.862 |
| Minimum Non-Detect | 0.4 |
| Maximum Non-Detect | 0.5 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum Detected | -0.635 |
| Maximum Detected | 1.16 |
| Mean of Detected | 0.391 |
| SD of Detected | 0.555 |
| Minimum Non-Detect | -0.916 |
| Maximum Non-Detect | -0.693 |

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 | 2 |
| Number treated as Detected | 14 |
| Single DL Non-Detect Percentage | 12.50% |

**UCL Statistics**

**Normal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.92 |
| 5% Shapiro Wilk Critical Value | 0.874 |

Data appear Normal at 5% Significance Level

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.947 |
| 5% Shapiro Wilk Critical Value | 0.874 |

Data appear Lognormal at 5% Significance Level

**Assuming Normal Distribution**

**Assuming Lognormal Distribution**

| DL/2 Substitution Method | |
|---|---|
| Mean | 1.506 |
| SD | 0.946 |
| 95% DL/2 (t) UCL | 1.921 |

| Maximum Likelihood Estimate(MLE) Method | |
|---|---|
| Mean | 1.477 |
| SD | 0.971 |
| 95% MLE (t) UCL | 1.902 |
| 95% MLE (Tiku) UCL | 1.903 |

| DL/2 Substitution Method | |
|---|---|
| Mean | 0.155 |
| SD | 0.827 |
| 95% H-Stat (DL/2) UCL | 2.775 |

| Log ROS Method | |
|---|---|
| Mean in Log Scale | 0.231 |
| SD in Log Scale | 0.677 |
| Mean in Original Scale | 1.529 |
| SD in Original Scale | 0.914 |
| 95% t UCL | 1.93 |
| 95% Percentile Bootstrap UCL | 1.917 |
| 95% BCA Bootstrap UCL | 1.913 |
| 95% H UCL | 2.347 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 3.12 |
| Theta Star | 0.542 |
| nu star | 87.35 |
| A-D Test Statistic | 0.349 |
| 5% A-D Critical Value | 0.74 |
| K-S Test Statistic | 0.74 |
| 5% K-S Critical Value | 0.23 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| Gamma ROS Statistics using Extrapolated Data | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 3.19 |
| Mean | 1.478 |
| Median | 1.32 |
| SD | 0.988 |
| k star | 0.346 |
| Theta star | 4.272 |
| Nu star | 11.07 |
| AppChi2 | 4.622 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 3.541 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 3.937 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| Kaplan-Meier (KM) Method | |
|---|---|
| Mean | 1.544 |
| SD | 0.866 |
| SE of Mean | 0.225 |
| 95% KM (t) UCL | 1.938 |
| 95% KM (z) UCL | 1.914 |
| 95% KM (jackknife) UCL | 1.929 |
| 95% KM (bootstrap t) UCL | 1.963 |
| 95% KM (BCA) UCL | 1.938 |
| 95% KM (Percentile Bootstrap) UCL | 1.92 |
| 95% KM (Chebyshev) UCL | 2.524 |
| 97.5% KM (Chebyshev) UCL | 2.948 |
| 99% KM (Chebyshev) UCL | 3.781 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 1.938 |
| 95% KM (Percentile Bootstrap) UCL | 1.92 |

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

**Phosphorus**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 16 |
| | | 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 Phosphorus was not processed!

**Potassium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 16 | Number of Distinct Observations | 16 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 5200 | Minimum of Log Data | 8.556 |
| Maximum | 279000 | Maximum of Log Data | 12.54 |
| Mean | 133806 | Mean of log Data | 11.3 |
| Geometric Mean | 81169 | SD of log Data | 1.289 |
| Median | 138500 | | |
| SD | 96240 | | |
| Std. Error of Mean | 24060 | | |
| Coefficient of Variation | 0.719 | | |
| Skewness | 0.0101 | | |

**Relevant UCL Statistics**

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.911 | Shapiro Wilk Test Statistic | 0.835 |
| Shapiro Wilk Critical Value | 0.887 | Shapiro Wilk Critical Value | 0.887 |
| Data appear Normal at 5% Significance Level | | Data not Lognormal at 5% Significance Level | |

| Assuming Normal Distribution | | Assuming Lognormal Distribution | |
|---|---|---|---|
| 95% Student's-t UCL | 175985 | 95% H-UCL | 535508 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 443957 |
| 95% Adjusted-CLT UCL (Chen-1995) | 173446 | 97.5% Chebyshev (MVUE) UCL | 561981 |
| 95% Modified-t UCL (Johnson-1978) | 175995 | 99% Chebyshev (MVUE) UCL | 793817 |

| Gamma Distribution Test | | Data Distribution |
|---|---|---|
| k star (bias corrected) | 0.966 | Data appear Normal at 5% Significance Level |
| Theta Star | 138474 | |
| MLE of Mean | 133806 | |
| MLE of Standard Deviation | 136120 | |
| nu star | 30.92 | |
| Approximate Chi Square Value (.05) | 19.22 | **Nonparametric Statistics** |
| Adjusted Level of Significance | 0.0335 | 95% CLT UCL 173381 |
| Adjusted Chi Square Value | 18.17 | 95% Jackknife UCL 175985 |
| | | 95% Standard Bootstrap UCL 171712 |
| Anderson-Darling Test Statistic | 0.796 | 95% Bootstrap-t UCL 175178 |
| Anderson-Darling 5% Critical Value | 0.761 | 95% Hall's Bootstrap UCL 172480 |
| Kolmogorov-Smirnov Test Statistic | 0.194 | 95% Percentile Bootstrap UCL 172875 |
| Kolmogorov-Smirnov 5% Critical Value | 0.221 | 95% BCA Bootstrap UCL 173963 |
| Data follow Appr. Gamma Distribution at 5% Significance Level | | 95% Chebyshev(Mean, Sd) UCL 238681 |
| | | 97.5% Chebyshev(Mean, Sd) UCL 284061 |
| **Assuming Gamma Distribution** | | 99% Chebyshev(Mean, Sd) UCL 373200 |
| 95% Approximate Gamma UCL (Use when n >= 40) | 215284 | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 227677 | |

Potential UCL to Use | Use 95% Student's-t UCL 175985

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.

## Rhenium

### General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 16 |
| | | 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 Rhenium was not processed!

## Rubidium

### General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 15 |
| Number of Distinct Detected Data | 15 | Number of Non-Detect Data | 1 |
| | | Percent Non-Detects | 6.25% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 1.75 | Minimum Detected | 0.56 |
| Maximum Detected | 79.3 | Maximum Detected | 4.373 |
| Mean of Detected | 43.09 | Mean of Detected | 3.376 |
| SD of Detected | 28.1 | SD of Detected | 1.124 |
| Minimum Non-Detect | 5 | Minimum Non-Detect | 1.609 |
| Maximum Non-Detect | 5 | Maximum Non-Detect | 1.609 |

### 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 | 0.825 |
| 5% Shapiro Wilk Critical Value | 0.881 | 5% Shapiro Wilk Critical Value | 0.881 |
| Data appear 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 | 40.55 | Mean | 3.222 |
| SD | 28.98 | SD | 1.248 |
| 95% DL/2 (t) UCL | 53.26 | 95% H-Stat (DL/2) UCL | 148.5 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 38.97 | Mean in Log Scale | 3.251 |
| SD | 30.81 | SD in Log Scale | 1.195 |

| | |
|---|---|
| 95% MLE (t) UCL | 52.47 |
| 95% MLE (Tiku) UCL | 52.61 |

| | |
|---|---|
| Mean in Original Scale | 40.64 |
| SD in Original Scale | 28.86 |
| 95% t UCL | 53.29 |
| 95% Percentile Bootstrap UCL | 52.07 |
| 95% BCA Bootstrap UCL | 51.84 |
| 95% H UCL | 133.8 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 1.192 |
| Theta Star | 36.14 |
| nu star | 35.77 |
| | |
| A-D Test Statistic | 0.82 |
| 5% A-D Critical Value | 0.755 |
| K-S Test Statistic | 0.755 |
| 5% K-S Critical Value | 0.226 |

Data follow Appr. Gamma Distribution at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 79.3 |
| Mean | 40.4 |
| Median | 42.15 |
| SD | 29.21 |
| k star | 0.416 |
| Theta star | 97.15 |
| Nu star | 13.31 |
| AppChi2 | 6.099 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 88.13 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 96.82 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 40.51 |
| SD | 28.13 |
| SE of Mean | 7.279 |
| 95% KM (t) UCL | 53.27 |
| 95% KM (z) UCL | 52.48 |
| 95% KM (jackknife) UCL | 53.09 |
| 95% KM (bootstrap t) UCL | 52.38 |
| 95% KM (BCA) UCL | 51.98 |
| 95% KM (Percentile Bootstrap) UCL | 52.64 |
| 95% KM (Chebyshev) UCL | 72.23 |
| 97.5% KM (Chebyshev) UCL | 85.96 |
| 99% KM (Chebyshev) UCL | 112.9 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 53.27 |
| 95% KM (Percentile Bootstrap) UCL | 52.64 |

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.

**Selenium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 16 |
| | | 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 Selenium was not processed!

**Silicon**

## General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Observations | 16 | Number of Distinct Observations | 16 |

### Raw Statistics

| | |
|---|---|
| Minimum | 2210 |
| Maximum | 4730 |
| Mean | 2980 |
| Geometric Mean | 2921 |
| Median | 2885 |
| SD | 644.6 |
| Std. Error of Mean | 161.2 |
| Coefficient of Variation | 0.216 |
| Skewness | 1.301 |

### Log-transformed Statistics

| | |
|---|---|
| Minimum of Log Data | 7.701 |
| Maximum of Log Data | 8.462 |
| Mean of log Data | 7.98 |
| SD of log Data | 0.202 |

## Relevant UCL Statistics

### Normal Distribution Test

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.898 |
| Shapiro Wilk Critical Value | 0.887 |

Data appear Normal at 5% Significance Level

### Lognormal Distribution Test

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.95 |
| Shapiro Wilk Critical Value | 0.887 |

Data appear Lognormal at 5% Significance Level

### Assuming Normal Distribution

| | |
|---|---|
| 95% Student's-t UCL | 3263 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 3301 |
| 95% Modified-t UCL (Johnson-1978) | 3271 |

### Assuming Lognormal Distribution

| | |
|---|---|
| 95% H-UCL | 3275 |
| 95% Chebyshev (MVUE) UCL | 3636 |
| 97.5% Chebyshev (MVUE) UCL | 3921 |
| 99% Chebyshev (MVUE) UCL | 4480 |

### Gamma Distribution Test

| | |
|---|---|
| k star (bias corrected) | 20.6 |
| Theta Star | 144.6 |
| MLE of Mean | 2980 |
| MLE of Standard Deviation | 656.5 |
| nu star | 659.3 |
| Approximate Chi Square Value (.05) | 600.7 |
| Adjusted Level of Significance | 0.0335 |
| Adjusted Chi Square Value | 594.4 |

| | |
|---|---|
| Anderson-Darling Test Statistic | 0.33 |
| Anderson-Darling 5% Critical Value | 0.736 |
| Kolmogorov-Smirnov Test Statistic | 0.146 |
| Kolmogorov-Smirnov 5% Critical Value | 0.215 |

Data appear Gamma Distributed at 5% Significance Level

### Assuming Gamma Distribution

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 3271 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 3306 |

### Data Distribution

Data appear Normal at 5% Significance Level

### Nonparametric Statistics

| | |
|---|---|
| 95% CLT UCL | 3245 |
| 95% Jackknife UCL | 3263 |
| 95% Standard Bootstrap UCL | 3240 |
| 95% Bootstrap-t UCL | 3342 |
| 95% Hall's Bootstrap UCL | 3434 |
| 95% Percentile Bootstrap UCL | 3252 |
| 95% BCA Bootstrap UCL | 3304 |
| 95% Chebyshev(Mean, Sd) UCL | 3682 |
| 97.5% Chebyshev(Mean, Sd) UCL | 3986 |
| 99% Chebyshev(Mean, Sd) UCL | 4584 |

**Potential UCL to Use** Use 95% Student's-t UCL 3263

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.

## Silver

### General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 16 |
| | | 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 Silver was not processed!

## Sodium

### General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Observations | 16 | Number of Distinct Observations | 16 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 79800 | Minimum of Log Data | 11.29 |
| Maximum | 7790000 | Maximum of Log Data | 15.87 |
| Mean | 3649644 | Mean of log Data | 14.5 |
| Geometric Mean | 1973292 | SD of log Data | 1.512 |
| Median | 3845000 | | |
| SD | 2699594 | | |
| Std. Error of Mean | 674898 | | |
| Coefficient of Variation | 0.74 | | |
| Skewness | 0.0002629 | | |

### Relevant UCL Statistics

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.913 | Shapiro Wilk Test Statistic | 0.805 |
| Shapiro Wilk Critical Value | 0.887 | Shapiro Wilk Critical Value | 0.887 |
| Data appear Normal at 5% Significance Level | | Data not Lognormal at 5% Significance Level | |

| Assuming Normal Distribution | | Assuming Lognormal Distribution | |
|---|---|---|---|
| 95% Student's-t UCL | 4832775 | 95% H-UCL | 24874954 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 15759105 |
| 95% Adjusted-CLT UCL (Chen-1995) | 4759800 | 97.5% Chebyshev (MVUE) UCL | 20228451 |
| 95% Modified-t UCL (Johnson-1978) | 4832782 | 99% Chebyshev (MVUE) UCL | 29007616 |

| Gamma Distribution Test | | Data Distribution |
|---|---|---|
| k star (bias corrected) | 0.809 | Data appear Normal at 5% Significance Level |
| Theta Star | 4508530 | |
| MLE of Mean | 3649644 | |
| MLE of Standard Deviation | 4056418 | |
| nu star | 25.9 | |
| Approximate Chi Square Value (.05) | 15.31 | **Nonparametric Statistics** |
| Adjusted Level of Significance | 0.0335 | 95% CLT UCL 4759753 |
| Adjusted Chi Square Value | 14.38 | 95% Jackknife UCL 4832775 |
| | | 95% Standard Bootstrap UCL 4757653 |
| Anderson-Darling Test Statistic | 0.898 | 95% Bootstrap-t UCL 4746343 |

| | |
|---|---|
| Anderson-Darling 5% Critical Value | 0.766 |
| Kolmogorov-Smirnov Test Statistic | 0.191 |
| Kolmogorov-Smirnov 5% Critical Value | 0.222 |

Data follow Appr. Gamma Distribution at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 6176917 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 6573127 |

| | |
|---|---|
| 95% Hall's Bootstrap UCL | 4709349 |
| 95% Percentile Bootstrap UCL | 4724125 |
| 95% BCA Bootstrap UCL | 4688719 |
| 95% Chebyshev(Mean, Sd) UCL | 6591458 |
| 97.5% Chebyshev(Mean, Sd) UCL | 7864383 |
| 99% Chebyshev(Mean, Sd) UCL | 10364799 |

**Potential UCL to Use** — Use 95% Student's-t UCL 4832775

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.

**Strontium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 16 | Number of Distinct Observations | 16 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 63 |
| Maximum | 6210 |
| Mean | 2959 |
| Geometric Mean | 1597 |
| Median | 3270 |
| SD | 2202 |
| Std. Error of Mean | 550.5 |
| Coefficient of Variation | 0.744 |
| Skewness | -0.0415 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 4.143 |
| Maximum of Log Data | 8.734 |
| Mean of log Data | 7.376 |
| SD of log Data | 1.483 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.906 |
| Shapiro Wilk Critical Value | 0.887 |

Data appear Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.825 |
| Shapiro Wilk Critical Value | 0.887 |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 3924 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 3859 |
| 95% Modified-t UCL (Johnson-1978) | 3923 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 18441 |
| 95% Chebyshev (MVUE) UCL | 12144 |
| 97.5% Chebyshev (MVUE) UCL | 15563 |
| 99% Chebyshev (MVUE) UCL | 22279 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 0.808 |
| Theta Star | 3663 |
| MLE of Mean | 2959 |
| MLE of Standard Deviation | 3293 |
| nu star | 25.85 |
| Approximate Chi Square Value (.05) | 15.26 |
| Adjusted Level of Significance | 0.0335 |
| Adjusted Chi Square Value | 14.34 |

**Data Distribution**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 3865 |
| 95% Jackknife UCL | 3924 |
| 95% Standard Bootstrap UCL | 3838 |

| | | | |
|---|---|---|---|
| Anderson-Darling Test Statistic | 0.93 | 95% Bootstrap-t UCL | 3925 |
| Anderson-Darling 5% Critical Value | 0.766 | 95% Hall's Bootstrap UCL | 3812 |
| Kolmogorov-Smirnov Test Statistic | 0.214 | 95% Percentile Bootstrap UCL | 3890 |
| Kolmogorov-Smirnov 5% Critical Value | 0.222 | 95% BCA Bootstrap UCL | 3850 |
| Data follow Appr. Gamma Distribution at 5% Significance Level | | 95% Chebyshev(Mean, Sd) UCL | 5359 |
| | | 97.5% Chebyshev(Mean, Sd) UCL | 6397 |
| **Assuming Gamma Distribution** | | 99% Chebyshev(Mean, Sd) UCL | 8437 |
| 95% Approximate Gamma UCL (Use when n >= 40) | 5012 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 5333 | | |
| Potential UCL to Use | | Use 95% Student's-t UCL | 3924 |

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 positvely skewed data sets.

**Tellurium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 16 |
| | | 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 Tellurium was not processed!

**Thallium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 3 |
| Number of Distinct Detected Data | 3 | Number of Non-Detect Data | 13 |
| | | Percent Non-Detects | 81.25% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.0033 | Minimum Detected | -5.714 |
| Maximum Detected | 0.075 | Maximum Detected | -2.59 |
| Mean of Detected | 0.0484 | Mean of Detected | -3.669 |
| SD of Detected | 0.0393 | SD of Detected | 1.772 |
| Minimum Non-Detect | 0.004 | Minimum Non-Detect | -5.521 |
| Maximum Non-Detect | 0.05 | Maximum Non-Detect | -2.996 |

| | | |
|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | Number treated as Non-Detect | 14 |
| 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 87.50%

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

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.833 |
| 5% Shapiro Wilk Critical Value | 0.767 |

Data appear Normal at 5% Significance Level

### Assuming Normal Distribution

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.0251 |
| SD | 0.0205 |
| 95% DL/2 (t) UCL | 0.0341 |
| Maximum Likelihood Estimate(MLE) Method | N/A |

MLE method failed to converge properly

### Lognormal Distribution Test with Detected Values Only

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.777 |
| 5% Shapiro Wilk Critical Value | 0.767 |

Data appear Lognormal at 5% Significance Level

### Assuming Lognormal Distribution

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -4.159 |
| SD | 1.208 |
| 95% H-Stat (DL/2) UCL | 0.0836 |
| Log ROS Method | |
| Mean in Log Scale | -5.345 |
| SD in Log Scale | 1.472 |
| Mean in Original Scale | 0.0135 |
| SD in Original Scale | 0.023 |
| 95% t UCL | 0.0236 |
| 95% Percentile Bootstrap UCL | 0.024 |
| 95% BCA Bootstrap UCL | 0.026 |
| 95% H-UCL | 0.0533 |

### Gamma Distribution Test with Detected Values Only

| | |
|---|---|
| k star (bias corrected) | N/A |
| Theta Star | N/A |
| nu star | N/A |
| A-D Test Statistic | N/A |
| 5% A-D Critical Value | N/A |
| K-S Test Statistic | N/A |
| 5% K-S Critical Value | N/A |

Data not Gamma Distributed at 5% Significance Level

### Assuming Gamma Distribution

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | N/A |
| Maximum | N/A |
| Mean | N/A |
| Median | N/A |
| SD | N/A |
| k star | N/A |
| Theta star | N/A |
| Nu star | N/A |

### Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

### Nonparametric Statistics

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.0118 |
| SD | 0.0224 |
| SE of Mean | 0.00687 |
| 95% KM (t) UCL | 0.0238 |
| 95% KM (z) UCL | 0.0231 |
| 95% KM (jackknife) UCL | 0.0523 |
| 95% KM (bootstrap t) UCL | 0.0172 |
| 95% KM (BCA) UCL | 0.075 |
| 95% KM (Percentile Bootstrap) UCL | 0.075 |
| 95% KM (Chebyshev) UCL | 0.0417 |
| 97.5% KM (Chebyshev) UCL | 0.0547 |
| 99% KM (Chebyshev) UCL | 0.0801 |

Potential UCLs to Use

| | | | |
|---|---|---|---|
| AppChi2 | N/A | 95% KM (t) UCL | 0.0238 |
| 95% Gamma Approximate UCL (Use when n >= 40) | N/A | 95% KM (Percentile Bootstrap) UCL | 0.075 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 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.

Thorium

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 1 |
| Number of Distinct Detected Data | 1 | Number of Non-Detect Data | 15 |
| | | Percent Non-Detects | 93.75% |

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 Thorium was not processed!

Tin

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 16 |
| | | 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 Tin was not processed!

Titanium

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 2 |
| Number of Distinct Detected Data | 2 | Number of Non-Detect Data | 14 |
| | | Percent Non-Detects | 87.50% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 2.1 | Minimum Detected | 0.742 |
| Maximum Detected | 6.1 | Maximum Detected | 1.808 |
| Mean of Detected | 4.1 | Mean of Detected | 1.275 |
| SD of Detected | 2.828 | SD of Detected | 0.754 |
| Minimum Non-Detect | 0.4 | Minimum Non-Detect | -0.916 |
| Maximum Non-Detect | 5 | Maximum Non-Detect | 1.609 |

| | | |
|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | Number treated as Non-Detect | 15 |
| For all methods (except KM, DL/2, and ROS Methods), | Number treated as Detected | 1 |
| Observations < Largest ND are treated as NDs | Single DL Non-Detect Percentage | 93.75% |

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

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**

| | |
|---|---|
| Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 2.269 |
| SD | 1.37 |
| 95% DL/2 (t) UCL | 2.869 |
| Maximum Likelihood Estimate(MLE) Method | N/A |

MLE method failed to converge properly

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.488 |
| SD | 1.065 |
| 95% H-Stat (DL/2) UCL | 6.214 |
| Log ROS Method | |
| Mean in Log Scale | N/A |
| SD in Log Scale | N/A |
| Mean in Original Scale | N/A |
| SD in Original Scale | N/A |
| 95% t UCL | N/A |
| 95% Percentile Bootstrap UCL | N/A |
| 95% BCA Bootstrap UCL | N/A |
| 95% H-UCL | N/A |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | N/A |
| Theta Star | N/A |
| nu star | N/A |
| A-D Test Statistic | N/A |
| 5% A-D Critical Value | N/A |
| K-S Test Statistic | N/A |
| 5% K-S Critical Value | N/A |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | N/A |

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 2.35 |
| SD | 0.968 |
| SE of Mean | 0.342 |
| 95% KM (t) UCL | 2.95 |
| 95% KM (z) UCL | 2.913 |
| 95% KM (jackknife) UCL | 5.03 |
| 95% KM (bootstrap t) UCL | 2.35 |

| | | | |
|---|---|---|---|
| Maximum | N/A | 95% KM (BCA) UCL | 6.1 |
| Mean | N/A | 95% KM (Percentile Bootstrap) UCL | 6.1 |
| Median | N/A | 95% KM (Chebyshev) UCL | 3.842 |
| SD | N/A | 97.5% KM (Chebyshev) UCL | 4.488 |
| k star | N/A | 99% KM (Chebyshev) UCL | 5.756 |
| Theta star | N/A | | |
| Nu star | N/A | Potential UCLs to Use | |
| AppChi2 | N/A | 95% KM (t) UCL | 2.95 |
| 95% Gamma Approximate UCL (Use when n >= 40) | N/A | 95% KM (% Bootstrap) UCL | 6.1 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 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.

Tungsten

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 16 |
| | | 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 Tungsten was not processed!

Uranium

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Observations | 16 | Number of Distinct Observations | 16 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 0.075 | Minimum of Log Data | -2.59 |
| Maximum | 1.83 | Maximum of Log Data | 0.604 |
| Mean | 0.814 | Mean of log Data | -0.597 |
| Geometric Mean | 0.55 | SD of log Data | 1.058 |
| Median | 0.8 | | |
| SD | 0.586 | | |
| Std. Error of Mean | 0.147 | | |
| Coefficient of Variation | 0.72 | | |
| Skewness | 0.34 | | |

Relevant UCL Statistics

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.924 | Shapiro Wilk Test Statistic | 0.879 |
| Shapiro Wilk Critical Value | 0.887 | Shapiro Wilk Critical Value | 0.887 |
| Data appear Normal at 5% Significance Level | | Data not Lognormal at 5% Significance Level | |

| Assuming Normal Distribution | |
|---|---|
| 95% Student's-t UCL | 1.071 |
| **95% UCLs (Adjusted for Skewness)** | |
| 95% Adjusted-CLT UCL (Chen-1995) | 1.069 |
| 95% Modified-t UCL (Johnson-1978) | 1.073 |

| Assuming Lognormal Distribution | |
|---|---|
| 95% H-UCL | 2.066 |
| 95% Chebyshev (MVUE) UCL | 2.085 |
| 97.5% Chebyshev (MVUE) UCL | 2.591 |
| 99% Chebyshev (MVUE) UCL | 3.584 |

| Gamma Distribution Test | |
|---|---|
| k star (bias corrected) | 1.195 |
| Theta Star | 0.681 |
| MLE of Mean | 0.814 |
| MLE of Standard Deviation | 0.745 |
| nu star | 38.25 |
| Approximate Chi Square Value (.05) | 25.09 |
| Adjusted Level of Significance | 0.0335 |
| Adjusted Chi Square Value | 23.88 |
| Anderson-Darling Test Statistic | 0.566 |
| Anderson-Darling 5% Critical Value | 0.756 |
| Kolmogorov-Smirnov Test Statistic | 0.161 |
| Kolmogorov-Smirnov 5% Critical Value | 0.219 |

Data appear Gamma Distributed at 5% Significance Level

| Assuming Gamma Distribution | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 1.241 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 1.304 |

**Data Distribution**

Data appear Normal at 5% Significance Level

| Nonparametric Statistics | |
|---|---|
| 95% CLT UCL | 1.055 |
| 95% Jackknife UCL | 1.071 |
| 95% Standard Bootstrap UCL | 1.056 |
| 95% Bootstrap-t UCL | 1.085 |
| 95% Hall's Bootstrap UCL | 1.062 |
| 95% Percentile Bootstrap UCL | 1.046 |
| 95% BCA Bootstrap UCL | 1.08 |
| 95% Chebyshev(Mean, Sd) UCL | 1.453 |
| 97.5% Chebyshev(Mean, Sd) UCL | 1.729 |
| 99% Chebyshev(Mean, Sd) UCL | 2.272 |

| Potential UCL to Use | Use 95% Student's-t UCL 1.071 |
|---|---|

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 Data | 16 | Number of Detected Data | 7 |
| Number of Distinct Detected Data | 7 | Number of Non-Detect Data | 9 |
| | | Percent Non-Detects | 56.25% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.29 | Minimum Detected | -1.238 |
| Maximum Detected | 0.98 | Maximum Detected | -0.0202 |
| Mean of Detected | 0.553 | Mean of Detected | -0.654 |
| SD of Detected | 0.218 | SD of Detected | 0.377 |
| Minimum Non-Detect | 0.5 | Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | 0.5 | Maximum Non-Detect | -0.693 |

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

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.902 |
| 5% Shapiro Wilk Critical Value | 0.803 |

Data appear Normal at 5% Significance Level

### Assuming Normal Distribution

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.383 |
| SD | 0.208 |
| 95% DL/2 (t) UCL | 0.474 |
| | |
| Maximum Likelihood Estimate(MLE) Method | |
| Mean | 0.278 |
| SD | 0.32 |
| 95% MLE (t) UCL | 0.419 |
| 95% MLE (Tiku) UCL | 0.562 |

### Lognormal Distribution Test with Detected Values Only

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.97 |
| 5% Shapiro Wilk Critical Value | 0.803 |

Data appear Lognormal at 5% Significance Level

### Assuming Lognormal Distribution

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -1.066 |
| SD | 0.445 |
| 95% H-Stat (DL/2) UCL | 0.478 |
| | |
| Log ROS Method | |
| Mean in Log Scale | -0.854 |
| SD in Log Scale | 0.348 |
| Mean in Original Scale | 0.452 |
| SD in Original Scale | 0.178 |
| 95% t UCL | 0.53 |
| 95% Percentile Bootstrap UCL | 0.53 |
| 95% BCA Bootstrap UCL | 0.547 |
| 95% H UCL | 0.537 |

### Gamma Distribution Test with Detected Values Only

| | |
|---|---|
| k star (bias corrected) | 4.814 |
| Theta Star | 0.115 |
| nu star | 67.4 |
| | |
| A-D Test Statistic | 0.269 |
| 5% A-D Critical Value | 0.709 |
| K-S Test Statistic | 0.709 |
| 5% K-S Critical Value | 0.312 |

Data appear Gamma Distributed at 5% Significance Level

### Assuming Gamma Distribution

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.0786 |
| Maximum | 0.98 |
| Mean | 0.455 |
| Median | 0.449 |
| SD | 0.205 |
| k star | 3.501 |
| Theta star | 0.13 |
| Nu star | 112 |
| AppChi2 | 88.59 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.576 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.592 |

Note: DL/2 is not a recommended method.

### Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

### Nonparametric Statistics

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.46 |
| SD | 0.165 |
| SE of Mean | 0.0525 |
| 95% KM (t) UCL | 0.552 |
| 95% KM (z) UCL | 0.546 |
| 95% KM (jackknife) UCL | 0.561 |
| 95% KM (bootstrap t) UCL | 0.565 |
| 95% KM (BCA) UCL | 0.564 |
| 95% KM (Percentile Bootstrap) UCL | 0.555 |
| 95% KM (Chebyshev) UCL | 0.689 |
| 97.5% KM (Chebyshev) UCL | 0.788 |
| 99% KM (Chebyshev) UCL | 0.982 |

### Potential UCLs to Use

| | |
|---|---|
| 95% KM (t) UCL | 0.552 |
| 95% KM (Percentile Bootstrap) UCL | 0.555 |

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.

Yttrium

## General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 4 |
| Number of Distinct Detected Data | 3 | Number of Non-Detect Data | 12 |
| | | Percent Non-Detects | 75.00% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.053 | Minimum Detected | -2.937 |
| Maximum Detected | 0.128 | Maximum Detected | -2.056 |
| Mean of Detected | 0.075 | Mean of Detected | -2.662 |
| SD of Detected | 0.0359 | SD of Detected | 0.417 |
| Minimum Non-Detect | 0.5 | Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | 0.5 | Maximum Non-Detect | -0.693 |

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 | 0.748 | Shapiro Wilk Test Statistic | 0.791 |
| 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 | 0.206 | Mean | -1.705 |
| SD | 0.0799 | SD | 0.6 |
| 95% DL/2 (t) UCL | 0.241 | 95% H-Stat (DL/2) UCL | 0.304 |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE method failed to converge properly | | Mean in Log Scale | -2.662 |
| | | SD in Log Scale | 0.419 |
| | | Mean in Original Scale | 0.0759 |
| | | SD in Original Scale | 0.0328 |
| | | 95% t UCL | 0.0902 |
| | | 95% Percentile Bootstrap UCL | 0.089 |
| | | 95% BCA Bootstrap UCL | 0.0907 |
| | | 95% H-UCL | 0.0943 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 1.945 | Data appear Normal at 5% Significance Level |
| Theta Star | 0.0386 | |
| nu star | 15.56 | |
| A-D Test Statistic | 0.603 | Nonparametric Statistics |

| | |
|---|---|
| 5% A-D Critical Value | 0.658 |
| K-S Test Statistic | 0.658 |
| 5% K-S Critical Value | 0.395 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.0155 |
| Maximum | 0.128 |
| Mean | 0.074 |
| Median | 0.0696 |
| SD | 0.0322 |
| k star | 3.652 |
| Theta star | 0.0203 |
| Nu star | 116.9 |
| AppChi2 | 92.89 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.0931 |
| 95% Adjusted Gamma UCL (Use when n < 40) | N/A |

Note: DL/2 is not a recommended method.

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.075 |
| SD | 0.0311 |
| SE of Mean | 0.0179 |
| 95% KM (t) UCL | 0.106 |
| 95% KM (z) UCL | 0.104 |
| 95% KM (jackknife) UCL | 0.11 |
| 95% KM (bootstrap t) UCL | 0.239 |
| 95% KM (BCA) UCL | 0.107 |
| 95% KM (Percentile Bootstrap) UCL | 0.103 |
| 95% KM (Chebyshev) UCL | 0.153 |
| 97.5% KM (Chebyshev) UCL | 0.187 |
| 99% KM (Chebyshev) UCL | 0.253 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.106 |
| 95% KM (Percentile Bootstrap) UCL | 0.103 |

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.

Zinc

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 16 | Number of Detected Data | 15 |
| Number of Distinct Detected Data | 14 | Number of Non-Detect Data | 1 |
| | | Percent Non-Detects | 6.25% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 2.2 | Minimum Detected | 0.788 |
| Maximum Detected | 36.6 | Maximum Detected | 3.6 |
| Mean of Detected | 13.07 | Mean of Detected | 2.301 |
| SD of Detected | 9.971 | SD of Detected | 0.786 |
| Minimum Non-Detect | 3 | Minimum Non-Detect | 1.099 |
| Maximum Non-Detect | 3 | Maximum Non-Detect | 1.099 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.851 | Shapiro Wilk Test Statistic | 0.967 |
| 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 | | Assuming Lognormal Distribution | |
|---|---|---|---|
| DL/2 Substitution Method | | DL/2 Substitution Method | |
| Mean | 12.34 | Mean | 2.182 |
| SD | 10.06 | SD | 0.895 |
| 95% DL/2 (t) UCL | 16.75 | 95% H-Stat (DL/2) UCL | 23.83 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |

| | |
|---|---|
| Mean | 11.74 |
| SD | 10.64 |
| 95% MLE (t) UCL | 16.4 |
| 95% MLE (Tiku) UCL | 16.33 |

| | |
|---|---|
| Mean in Log Scale | 2.207 |
| SD in Log Scale | 0.847 |
| Mean in Original Scale | 12.39 |
| SD in Original Scale | 10.01 |
| 95% t UCL | 16.77 |
| 95% Percentile Bootstrap UCL | 16.62 |
| 95% BCA Bootstrap UCL | 17.22 |
| 95% H UCL | 22.36 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 1.651 |
| Theta Star | 7.915 |
| nu star | 49.53 |
| | |
| A-D Test Statistic | 0.329 |
| 5% A-D Critical Value | 0.747 |
| K-S Test Statistic | 0.747 |
| 5% K-S Critical Value | 0.224 |

Data appear Gamma Distributed at 5% Significance Level

**Data Distribution Test with Detected Values Only**

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 36.6 |
| Mean | 12.25 |
| Median | 10.25 |
| SD | 10.17 |
| k star | 0.465 |
| Theta star | 26.35 |
| Nu star | 14.87 |
| AppChi2 | 7.174 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 25.4 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 27.72 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 12.39 |
| SD | 9.691 |
| SE of Mean | 2.508 |
| 95% KM (t) UCL | 16.78 |
| 95% KM (z) UCL | 16.51 |
| 95% KM (jackknife) UCL | 16.74 |
| 95% KM (bootstrap t) UCL | 18.78 |
| 95% KM (BCA) UCL | 16.69 |
| 95% KM (Percentile Bootstrap) UCL | 16.41 |
| 95% KM (Chebyshev) UCL | 23.32 |
| 97.5% KM (Chebyshev) UCL | 28.05 |
| 99% KM (Chebyshev) UCL | 37.34 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (Chebyshev) UCL | 23.32 |

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.

From File: INPUT.wst

## Summary Statistics for Raw Full Data Sets

| Variable | NumObs | Minimum | Maximum | Mean | Median | Variance | SD | MAD/0.675 | Skewness | Kurtosis | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_Acridine | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Anthracene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Acenaphthene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Acenaphthylene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| ROS_Benz(a)anthracene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Benzo(a)pyrene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| S_Benzo(b)fluoranthene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| OS_Benzo(g,h,i)perylene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| S_Benzo(k)fluoranthene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Chrysene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| _Dibenz(a,h)anthracene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Fluoranthene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Fluorene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| _Indeno(1,2,3-c,d)pyrene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Naphthalene | 45 | 2.587E-07 | 0.764 | 0.0247 | 0.0002662 | 0.0133 | 0.115 | 0.0003908 | 6.279 | 40.75 | 4.672 |
| LnROS_Phenanthrene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Pyrene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Quinoline | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Total PAHs | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

## Percentiles for Raw Full Data Sets

| Variable | NumObs | 5%ile | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | 99%ile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_Acridine | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Anthracene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Acenaphthene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Acenaphthylene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| ROS_Benz(a)anthracene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Benzo(a)pyrene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| S_Benzo(b)fluoranthene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| OS_Benzo(g,h,i)perylene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| S_Benzo(k)fluoranthene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Chrysene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| _Dibenz(a,h)anthracene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Fluoranthene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Fluorene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| _Indeno(1,2,3-c,d)pyrene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Naphthalene | 45 | 1.754E-06 | 4.867E-06 | 1.926E-05 | 3.32E-05 | 0.0002662 | 0.00259 | 0.00451 | 0.0181 | 0.0708 | 0.49 |
| LnROS_Phenanthrene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Pyrene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Quinoline | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Total PAHs | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

From File: INPUT.wst

Summary Statistics for Raw Full Data Sets

| Variable | NumObs | Minimum | Maximum | Mean | Median | Variance | SD | MAD/0.675 | Skewness | Kurtosis | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_Aluminum | 52 | 2.347 | 50.1 | 11 | 9.1 | 63.14 | 7.946 | 4.529 | 2.637 | 10.57 | 0.722 |
| LnROS_Antimony | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Arsenic | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Barium | 52 | 5.8 | 12.7 | 9.19 | 9.2 | 1.767 | 1.329 | 1.186 | -0.263 | 0.859 | 0.145 |
| LnROS_Beryllium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Bismuth | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Boron | 52 | 2030 | 4080 | 3303 | 3500 | 322128 | 567.6 | 593 | -0.531 | -0.924 | 0.172 |
| LnROS_Cadmium | 52 | 0.0335 | 0.124 | 0.0733 | 0.0671 | 0.0005993 | 0.0245 | 0.027 | 0.435 | -0.937 | 0.334 |
| LnROS_Calcium | 52 | 185000 | 327000 | 262596 | 257500 | 2.004E+09 | 44767 | 65234 | -0.104 | -1.465 | 0.17 |
| LnROS_Cesium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Chromium | 52 | 0.00932 | 1.07 | 0.152 | 0.0889 | 0.0369 | 0.192 | 0.0815 | 3.064 | 11.3 | 1.265 |
| LnROS_Cobalt | 52 | 0.00284 | 0.451 | 0.0648 | 0.0343 | 0.00674 | 0.0821 | 0.0339 | 2.697 | 9.16 | 1.267 |
| LnROS_Copper | 52 | 0.3 | 14.4 | 1.048 | 0.79 | 3.621 | 1.903 | 0.245 | 7.037 | 50.3 | 1.815 |
| LnROS_Gallium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Iron | 52 | 0.121 | 73 | 6.023 | 2.395 | 123.5 | 11.12 | 2.696 | 4.647 | 26.31 | 1.845 |
| LnROS_Lead | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Lithium | 52 | 79 | 156 | 126.6 | 128 | 363.8 | 19.07 | 14.83 | -0.86 | 0.365 | 0.151 |
| LnROS_Magnesium | 52 | 572000 | 987000 | 816385 | 807000 | 1.325E+10 | 115116 | 154930 | -0.268 | -1.147 | 0.141 |
| LnROS_Manganese | 52 | 1.81 | 111 | 8.95 | 3.995 | 388.3 | 19.7 | 1.245 | 4.379 | 19.24 | 2.202 |
| LnROS_Molybdenum | 52 | 5 | 9.5 | 7.669 | 7.8 | 1.206 | 1.098 | 1.186 | -0.53 | -0.243 | 0.143 |
| LnROS_Nickel | 52 | 0.0825 | 1.12 | 0.33 | 0.28 | 0.0397 | 0.199 | 0.153 | 1.697 | 4.136 | 0.605 |
| LnROS_Phosphorus | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Potassium | 52 | 177000 | 307000 | 250577 | 253500 | 1.641E+09 | 40509 | 54855 | -0.282 | -1.442 | 0.162 |
| LnROS_Rhenium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Rubidium | 52 | 44.7 | 94.2 | 76.54 | 80.55 | 136.2 | 11.67 | 11.12 | -0.879 | 0.347 | 0.152 |
| LnROS_Selenium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Silicon | 52 | 473.1 | 1580 | 1052 | 940 | 118108 | 343.7 | 392.9 | 0.185 | -1.44 | 0.327 |
| LnROS_Silver | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Sodium | 52 | 5040000 | 8850000 | 6936346 | 7175000 | 1.532E+12 | 1237830 | 1467754 | -0.264 | -1.444 | 0.178 |
| LnROS_Strontium | 52 | 3530 | 6090 | 4876 | 4800 | 489514 | 699.7 | 822.8 | -0.101 | -1.061 | 0.143 |
| LnROS_Tellurium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Thallium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Thorium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Tin | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Titanium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Tungsten | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Uranium | 52 | 1.38 | 2.65 | 2.102 | 2.06 | 0.0984 | 0.314 | 0.356 | -0.257 | -0.61 | 0.149 |
| LnROS_Vanadium | 52 | 0.76 | 1.54 | 1.131 | 1.135 | 0.0245 | 0.157 | 0.126 | 0.0629 | 0.709 | 0.138 |
| LnROS_Yttrium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Zinc | 52 | 1.428 | 7.4 | 3.274 | 3.2 | 1.441 | 1.2 | 1.057 | 1.144 | 1.968 | 0.367 |
| LnROS_Zirconium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

Percentiles for Raw Full Data Sets

| Variable | NumObs | 5%ile | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | 99%ile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_Aluminum | 52 | 3.392 | 4.108 | 5.288 | 5.837 | 9.1 | 11.93 | 15.12 | 19.88 | 22.85 | 37.66 |
| LnROS_Antimony | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Arsenic | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Barium | 52 | 6.905 | 7.71 | 8.12 | 8.275 | 9.2 | 10 | 10.08 | 10.4 | 11.08 | 12.19 |
| LnROS_Beryllium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Bismuth | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Boron | 52 | 2481 | 2545 | 2670 | 2740 | 3500 | 3765 | 3808 | 3919 | 3997 | 4060 |
| LnROS_Cadmium | 52 | 0.041 | 0.0455 | 0.052 | 0.054 | 0.0671 | 0.0923 | 0.0982 | 0.113 | 0.114 | 0.121 |
| LnROS_Calcium | 52 | 196100 | 203200 | 216200 | 218000 | 257500 | 305000 | 306800 | 319000 | 322000 | 325980 |
| LnROS_Cesium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Chromium | 52 | 0.0182 | 0.0229 | 0.0365 | 0.0433 | 0.0889 | 0.181 | 0.208 | 0.311 | 0.452 | 0.922 |
| LnROS_Cobalt | 52 | 0.00569 | 0.00815 | 0.0131 | 0.0159 | 0.0343 | 0.0865 | 0.0982 | 0.153 | 0.231 | 0.345 |
| LnROS_Copper | 52 | 0.385 | 0.531 | 0.59 | 0.625 | 0.79 | 0.938 | 0.976 | 1.116 | 1.164 | 7.841 |
| LnROS_Gallium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Iron | 52 | 0.279 | 0.428 | 0.759 | 0.95 | 2.395 | 6.022 | 7.525 | 14 | 19.15 | 49.03 |
| LnROS_Lead | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Lithium | 52 | 87.55 | 96.4 | 117.6 | 121 | 128 | 140.5 | 143.6 | 148.9 | 151.5 | 154.5 |
| LnROS_Magnesium | 52 | 631750 | 674200 | 708600 | 719000 | 807000 | 916750 | 934200 | 949800 | 962000 | 980370 |
| LnROS_Manganese | 52 | 2.052 | 2.251 | 3.146 | 3.308 | 3.995 | 4.915 | 5.236 | 7.726 | 31.06 | 100.1 |
| LnROS_Molybdenum | 52 | 5.865 | 6.2 | 6.74 | 6.9 | 7.8 | 8.6 | 8.6 | 8.89 | 9.19 | 9.449 |
| LnROS_Nickel | 52 | 0.116 | 0.138 | 0.175 | 0.192 | 0.28 | 0.408 | 0.495 | 0.569 | 0.605 | 0.993 |
| LnROS_Phosphorus | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Potassium | 52 | 190100 | 198100 | 202000 | 206500 | 253500 | 288000 | 290000 | 297800 | 300450 | 304960 |
| LnROS_Rhenium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Rubidium | 52 | 56.04 | 60.28 | 68.22 | 70.13 | 80.55 | 85.43 | 87.06 | 88.62 | 90.39 | 93.28 |
| LnROS_Selenium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Silicon | 52 | 573.1 | 671 | 752 | 767.5 | 940 | 1400 | 1408 | 1528 | 1560 | 1575 |
| LnROS_Silver | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Sodium | 52 | 5110000 | 5213000 | 5416000 | 5602500 | 7175000 | 8045000 | 8086000 | 8314000 | 8531500 | 8804100 |
| LnROS_Strontium | 52 | 3742 | 3943 | 4292 | 4338 | 4800 | 5495 | 5582 | 5717 | 5924 | 6065 |
| LnROS_Tellurium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Thallium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Thorium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Tin | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Titanium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Tungsten | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Uranium | 52 | 1.6 | 1.72 | 1.848 | 1.888 | 2.06 | 2.37 | 2.434 | 2.508 | 2.539 | 2.599 |
| LnROS_Vanadium | 52 | 0.858 | 0.951 | 1.014 | 1.05 | 1.135 | 1.195 | 1.23 | 1.299 | 1.409 | 1.499 |
| LnROS_Yttrium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Zinc | 52 | 1.763 | 1.969 | 2.277 | 2.41 | 3.2 | 3.725 | 4.06 | 4.6 | 5.46 | 6.788 |
| LnROS_Zirconium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

## General UCL Statistics for Data Sets with Non-Detects

**User Selected Options**

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

**Aluminum**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 38 |
| Number of Distinct Detected Data | 34 | Number of Non-Detect Data | 14 |
| | | Percent Non-Detects | 26.92% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 6.2 | Minimum Detected | 1.825 |
| Maximum Detected | 50.1 | Maximum Detected | 3.914 |
| Mean of Detected | 13.46 | Mean of Detected | 2.487 |
| SD of Detected | 7.979 | SD of Detected | 0.445 |
| Minimum Non-Detect | 5 | Minimum Non-Detect | 1.609 |
| Maximum Non-Detect | 5 | Maximum Non-Detect | 1.609 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.715 | Shapiro Wilk Test Statistic | 0.917 |
| 5% Shapiro Wilk Critical Value | 0.938 | 5% Shapiro Wilk Critical Value | 0.938 |
| 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 | 10.51 | Mean | 2.064 |
| SD | 8.382 | SD | 0.799 |
| 95% DL/2 (t) UCL | 12.45 | 95% H-Stat (DL/2) UCL | 13.73 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 9.458 | Mean in Log Scale | 2.204 |
| SD | 9.787 | SD in Log Scale | 0.62 |
| 95% MLE (t) UCL | 11.73 | Mean in Original Scale | 11 |
| 95% MLE (Tiku) UCL | 11.82 | SD in Original Scale | 7.946 |
| | | 95% t UCL | 12.85 |
| | | 95% Percentile Bootstrap UCL | 12.87 |
| | | 95% BCA Bootstrap UCL | 13.35 |
| | | 95% H UCL | 13.02 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 4.246 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 3.169 | |
| nu star | 322.7 | |

| | |
|---|---|
| A-D Test Statistic | 1.507 |
| 5% A-D Critical Value | 0.752 |
| K-S Test Statistic | 0.752 |
| 5% K-S Critical Value | 0.144 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 50.1 |
| Mean | 9.839 |
| Median | 9.1 |
| SD | 9.076 |
| k star | 0.19 |
| Theta star | 51.7 |
| Nu star | 19.79 |
| AppChi2 | 10.7 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 18.2 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 18.54 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 11.5 |
| SD | 7.46 |
| SE of Mean | 1.048 |
| 95% KM (t) UCL | 13.26 |
| 95% KM (z) UCL | 13.23 |
| 95% KM (jackknife) UCL | 13.12 |
| 95% KM (bootstrap t) UCL | 13.84 |
| 95% KM (BCA) UCL | 13.59 |
| 95% KM (Percentile Bootstrap) UCL | 13.41 |
| 95% KM (Chebyshev) UCL | 16.07 |
| 97.5% KM (Chebyshev) UCL | 18.05 |
| 99% KM (Chebyshev) UCL | 21.93 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (BCA) UCL | 13.59 |

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

## Antimony

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 1 |
| Number of Distinct Detected Data | 1 | Number of Non-Detect Data | 51 |
| | | Percent Non-Detects | 98.08% |

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 was not processed!

## Arsenic

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 52 |
| | | 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 Arsenic was not processed!

Barium

## General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Observations | 52 | Number of Distinct Observations | 32 |

### Raw Statistics

| | |
|---|---|
| Minimum | 5.8 |
| Maximum | 12.7 |
| Mean | 9.19 |
| Geometric Mean | 9.09 |
| Median | 9.2 |
| SD | 1.329 |
| Std. Error of Mean | 0.184 |
| Coefficient of Variation | 0.145 |
| Skewness | -0.263 |

### Log-transformed Statistics

| | |
|---|---|
| Minimum of Log Data | 1.758 |
| Maximum of Log Data | 2.542 |
| Mean of log Data | 2.207 |
| SD of log Data | 0.152 |

## Relevant UCL Statistics

### Normal Distribution Test

| | |
|---|---|
| Lilliefors Test Statistic | 0.115 |
| Lilliefors Critical Value | 0.123 |

Data appear Normal at 5% Significance Level

### Lognormal Distribution Test

| | |
|---|---|
| Lilliefors Test Statistic | 0.146 |
| Lilliefors Critical Value | 0.123 |

Data not Lognormal at 5% Significance Level

### Assuming Normal Distribution

| | |
|---|---|
| 95% Student's-t UCL | 9.499 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 9.486 |
| 95% Modified-t UCL (Johnson-1978) | 9.498 |

### Assuming Lognormal Distribution

| | |
|---|---|
| 95% H-UCL | 9.538 |
| 95% Chebyshev (MVUE) UCL | 10.05 |
| 97.5% Chebyshev (MVUE) UCL | 10.41 |
| 99% Chebyshev (MVUE) UCL | 11.14 |

### Gamma Distribution Test

| | |
|---|---|
| k star (bias corrected) | 43.23 |
| Theta Star | 0.213 |
| MLE of Mean | 9.19 |
| MLE of Standard Deviation | 1.398 |
| nu star | 4496 |
| Approximate Chi Square Value (.05) | 4341 |
| Adjusted Level of Significance | 0.0454 |
| Adjusted Chi Square Value | 4337 |
| Anderson-Darling Test Statistic | 0.778 |
| Anderson-Darling 5% Critical Value | 0.748 |
| Kolmogorov-Smirnov Test Statistic | 0.135 |
| Kolmogorov-Smirnov 5% Critical Value | 0.123 |

Data not Gamma Distributed at 5% Significance Level

### Assuming Gamma Distribution

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 9.518 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 9.528 |

### Data Distribution

Data appear Normal at 5% Significance Level

### Nonparametric Statistics

| | |
|---|---|
| 95% CLT UCL | 9.494 |
| 95% Jackknife UCL | 9.499 |
| 95% Standard Bootstrap UCL | 9.491 |
| 95% Bootstrap-t UCL | 9.485 |
| 95% Hall's Bootstrap UCL | 9.498 |
| 95% Percentile Bootstrap UCL | 9.485 |
| 95% BCA Bootstrap UCL | 9.475 |
| 95% Chebyshev(Mean, Sd) UCL | 9.994 |
| 97.5% Chebyshev(Mean, Sd) UCL | 10.34 |
| 99% Chebyshev(Mean, Sd) UCL | 11.02 |

**Potential UCL to Use** Use 95% Student's-t UCL 9.499

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 positvely skewed data sets.

**Beryllium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 52 |
| | | 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 Beryllium was not processed!

**Bismuth**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 52 |
| | | 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 Bismuth was not processed!

**Boron**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 52 | Number of Distinct Observations | 48 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 2030 | Minimum of Log Data | 7.616 |
| Maximum | 4080 | Maximum of Log Data | 8.314 |
| Mean | 3303 | Mean of log Data | 8.087 |
| Geometric Mean | 3251 | SD of log Data | 0.184 |
| Median | 3500 | | |
| SD | 567.6 | | |

| | |
|---|---|
| Std. Error of Mean | 78.71 |
| Coefficient of Variation | 0.172 |
| Skewness | -0.531 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Lilliefors Test Statistic | 0.149 |
| Lilliefors Critical Value | 0.123 |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Lilliefors Test Statistic | 0.167 |
| Lilliefors Critical Value | 0.123 |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 3435 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 3426 |
| 95% Modified-t UCL (Johnson-1978) | 3434 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 3456 |
| 95% Chebyshev (MVUE) UCL | 3676 |
| 97.5% Chebyshev (MVUE) UCL | 3837 |
| 99% Chebyshev (MVUE) UCL | 4152 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 29.87 |
| Theta Star | 110.6 |
| MLE of Mean | 3303 |
| MLE of Standard Deviation | 604.4 |
| nu star | 3106 |
| Approximate Chi Square Value (.05) | 2978 |
| Adjusted Level of Significance | 0.0454 |
| Adjusted Chi Square Value | 2974 |
| Anderson-Darling Test Statistic | 1.896 |
| Anderson-Darling 5% Critical Value | 0.748 |
| Kolmogorov-Smirnov Test Statistic | 0.163 |
| Kolmogorov-Smirnov 5% Critical Value | 0.123 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 3446 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 3450 |

**Data Distribution**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 3433 |
| 95% Jackknife UCL | 3435 |
| 95% Standard Bootstrap UCL | 3431 |
| 95% Bootstrap-t UCL | 3426 |
| 95% Hall's Bootstrap UCL | 3423 |
| 95% Percentile Bootstrap UCL | 3425 |
| 95% BCA Bootstrap UCL | 3430 |
| 95% Chebyshev(Mean, Sd) UCL | 3646 |
| 97.5% Chebyshev(Mean, Sd) UCL | 3795 |
| 99% Chebyshev(Mean, Sd) UCL | 4086 |

**Potential UCL to Use**

Use 95% Student's-t UCL 3435

or 95% Modified-t UCL 3434

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 positvely skewed data sets.

**Cadmium**

## General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 25 |
| Number of Distinct Detected Data | 20 | Number of Non-Detect Data | 27 |
| | | Percent Non-Detects | 51.92% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.052 | Minimum Detected | -2.957 |
| Maximum Detected | 0.124 | Maximum Detected | -2.087 |
| Mean of Detected | 0.0937 | Mean of Detected | -2.387 |
| SD of Detected | 0.0182 | SD of Detected | 0.209 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.05 | Maximum Non-Detect | -2.996 |

## 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 | 0.94 |
| 5% Shapiro Wilk Critical Value | 0.918 | 5% 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 | |
|---|---|---|---|
| DL/2 Substitution Method | | DL/2 Substitution Method | |
| Mean | 0.058 | Mean | -3.063 |
| SD | 0.0368 | SD | 0.672 |
| 95% DL/2 (t) UCL | 0.0666 | 95% H-Stat (DL/2) UCL | 0.0707 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 0.0524 | Mean in Log Scale | -2.668 |
| SD | 0.0461 | SD in Log Scale | 0.338 |
| 95% MLE (t) UCL | 0.0631 | Mean in Original Scale | 0.0733 |
| 95% MLE (Tiku) UCL | 0.0658 | SD in Original Scale | 0.0245 |
| | | 95% t UCL | 0.079 |
| | | 95% Percentile Bootstrap UCL | 0.0788 |
| | | 95% BCA Bootstrap UCL | 0.0788 |
| | | 95% H UCL | 0.0798 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 22.31 | Data appear Normal at 5% Significance Level |
| Theta Star | 0.0042 | |
| nu star | 1115 | |
| | | |
| A-D Test Statistic | 0.388 | Nonparametric Statistics |
| 5% A-D Critical Value | 0.743 | Kaplan-Meier (KM) Method |
| K-S Test Statistic | 0.743 | Mean 0.0721 |
| 5% K-S Critical Value | 0.174 | SD 0.0242 |
| Data appear Gamma Distributed at 5% Significance Level | | SE of Mean 0.00343 |
| | | 95% KM (t) UCL 0.0778 |
| Assuming Gamma Distribution | | 95% KM (z) UCL 0.0777 |
| Gamma ROS Statistics using Extrapolated Data | | 95% KM (jackknife) UCL 0.0791 |
| Minimum | 0.000001 | 95% KM (bootstrap t) UCL 0.0774 |
| Maximum | 0.124 | 95% KM (BCA) UCL 0.0862 |

| | | | |
|---|---|---|---|
| Mean | 0.0531 | 95% KM (Percentile Bootstrap) UCL | 0.0846 |
| Median | 0.0521 | 95% KM (Chebyshev) UCL | 0.087 |
| SD | 0.0437 | 97.5% KM (Chebyshev) UCL | 0.0935 |
| k star | 0.249 | 99% KM (Chebyshev) UCL | 0.106 |
| Theta star | 0.213 | | |
| Nu star | 25.88 | **Potential UCLs to Use** | |
| AppChi2 | 15.28 | 95% KM (t) UCL | 0.0778 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.0899 | 95% KM (Percentile Bootstrap) UCL | 0.0846 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.0913 | | |

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.

**Calcium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 52 | Number of Distinct Observations | 42 |

| **Raw Statistics** | | **Log-transformed Statistics** | |
|---|---|---|---|
| Minimum | 185000 | Minimum of Log Data | 12.13 |
| Maximum | 327000 | Maximum of Log Data | 12.7 |
| Mean | 262596 | Mean of log Data | 12.46 |
| Geometric Mean | 258750 | SD of log Data | 0.175 |
| Median | 257500 | | |
| SD | 44767 | | |
| Std. Error of Mean | 6208 | | |
| Coefficient of Variation | 0.17 | | |
| Skewness | -0.104 | | |

**Relevant UCL Statistics**

| **Normal Distribution Test** | | **Lognormal Distribution Test** | |
|---|---|---|---|
| Lilliefors Test Statistic | 0.153 | Lilliefors Test Statistic | 0.166 |
| Lilliefors Critical Value | 0.123 | Lilliefors Critical Value | 0.123 |
| 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 | 272996 | 95% H-UCL | 274015 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 290633 |
| 95% Adjusted-CLT UCL (Chen-1995) | 272711 | 97.5% Chebyshev (MVUE) UCL | 302735 |
| 95% Modified-t UCL (Johnson-1978) | 272981 | 99% Chebyshev (MVUE) UCL | 326507 |

| **Gamma Distribution Test** | | **Data Distribution** |
|---|---|---|
| k star (bias corrected) | 32.1 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 8181 | |
| MLE of Mean | 262596 | |
| MLE of Standard Deviation | 46349 | |
| nu star | 3338 | |
| Approximate Chi Square Value (.05) | 3205 | **Nonparametric Statistics** |

| | | | |
|---|---|---|---|
| Adjusted Level of Significance | 0.0454 | 95% CLT UCL | 272807 |
| Adjusted Chi Square Value | 3201 | 95% Jackknife UCL | 272996 |
| | | 95% Standard Bootstrap UCL | 272717 |
| Anderson-Darling Test Statistic | 1.604 | 95% Bootstrap-t UCL | 273065 |
| Anderson-Darling 5% Critical Value | 0.748 | 95% Hall's Bootstrap UCL | 272255 |
| Kolmogorov-Smirnov Test Statistic | 0.164 | 95% Percentile Bootstrap UCL | 273423 |
| Kolmogorov-Smirnov 5% Critical Value | 0.123 | 95% BCA Bootstrap UCL | 272404 |
| Data not Gamma Distributed at 5% Significance Level | | 95% Chebyshev(Mean, Sd) UCL | 289656 |
| | | 97.5% Chebyshev(Mean, Sd) UCL | 301365 |
| **Assuming Gamma Distribution** | | 99% Chebyshev(Mean, Sd) UCL | 324365 |
| 95% Approximate Gamma UCL (Use when n >= 40) | 273514 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 273830 | | |

| | | | |
|---|---|---|---|
| Potential UCL to Use | | Use 95% Student's-t UCL | 272996 |
| | | or 95% Modified-t UCL | 272981 |

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 positvely skewed data sets.

**Cesium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 52 |
| | | 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 Cesium was not processed!

**Chromium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 2 |
| Number of Distinct Detected Data | 2 | Number of Non-Detect Data | 50 |
| | | Percent Non-Detects | 96.15% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.78 | Minimum Detected | -0.248 |
| Maximum Detected | 1.07 | Maximum Detected | 0.0677 |

| | | | |
|---|---|---|---|
| Mean of Detected | 0.925 | Mean of Detected | -0.0904 |
| SD of Detected | 0.205 | SD of Detected | 0.224 |
| Minimum Non-Detect | 0.1 | Minimum Non-Detect | -2.303 |
| Maximum Non-Detect | 0.5 | Maximum Non-Detect | -0.693 |

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 | 50 |
| Number treated as Detected | 2 |
| Single DL Non-Detect Percentage | 96.15% |

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

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**

| | |
|---|---|
| Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.245 |
| SD | 0.158 |
| 95% DL/2 (t) UCL | 0.282 |
| Maximum Likelihood Estimate(MLE) Method | N/A |

MLE method failed to converge properly

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -1.584 |
| SD | 0.658 |
| 95% H-Stat (DL/2) UCL | 0.306 |
| Log ROS Method | |
| Mean in Log Scale | N/A |
| SD in Log Scale | N/A |
| Mean in Original Scale | N/A |
| SD in Original Scale | N/A |
| 95% t UCL | N/A |
| 95% Percentile Bootstrap UCL | N/A |
| 95% BCA Bootstrap UCL | N/A |
| 95% H-UCL | N/A |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | N/A |
| Theta Star | N/A |
| nu star | N/A |
| A-D Test Statistic | N/A |

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | | | |
|---|---|---|---|
| 5% A-D Critical Value | N/A | Kaplan-Meier (KM) Method | |
| K-S Test Statistic | N/A | Mean | 0.786 |
| 5% K-S Critical Value | N/A | SD | 0.0398 |
| Data not Gamma Distributed at 5% Significance Level | | SE of Mean | 0.00781 |
| | | 95% KM (t) UCL | 0.799 |
| **Assuming Gamma Distribution** | | 95% KM (z) UCL | 0.798 |
| Gamma ROS Statistics using Extrapolated Data | | 95% KM (jackknife) UCL | 0.974 |
| Minimum | N/A | 95% KM (bootstrap t) UCL | N/A |
| Maximum | N/A | 95% KM (BCA) UCL | 1.07 |
| Mean | N/A | 95% KM (Percentile Bootstrap) UCL | 1.07 |
| Median | N/A | 95% KM (Chebyshev) UCL | 0.82 |
| SD | N/A | 97.5% KM (Chebyshev) UCL | 0.834 |
| k star | N/A | 99% KM (Chebyshev) UCL | 0.863 |
| Theta star | N/A | | |
| Nu star | N/A | Potential UCLs to Use | |
| AppChi2 | N/A | 95% KM (t) UCL | 0.799 |
| 95% Gamma Approximate UCL (Use when n >= 40) | N/A | 95% KM (% Bootstrap) UCL | 1.07 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 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.

**Cobalt**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 18 |
| Number of Distinct Detected Data | 17 | Number of Non-Detect Data | 34 |
| | | Percent Non-Detects | 65.38% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.05 | Minimum Detected | -2.996 |
| Maximum Detected | 0.451 | Maximum Detected | -0.796 |
| Mean of Detected | 0.144 | Mean of Detected | -2.108 |
| SD of Detected | 0.0983 | SD of Detected | 0.574 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.05 | Maximum Non-Detect | -2.996 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.788 | Shapiro Wilk Test Statistic | 0.955 |
| 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** | | **Assuming Lognormal Distribution** | |
| DL/2 Substitution Method | | DL/2 Substitution Method | |
| Mean | 0.0662 | Mean | -3.142 |
| SD | 0.0806 | SD | 0.829 |

| | |
|---|---|
| 95% DL/2 (t) UCL | 0.0849 |
| 95% H-Stat (DL/2) UCL | 0.0781 |

| | |
|---|---|
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE yields a negative mean**

| | |
|---|---|
| Log ROS Method | |
| Mean in Log Scale | -3.355 |
| SD in Log Scale | 1.151 |
| Mean in Original Scale | 0.0648 |
| SD in Original Scale | 0.0821 |
| 95% t UCL | 0.0839 |
| 95% Percentile Bootstrap UCL | 0.0849 |
| 95% BCA Bootstrap UCL | 0.0892 |
| 95% H-UCL | 0.101 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 2.619 |
| Theta Star | 0.055 |
| nu star | 94.27 |
| A-D Test Statistic | 0.597 |
| 5% A-D Critical Value | 0.745 |
| K-S Test Statistic | 0.745 |
| 5% K-S Critical Value | 0.205 |

Data follow Appr. Gamma Distribution at 5% Significance Level

**Data Distribution Test with Detected Values Only**

Data Follow Appr. Gamma Distribution at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 0.451 |
| Mean | 0.0498 |
| Median | 0.000001 |
| SD | 0.0895 |
| k star | 0.124 |
| Theta star | 0.403 |
| Nu star | 12.85 |
| AppChi2 | 5.795 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.111 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.113 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.0825 |
| SD | 0.0718 |
| SE of Mean | 0.0102 |
| 95% KM (t) UCL | 0.0997 |
| 95% KM (z) UCL | 0.0994 |
| 95% KM (jackknife) UCL | 0.0967 |
| 95% KM (bootstrap t) UCL | 0.105 |
| 95% KM (BCA) UCL | 0.113 |
| 95% KM (Percentile Bootstrap) UCL | 0.105 |
| 95% KM (Chebyshev) UCL | 0.127 |
| 97.5% KM (Chebyshev) UCL | 0.147 |
| 99% KM (Chebyshev) UCL | 0.185 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.0997 |

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.

**Copper**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 48 |
| Number of Distinct Detected Data | 39 | Number of Non-Detect Data | 4 |
| | | Percent Non-Detects | 7.69% |

**Raw Statistics** **Log-transformed Statistics**

| | |
|---|---|
| Minimum Detected | 0.51 |
| Maximum Detected | 14.4 |
| Mean of Detected | 1.106 |
| SD of Detected | 1.971 |
| Minimum Non-Detect | 0.5 |
| Maximum Non-Detect | 0.5 |

| | |
|---|---|
| Minimum Detected | -0.673 |
| Maximum Detected | 2.667 |
| Mean of Detected | -0.165 |
| SD of Detected | 0.485 |
| Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | -0.693 |

## UCL Statistics

### Normal Distribution Test with Detected Values Only

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.225 |
| 5% Shapiro Wilk Critical Value | 0.947 |

Data not Normal at 5% Significance Level

### Assuming Normal Distribution

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 1.04 |
| SD | 1.906 |
| 95% DL/2 (t) UCL | 1.483 |
| | |
| Maximum Likelihood Estimate(MLE) Method | |
| Mean | 0.95 |
| SD | 1.974 |
| 95% MLE (t) UCL | 1.409 |
| 95% MLE (Tiku) UCL | 1.367 |

### Lognormal Distribution Test with Detected Values Only

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.625 |
| 5% Shapiro Wilk Critical Value | 0.947 |

Data not Lognormal at 5% Significance Level

### Assuming Lognormal Distribution

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -0.259 |
| SD | 0.57 |
| 95% H-Stat (DL/2) UCL | 1.059 |
| | |
| Log ROS Method | |
| Mean in Log Scale | -0.233 |
| SD in Log Scale | 0.524 |
| Mean in Original Scale | 1.048 |
| SD in Original Scale | 1.903 |
| 95% t UCL | 1.49 |
| 95% Percentile Bootstrap UCL | 1.569 |
| 95% BCA Bootstrap UCL | 1.861 |
| 95% H UCL | 1.044 |

### Gamma Distribution Test with Detected Values Only

| | |
|---|---|
| k star (bias corrected) | 1.918 |
| Theta Star | 0.577 |
| nu star | 184.1 |
| | |
| A-D Test Statistic | 8.053 |
| 5% A-D Critical Value | 0.762 |
| K-S Test Statistic | 0.762 |
| 5% K-S Critical Value | 0.129 |

Data not Gamma Distributed at 5% Significance Level

### Assuming Gamma Distribution

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 14.4 |
| Mean | 1.021 |
| Median | 0.79 |
| SD | 1.915 |
| k star | 0.495 |
| Theta star | 2.061 |
| Nu star | 51.51 |

### Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

### Nonparametric Statistics

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 1.06 |
| SD | 1.88 |
| SE of Mean | 0.264 |
| 95% KM (t) UCL | 1.502 |
| 95% KM (z) UCL | 1.494 |
| 95% KM (jackknife) UCL | 1.5 |
| 95% KM (bootstrap t) UCL | 3.945 |
| 95% KM (BCA) UCL | 1.595 |
| 95% KM (Percentile Bootstrap) UCL | 1.582 |
| 95% KM (Chebyshev) UCL | 2.209 |
| 97.5% KM (Chebyshev) UCL | 2.706 |
| 99% KM (Chebyshev) UCL | 3.682 |

Potential UCLs to Use

| | | | |
|---|---|---|---|
| AppChi2 | 36.03 | 95% KM (Chebyshev) UCL | 2.209 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 1.46 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 1.475 | | |

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.

## Gallium

### General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 52 |
| | | 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 Gallium was not processed!

## Iron

### General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 9 |
| Number of Distinct Detected Data | 6 | Number of Non-Detect Data | 43 |
| | | Percent Non-Detects | 82.69% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 13 | Minimum Detected | 2.565 |
| Maximum Detected | 73 | Maximum Detected | 4.29 |
| Mean of Detected | 22.89 | Mean of Detected | 2.945 |
| SD of Detected | 19.37 | SD of Detected | 0.564 |
| Minimum Non-Detect | 10 | Minimum Non-Detect | 2.303 |
| Maximum Non-Detect | 10 | Maximum Non-Detect | 2.303 |

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 | 0.574 | Shapiro Wilk Test Statistic | 0.718 |

| | |
|---|---|
| 5% Shapiro Wilk Critical Value | 0.829 |

Data not Normal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 8.096 |
| SD | 10.27 |
| 95% DL/2 (t) UCL | 10.48 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE yields a negative mean**

| | |
|---|---|
| 5% Shapiro Wilk Critical Value | 0.829 |

Data not Lognormal at 5% Significance Level

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 1.841 |
| SD | 0.557 |
| 95% H-Stat (DL/2) UCL | 8.543 |
| | |
| Log ROS Method | |
| Mean in Log Scale | 0.886 |
| SD in Log Scale | 1.376 |
| Mean in Original Scale | 6.023 |
| SD in Original Scale | 11.12 |
| 95% t UCL | 8.605 |
| 95% Percentile Bootstrap UCL | 8.622 |
| 95% BCA Bootstrap UCL | 10.54 |
| 95% H-UCL | 10.65 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 1.972 |
| Theta Star | 11.61 |
| nu star | 35.5 |
| | |
| A-D Test Statistic | 1.322 |
| 5% A-D Critical Value | 0.727 |
| K-S Test Statistic | 0.727 |
| 5% K-S Critical Value | 0.282 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 73 |
| Mean | 3.962 |
| Median | 0.000001 |
| SD | 11.63 |
| k star | 0.0778 |
| Theta star | 50.9 |
| Nu star | 8.094 |
| AppChi2 | 2.789 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 11.49 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 11.87 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 14.71 |
| SD | 8.468 |
| SE of Mean | 1.246 |
| 95% KM (t) UCL | 16.8 |
| 95% KM (z) UCL | 16.76 |
| 95% KM (jackknife) UCL | 16.7 |
| 95% KM (bootstrap t) UCL | 23.32 |
| 95% KM (BCA) UCL | 17.63 |
| 95% KM (Percentile Bootstrap) UCL | 17.12 |
| 95% KM (Chebyshev) UCL | 20.14 |
| 97.5% KM (Chebyshev) UCL | 22.49 |
| 99% KM (Chebyshev) UCL | 27.1 |
| | |
| Potential UCLs to Use | |
| 95% KM (t) UCL | 16.8 |
| 95% KM (% Bootstrap) UCL | 17.12 |

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.

**Lead**

### General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 52 |
| | | 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 Lead was not processed!**

## Lithium

### General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Observations | 52 | Number of Distinct Observations | 36 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 79 |
| Maximum | 156 |
| Mean | 126.6 |
| Geometric Mean | 125 |
| Median | 128 |
| SD | 19.07 |
| Std. Error of Mean | 2.645 |
| Coefficient of Variation | 0.151 |
| Skewness | -0.86 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 4.369 |
| Maximum of Log Data | 5.05 |
| Mean of log Data | 4.829 |
| SD of log Data | 0.165 |

### Relevant UCL Statistics

**Normal Distribution Test**

| | |
|---|---|
| Lilliefors Test Statistic | 0.153 |
| Lilliefors Critical Value | 0.123 |

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

**Lognormal Distribution Test**

| | |
|---|---|
| Lilliefors Test Statistic | 0.191 |
| Lilliefors Critical Value | 0.123 |

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

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 131 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 130.6 |
| 95% Modified-t UCL (Johnson-1978) | 131 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 131.9 |
| 95% Chebyshev (MVUE) UCL | 139.5 |
| 97.5% Chebyshev (MVUE) UCL | 145 |
| 99% Chebyshev (MVUE) UCL | 155.8 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 37.65 |
| Theta Star | 3.363 |
| MLE of Mean | 126.6 |
| MLE of Standard Deviation | 20.63 |
| nu star | 3916 |
| Approximate Chi Square Value (.05) | 3772 |
| Adjusted Level of Significance | 0.0454 |
| Adjusted Chi Square Value | 3768 |

**Data Distribution**

**Data do not follow a Discernable Distribution (0.05)**

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 131 |
| 95% Jackknife UCL | 131 |

| | |
|---|---|
| Anderson-Darling Test Statistic | 1.701 |
| Anderson-Darling 5% Critical Value | 0.748 |
| Kolmogorov-Smirnov Test Statistic | 0.178 |
| Kolmogorov-Smirnov 5% Critical Value | 0.123 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 131.5 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 131.6 |

| | |
|---|---|
| 95% Standard Bootstrap UCL | 130.9 |
| 95% Bootstrap-t UCL | 130.8 |
| 95% Hall's Bootstrap UCL | 130.7 |
| 95% Percentile Bootstrap UCL | 130.9 |
| 95% BCA Bootstrap UCL | 130.8 |
| 95% Chebyshev(Mean, Sd) UCL | 138.1 |
| 97.5% Chebyshev(Mean, Sd) UCL | 143.1 |
| 99% Chebyshev(Mean, Sd) UCL | 152.9 |

| | |
|---|---|
| Potential UCL to Use | Use 95% Student's-t UCL 131 |
| | or 95% Modified-t UCL 131 |

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 positvely skewed data sets.

**Magnesium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 52 | Number of Distinct Observations | 51 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 572000 | Minimum of Log Data | 13.26 |
| Maximum | 987000 | Maximum of Log Data | 13.8 |
| Mean | 816385 | Mean of log Data | 13.6 |
| Geometric Mean | 808112 | SD of log Data | 0.146 |
| Median | 807000 | | |
| SD | 115116 | | |
| Std. Error of Mean | 15964 | | |
| Coefficient of Variation | 0.141 | | |
| Skewness | -0.268 | | |

**Relevant UCL Statistics**

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Lilliefors Test Statistic | 0.15 | Lilliefors Test Statistic | 0.151 |
| Lilliefors Critical Value | 0.123 | Lilliefors Critical Value | 0.123 |

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 | 843128 | 95% H-UCL | 845680 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 888866 |
| 95% Adjusted-CLT UCL (Chen-1995) | 842009 | 97.5% Chebyshev (MVUE) UCL | 920145 |
| 95% Modified-t UCL (Johnson-1978) | 843030 | 99% Chebyshev (MVUE) UCL | 981586 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 46.43 |
| Theta Star | 17583 |
| MLE of Mean | 816385 |
| MLE of Standard Deviation | 119810 |
| nu star | 4829 |
| Approximate Chi Square Value (.05) | 4668 |
| Adjusted Level of Significance | 0.0454 |
| Adjusted Chi Square Value | 4664 |
| Anderson-Darling Test Statistic | 1.235 |
| Anderson-Darling 5% Critical Value | 0.748 |
| Kolmogorov-Smirnov Test Statistic | 0.153 |
| Kolmogorov-Smirnov 5% Critical Value | 0.123 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 844453 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 845261 |

**Data Distribution**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 842643 |
| 95% Jackknife UCL | 843128 |
| 95% Standard Bootstrap UCL | 842520 |
| 95% Bootstrap-t UCL | 842441 |
| 95% Hall's Bootstrap UCL | 842304 |
| 95% Percentile Bootstrap UCL | 842904 |
| 95% BCA Bootstrap UCL | 840904 |
| 95% Chebyshev(Mean, Sd) UCL | 885969 |
| 97.5% Chebyshev(Mean, Sd) UCL | 916078 |
| 99% Chebyshev(Mean, Sd) UCL | 975221 |

**Potential UCL to Use**

| | |
|---|---|
| Use 95% Student's-t UCL | 843128 |
| or 95% Modified-t UCL | 843030 |

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 positvely skewed data sets.

Manganese

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 52 | Number of Distinct Observations | 51 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 1.81 |
| Maximum | 111 |
| Mean | 8.95 |
| Geometric Mean | 4.722 |
| Median | 3.995 |
| SD | 19.7 |
| Std. Error of Mean | 2.732 |
| Coefficient of Variation | 2.202 |
| Skewness | 4.379 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 0.593 |
| Maximum of Log Data | 4.71 |
| Mean of log Data | 1.552 |
| SD of log Data | 0.821 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Lilliefors Test Statistic | 0.428 |
| Lilliefors Critical Value | 0.123 |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Lilliefors Test Statistic | 0.257 |
| Lilliefors Critical Value | 0.123 |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 13.53 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 15.22 |
| 95% Modified-t UCL (Johnson-1978) | 13.8 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 8.457 |
| 95% Chebyshev (MVUE) UCL | 10.23 |
| 97.5% Chebyshev (MVUE) UCL | 11.82 |
| 99% Chebyshev (MVUE) UCL | 14.94 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 0.873 |
| Theta Star | 10.25 |
| MLE of Mean | 8.95 |
| MLE of Standard Deviation | 9.58 |
| nu star | 90.77 |
| Approximate Chi Square Value (.05) | 69.8 |
| Adjusted Level of Significance | 0.0454 |
| Adjusted Chi Square Value | 69.28 |
| Anderson-Darling Test Statistic | 9.161 |
| Anderson-Darling 5% Critical Value | 0.784 |
| Kolmogorov-Smirnov Test Statistic | 0.349 |
| Kolmogorov-Smirnov 5% Critical Value | 0.127 |

Data not Gamma Distributed at 5% Significance Level

**Data Distribution**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 13.44 |
| 95% Jackknife UCL | 13.53 |
| 95% Standard Bootstrap UCL | 13.58 |
| 95% Bootstrap-t UCL | 20.85 |
| 95% Hall's Bootstrap UCL | 15.54 |
| 95% Percentile Bootstrap UCL | 13.78 |
| 95% BCA Bootstrap UCL | 15.51 |
| 95% Chebyshev(Mean, Sd) UCL | 20.86 |
| 97.5% Chebyshev(Mean, Sd) UCL | 26.01 |
| 99% Chebyshev(Mean, Sd) UCL | 36.14 |

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 11.64 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 11.73 |

**Potential UCL to Use**

Use 95% Chebyshev (Mean, Sd) UCL 20.86

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.

**Molybdenum**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 52 | Number of Distinct Observations | 29 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 5 |
| Maximum | 9.5 |
| Mean | 7.669 |
| Geometric Mean | 7.586 |
| Median | 7.8 |
| SD | 1.098 |
| Std. Error of Mean | 0.152 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 1.609 |
| Maximum of Log Data | 2.251 |
| Mean of log Data | 2.026 |
| SD of log Data | 0.152 |

| | |
|---|---|
| Coefficient of Variation | 0.143 |
| Skewness | -0.53 |

## Relevant UCL Statistics

### Normal Distribution Test

| | |
|---|---|
| Lilliefors Test Statistic | 0.0894 |
| Lilliefors Critical Value | 0.123 |

Data appear Normal at 5% Significance Level

### Lognormal Distribution Test

| | |
|---|---|
| Lilliefors Test Statistic | 0.111 |
| Lilliefors Critical Value | 0.123 |

Data appear Lognormal at 5% Significance Level

### Assuming Normal Distribution

| | |
|---|---|
| 95% Student's-t UCL | 7.924 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 7.908 |
| 95% Modified-t UCL (Johnson-1978) | 7.923 |

### Assuming Lognormal Distribution

| | |
|---|---|
| 95% H-UCL | 7.959 |
| 95% Chebyshev (MVUE) UCL | 8.382 |
| 97.5% Chebyshev (MVUE) UCL | 8.689 |
| 99% Chebyshev (MVUE) UCL | 9.292 |

### Gamma Distribution Test

| | |
|---|---|
| k star (bias corrected) | 43.48 |
| Theta Star | 0.176 |
| MLE of Mean | 7.669 |
| MLE of Standard Deviation | 1.163 |
| nu star | 4522 |
| Approximate Chi Square Value (.05) | 4367 |
| Adjusted Level of Significance | 0.0454 |
| Adjusted Chi Square Value | 4362 |
| Anderson-Darling Test Statistic | 0.712 |
| Anderson-Darling 5% Critical Value | 0.748 |
| Kolmogorov-Smirnov Test Statistic | 0.104 |
| Kolmogorov-Smirnov 5% Critical Value | 0.123 |

Data appear Gamma Distributed at 5% Significance Level

### Assuming Gamma Distribution

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 7.942 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 7.95 |

### Data Distribution

Data appear Normal at 5% Significance Level

### Nonparametric Statistics

| | |
|---|---|
| 95% CLT UCL | 7.92 |
| 95% Jackknife UCL | 7.924 |
| 95% Standard Bootstrap UCL | 7.912 |
| 95% Bootstrap-t UCL | 7.911 |
| 95% Hall's Bootstrap UCL | 7.915 |
| 95% Percentile Bootstrap UCL | 7.908 |
| 95% BCA Bootstrap UCL | 7.912 |
| 95% Chebyshev(Mean, Sd) UCL | 8.333 |
| 97.5% Chebyshev(Mean, Sd) UCL | 8.62 |
| 99% Chebyshev(Mean, Sd) UCL | 9.185 |

### Potential UCL to Use

Use 95% Student's-t UCL 7.924

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 positvely skewed data sets.

Nickel

## General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 11 |
| Number of Distinct Detected Data | 10 | Number of Non-Detect Data | 41 |
| | | Percent Non-Detects | 78.85% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.51 | Minimum Detected | -0.673 |
| Maximum Detected | 1.12 | Maximum Detected | 0.113 |
| Mean of Detected | 0.635 | Mean of Detected | -0.485 |
| SD of Detected | 0.189 | SD of Detected | 0.248 |
| Minimum Non-Detect | 0.5 | Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | 0.5 | Maximum Non-Detect | -0.693 |

## UCL Statistics

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.673 | Shapiro Wilk Test Statistic | 0.734 |
| 5% Shapiro Wilk Critical Value | 0.85 | 5% Shapiro Wilk Critical Value | 0.85 |
| 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 | 0.332 | Mean | -1.196 |
| SD | 0.18 | SD | 0.388 |
| 95% DL/2 (t) UCL | 0.373 | 95% H-Stat (DL/2) UCL | 0.359 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 0.257 | Mean in Log Scale | -1.267 |
| SD | 0.29 | SD in Log Scale | 0.565 |
| 95% MLE (t) UCL | 0.324 | Mean in Original Scale | 0.33 |
| 95% MLE (Tiku) UCL | 0.414 | SD in Original Scale | 0.199 |
| | | 95% t UCL | 0.376 |
| | | 95% Percentile Bootstrap UCL | 0.377 |
| | | 95% BCA Bootstrap UCL | 0.383 |
| | | 95% H UCL | 0.385 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 11.71 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 0.0543 | |
| nu star | 257.6 | |
| | | |
| A-D Test Statistic | 1.407 | Nonparametric Statistics |
| 5% A-D Critical Value | 0.729 | Kaplan-Meier (KM) Method |
| K-S Test Statistic | 0.729 | Mean 0.537 |
| 5% K-S Critical Value | 0.255 | SD 0.0976 |
| Data not Gamma Distributed at 5% Significance Level | | SE of Mean 0.0142 |
| | | 95% KM (t) UCL 0.56 |
| Assuming Gamma Distribution | | 95% KM (z) UCL 0.56 |
| Gamma ROS Statistics using Extrapolated Data | | 95% KM (jackknife) UCL 0.559 |

| | | | |
|---|---|---|---|
| Minimum | 0.000001 | 95% KM (bootstrap t) UCL | 0.621 |
| Maximum | 1.12 | 95% KM (BCA) UCL | 0.577 |
| Mean | 0.155 | 95% KM (Percentile Bootstrap) UCL | 0.569 |
| Median | 0.000001 | 95% KM (Chebyshev) UCL | 0.598 |
| SD | 0.273 | 97.5% KM (Chebyshev) UCL | 0.625 |
| k star | 0.111 | 99% KM (Chebyshev) UCL | 0.678 |
| Theta star | 1.394 | | |
| Nu star | 11.54 | **Potential UCLs to Use** | |
| AppChi2 | 4.924 | 95% KM (t) UCL | 0.56 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.362 | 95% KM (% Bootstrap) UCL | 0.569 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.372 | | |

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.

**Phosphorus**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 52 |
| | | 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 Phosphorus was not processed!

**Potassium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 52 | Number of Distinct Observations | 41 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 177000 | Minimum of Log Data | 12.08 |
| Maximum | 307000 | Maximum of Log Data | 12.63 |
| Mean | 250577 | Mean of log Data | 12.42 |
| Geometric Mean | 247222 | SD of log Data | 0.168 |
| Median | 253500 | | |
| SD | 40509 | | |
| Std. Error of Mean | 5618 | | |
| Coefficient of Variation | 0.162 | | |
| Skewness | -0.282 | | |

**Relevant UCL Statistics**

**Normal Distribution Test** **Lognormal Distribution Test**

| | |
|---|---|
| Lilliefors Test Statistic | 0.161 |
| Lilliefors Critical Value | 0.123 |

Data not Normal at 5% Significance Level

| | |
|---|---|
| Lilliefors Test Statistic | 0.165 |
| Lilliefors Critical Value | 0.123 |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 259988 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 259583 |
| 95% Modified-t UCL (Johnson-1978) | 259951 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 261031 |
| 95% Chebyshev (MVUE) UCL | 276256 |
| 97.5% Chebyshev (MVUE) UCL | 287330 |
| 99% Chebyshev (MVUE) UCL | 309083 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 35.12 |
| Theta Star | 7134 |
| MLE of Mean | 250577 |
| MLE of Standard Deviation | 42281 |
| nu star | 3653 |
| Approximate Chi Square Value (.05) | 3513 |
| Adjusted Level of Significance | 0.0454 |
| Adjusted Chi Square Value | 3510 |
| Anderson-Darling Test Statistic | 2.119 |
| Anderson-Darling 5% Critical Value | 0.748 |
| Kolmogorov-Smirnov Test Statistic | 0.163 |
| Kolmogorov-Smirnov 5% Critical Value | 0.123 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 260522 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 260810 |

**Data Distribution**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 259817 |
| 95% Jackknife UCL | 259988 |
| 95% Standard Bootstrap UCL | 259691 |
| 95% Bootstrap-t UCL | 259950 |
| 95% Hall's Bootstrap UCL | 259105 |
| 95% Percentile Bootstrap UCL | 259423 |
| 95% BCA Bootstrap UCL | 260212 |
| 95% Chebyshev(Mean, Sd) UCL | 275064 |
| 97.5% Chebyshev(Mean, Sd) UCL | 285659 |
| 99% Chebyshev(Mean, Sd) UCL | 306471 |

**Potential UCL to Use**

Use 95% Student's-t UCL 259988

or 95% Modified-t UCL 259951

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 positvely skewed data sets.

**Rhenium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 52 |
| | | 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 Rhenium was not processed!

Rubidium

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 52 | Number of Distinct Observations | 50 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 44.7 | Minimum of Log Data | 3.8 |
| Maximum | 94.2 | Maximum of Log Data | 4.545 |
| Mean | 76.54 | Mean of log Data | 4.325 |
| Geometric Mean | 75.55 | SD of log Data | 0.168 |
| Median | 80.55 | | |
| SD | 11.67 | | |
| Std. Error of Mean | 1.618 | | |
| Coefficient of Variation | 0.152 | | |
| Skewness | -0.879 | | |

**Relevant UCL Statistics**

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Lilliefors Test Statistic | 0.149 | Lilliefors Test Statistic | 0.17 |
| Lilliefors Critical Value | 0.123 | Lilliefors Critical Value | 0.123 |
| 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 | 79.25 | 95% H-UCL | 79.78 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 84.44 |
| 95% Adjusted-CLT UCL (Chen-1995) | 78.99 | 97.5% Chebyshev (MVUE) UCL | 87.83 |
| 95% Modified-t UCL (Johnson-1978) | 79.22 | 99% Chebyshev (MVUE) UCL | 94.49 |

| Gamma Distribution Test | | Data Distribution |
|---|---|---|
| k star (bias corrected) | 36.57 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 2.093 | |
| MLE of Mean | 76.54 | |
| MLE of Standard Deviation | 12.66 | |
| nu star | 3804 | |
| Approximate Chi Square Value (.05) | 3661 | **Nonparametric Statistics** |
| Adjusted Level of Significance | 0.0454 | 95% CLT UCL 79.2 |
| Adjusted Chi Square Value | 3657 | 95% Jackknife UCL 79.25 |
| | | 95% Standard Bootstrap UCL 79.19 |
| Anderson-Darling Test Statistic | 1.499 | 95% Bootstrap-t UCL 79.01 |
| Anderson-Darling 5% Critical Value | 0.748 | 95% Hall's Bootstrap UCL 79.1 |
| Kolmogorov-Smirnov Test Statistic | 0.164 | 95% Percentile Bootstrap UCL 79.1 |
| Kolmogorov-Smirnov 5% Critical Value | 0.123 | 95% BCA Bootstrap UCL 79.16 |
| Data not Gamma Distributed at 5% Significance Level | | 95% Chebyshev(Mean, Sd) UCL 83.59 |
| | | 97.5% Chebyshev(Mean, Sd) UCL 86.64 |

| Assuming Gamma Distribution | | 99% Chebyshev(Mean, Sd) UCL | 92.64 |
|---|---|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 79.51 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 79.6 | | |

| Potential UCL to Use | Use 95% Student's-t UCL | 79.25 |
|---|---|---|
| | or 95% Modified-t UCL | 79.22 |

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 positvely skewed data sets.

## Selenium

### General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 52 |
| | | 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 Selenium was not processed!

## Silicon

### General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 48 |
| Number of Distinct Detected Data | 40 | Number of Non-Detect Data | 4 |
| | | Percent Non-Detects | 7.69% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 630 | Minimum Detected | 6.446 |
| Maximum Detected | 1580 | Maximum Detected | 7.365 |
| Mean of Detected | 1095 | Mean of Detected | 6.956 |
| SD of Detected | 321.5 | SD of Detected | 0.298 |
| Minimum Non-Detect | 500 | Minimum Non-Detect | 6.215 |
| Maximum Non-Detect | 500 | Maximum Non-Detect | 6.215 |

### UCL Statistics

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.866 | Shapiro Wilk Test Statistic | 0.881 |

| | |
|---|---|
| 5% Shapiro Wilk Critical Value | 0.947 |

Data not Normal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 1030 |
| SD | 383.4 |
| 95% DL/2 (t) UCL | 1119 |
| | |
| Maximum Likelihood Estimate(MLE) Method | |
| Mean | 1037 |
| SD | 368.7 |
| 95% MLE (t) UCL | 1122 |
| 95% MLE (Tiku) UCL | 1123 |

| | |
|---|---|
| 5% Shapiro Wilk Critical Value | 0.947 |

Data not Lognormal at 5% Significance Level

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 6.845 |
| SD | 0.481 |
| 95% H-Stat (DL/2) UCL | 1196 |
| | |
| Log ROS Method | |
| Mean in Log Scale | 6.904 |
| SD in Log Scale | 0.34 |
| Mean in Original Scale | 1052 |
| SD in Original Scale | 343.7 |
| 95% t UCL | 1132 |
| 95% Percentile Bootstrap UCL | 1127 |
| 95% BCA Bootstrap UCL | 1132 |
| 95% H UCL | 1146 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 11.03 |
| Theta Star | 99.25 |
| nu star | 1059 |
| | |
| A-D Test Statistic | 2.047 |
| 5% A-D Critical Value | 0.749 |
| K-S Test Statistic | 0.749 |
| 5% K-S Critical Value | 0.128 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 1580 |
| Mean | 1019 |
| Median | 940 |
| SD | 408.6 |
| k star | 1.071 |
| Theta star | 951.6 |
| Nu star | 111.4 |
| AppChi2 | 88.01 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 1290 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 1298 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 1059 |
| SD | 329.8 |
| SE of Mean | 46.22 |
| 95% KM (t) UCL | 1137 |
| 95% KM (z) UCL | 1135 |
| 95% KM (jackknife) UCL | 1135 |
| 95% KM (bootstrap t) UCL | 1134 |
| 95% KM (BCA) UCL | 1132 |
| 95% KM (Percentile Bootstrap) UCL | 1138 |
| 95% KM (Chebyshev) UCL | 1261 |
| 97.5% KM (Chebyshev) UCL | 1348 |
| 99% KM (Chebyshev) UCL | 1519 |
| | |
| Potential UCLs to Use | |
| 95% KM (Chebyshev) UCL | 1261 |

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.

**Silver**

### General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 52 |
| | | 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 Silver was not processed!**

## Sodium

### General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Observations | 52 | Number of Distinct Observations | 49 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 5040000 |
| Maximum | 8850000 |
| Mean | 6936346 |
| Geometric Mean | 6822743 |
| Median | 7175000 |
| SD | 1237830 |
| Std. Error of Mean | 171656 |
| Coefficient of Variation | 0.178 |
| Skewness | -0.264 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 15.43 |
| Maximum of Log Data | 16 |
| Mean of log Data | 15.74 |
| SD of log Data | 0.186 |

### Relevant UCL Statistics

**Normal Distribution Test**

| | |
|---|---|
| Lilliefors Test Statistic | 0.146 |
| Lilliefors Critical Value | 0.123 |

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

**Lognormal Distribution Test**

| | |
|---|---|
| Lilliefors Test Statistic | 0.158 |
| Lilliefors Critical Value | 0.123 |

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

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 7223919 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 7211969 |
| 95% Modified-t UCL (Johnson-1978) | 7222870 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 7259405 |
| 95% Chebyshev (MVUE) UCL | 7725829 |
| 97.5% Chebyshev (MVUE) UCL | 8066054 |
| 99% Chebyshev (MVUE) UCL | 8734360 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 28.7 |
| Theta Star | 241681 |
| MLE of Mean | 6936346 |
| MLE of Standard Deviation | 1294753 |
| nu star | 2985 |
| Approximate Chi Square Value (.05) | 2859 |
| Adjusted Level of Significance | 0.0454 |
| Adjusted Chi Square Value | 2855 |

**Data Distribution**

**Data do not follow a Discernable Distribution (0.05)**

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 7218695 |
| 95% Jackknife UCL | 7223919 |

| | |
|---|---|
| Anderson-Darling Test Statistic | 2.264 |
| Anderson-Darling 5% Critical Value | 0.748 |
| Kolmogorov-Smirnov Test Statistic | 0.157 |
| Kolmogorov-Smirnov 5% Critical Value | 0.123 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 7241906 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 7250756 |

| | |
|---|---|
| 95% Standard Bootstrap UCL | 7216977 |
| 95% Bootstrap-t UCL | 7221361 |
| 95% Hall's Bootstrap UCL | 7211604 |
| 95% Percentile Bootstrap UCL | 7203654 |
| 95% BCA Bootstrap UCL | 7226923 |
| 95% Chebyshev(Mean, Sd) UCL | 7684578 |
| 97.5% Chebyshev(Mean, Sd) UCL | 8008339 |
| 99% Chebyshev(Mean, Sd) UCL | 8644303 |

| | |
|---|---|
| Potential UCL to Use | Use 95% Student's-t UCL 7223919 |
| | or 95% Modified-t UCL 7222870 |

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 positvely skewed data sets.

**Strontium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 52 | Number of Distinct Observations | 49 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 3530 | Minimum of Log Data | 8.169 |
| Maximum | 6090 | Maximum of Log Data | 8.714 |
| Mean | 4876 | Mean of log Data | 8.482 |
| Geometric Mean | 4826 | SD of log Data | 0.147 |
| Median | 4800 | | |
| SD | 699.7 | | |
| Std. Error of Mean | 97.02 | | |
| Coefficient of Variation | 0.143 | | |
| Skewness | -0.101 | | |

**Relevant UCL Statistics**

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Lilliefors Test Statistic | 0.107 | Lilliefors Test Statistic | 0.116 |
| Lilliefors Critical Value | 0.123 | Lilliefors Critical Value | 0.123 |
| 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 | 5039 | 95% H-UCL | 5052 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 5312 |
| 95% Adjusted-CLT UCL (Chen-1995) | 5034 | 97.5% Chebyshev (MVUE) UCL | 5500 |
| 95% Modified-t UCL (Johnson-1978) | 5038 | 99% Chebyshev (MVUE) UCL | 5869 |

| Gamma Distribution Test | |
|---|---|
| k star (bias corrected) | 45.48 |
| Theta Star | 107.2 |
| MLE of Mean | 4876 |
| MLE of Standard Deviation | 723.1 |
| nu star | 4730 |
| Approximate Chi Square Value (.05) | 4571 |
| Adjusted Level of Significance | 0.0454 |
| Adjusted Chi Square Value | 4567 |
| Anderson-Darling Test Statistic | 0.612 |
| Anderson-Darling 5% Critical Value | 0.748 |
| Kolmogorov-Smirnov Test Statistic | 0.116 |
| Kolmogorov-Smirnov 5% Critical Value | 0.123 |

Data appear Gamma Distributed at 5% Significance Level

| Assuming Gamma Distribution | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 5046 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 5050 |

**Data Distribution**

Data appear Normal at 5% Significance Level

| Nonparametric Statistics | |
|---|---|
| 95% CLT UCL | 5036 |
| 95% Jackknife UCL | 5039 |
| 95% Standard Bootstrap UCL | 5033 |
| 95% Bootstrap-t UCL | 5037 |
| 95% Hall's Bootstrap UCL | 5033 |
| 95% Percentile Bootstrap UCL | 5030 |
| 95% BCA Bootstrap UCL | 5031 |
| 95% Chebyshev(Mean, Sd) UCL | 5299 |
| 97.5% Chebyshev(Mean, Sd) UCL | 5482 |
| 99% Chebyshev(Mean, Sd) UCL | 5842 |

Potential UCL to Use

Use 95% Student's-t UCL 5039

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 positvely skewed data sets.

## Tellurium

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 52 |
| | | 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 Tellurium was not processed!

## Thallium

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 1 |
| Number of Distinct Detected Data | 1 | Number of Non-Detect Data | 51 |
| | | Percent Non-Detects | 98.08% |

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!

**Thorium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 52 |
| | | 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 Thorium was not processed!

**Tin**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 52 |
| | | 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 Tin was not processed!

**Titanium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 52 |
| | | 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 Titanium was not processed!

Tungsten

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 52 |
| | | 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 Tungsten was not processed!

Uranium

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 51 |
| Number of Distinct Detected Data | 43 | Number of Non-Detect Data | 1 |
| | | Percent Non-Detects | 1.92% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 1.38 | Minimum Detected | 0.322 |
| Maximum Detected | 2.65 | Maximum Detected | 0.975 |
| Mean of Detected | 2.109 | Mean of Detected | 0.735 |
| SD of Detected | 0.312 | SD of Detected | 0.155 |
| Minimum Non-Detect | 1.89 | Minimum Non-Detect | 0.637 |
| Maximum Non-Detect | 1.89 | Maximum Non-Detect | 0.637 |

UCL Statistics

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Lilliefors Test Statistic | 0.0791 | Lilliefors Test Statistic | 0.0802 |
| 5% Lilliefors Critical Value | 0.124 | 5% Lilliefors Critical Value | 0.124 |
| 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 | 2.087 | Mean | 0.72 |
| SD | 0.349 | SD | 0.189 |
| 95% DL/2 (t) UCL | 2.168 | 95% H-Stat (DL/2) UCL | 2.188 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 2.105 | Mean in Log Scale | 0.731 |
| SD | 0.305 | SD in Log Scale | 0.156 |

| | |
|---|---|
| 95% MLE (t) UCL | 2.176 |
| 95% MLE (Tiku) UCL | 2.18 |

| | |
|---|---|
| Mean in Original Scale | 2.102 |
| SD in Original Scale | 0.314 |
| 95% t UCL | 2.175 |
| 95% Percentile Bootstrap UCL | 2.17 |
| 95% BCA Bootstrap UCL | 2.173 |
| 95% H UCL | 2.183 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 41.53 |
| Theta Star | 0.0508 |
| nu star | 4236 |
| | |
| A-D Test Statistic | 0.564 |
| 5% A-D Critical Value | 0.748 |
| K-S Test Statistic | 0.748 |
| 5% K-S Critical Value | 0.124 |

Data appear Gamma Distributed at 5% Significance Level

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Assuming Gamma Distribution**

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | 1.38 |
| Maximum | 2.65 |
| Mean | 2.102 |
| Median | 2.06 |
| SD | 0.314 |
| k star | 40.97 |
| Theta star | 0.0513 |
| Nu star | 4261 |
| AppChi2 | 4110 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 2.179 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 2.181 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

Kaplan-Meier (KM) Method

| | |
|---|---|
| Mean | 2.101 |
| SD | 0.312 |
| SE of Mean | 0.0439 |
| 95% KM (t) UCL | 2.175 |
| 95% KM (z) UCL | 2.173 |
| 95% KM (jackknife) UCL | 2.175 |
| 95% KM (bootstrap t) UCL | 2.174 |
| 95% KM (BCA) UCL | 2.172 |
| 95% KM (Percentile Bootstrap) UCL | 2.175 |
| 95% KM (Chebyshev) UCL | 2.292 |
| 97.5% KM (Chebyshev) UCL | 2.375 |
| 99% KM (Chebyshev) UCL | 2.538 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 2.175 |
| 95% KM (Percentile Bootstrap) UCL | 2.175 |

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 | 52 | Number of Distinct Observations | 34 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 0.76 |
| Maximum | 1.54 |
| Mean | 1.131 |
| Geometric Mean | 1.12 |
| Median | 1.135 |
| SD | 0.157 |
| Std. Error of Mean | 0.0217 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | -0.274 |
| Maximum of Log Data | 0.432 |
| Mean of log Data | 0.114 |
| SD of log Data | 0.142 |

| | |
|---|---|
| Coefficient of Variation | 0.138 |
| Skewness | 0.0629 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Lilliefors Test Statistic | 0.104 |
| Lilliefors Critical Value | 0.123 |

Data appear Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Lilliefors Test Statistic | 0.114 |
| Lilliefors Critical Value | 0.123 |

Data appear Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 1.168 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 1.167 |
| 95% Modified-t UCL (Johnson-1978) | 1.168 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 1.171 |
| 95% Chebyshev (MVUE) UCL | 1.229 |
| 97.5% Chebyshev (MVUE) UCL | 1.271 |
| 99% Chebyshev (MVUE) UCL | 1.354 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 48.87 |
| Theta Star | 0.0232 |
| MLE of Mean | 1.131 |
| MLE of Standard Deviation | 0.162 |
| nu star | 5082 |
| Approximate Chi Square Value (.05) | 4918 |
| Adjusted Level of Significance | 0.0454 |
| Adjusted Chi Square Value | 4913 |
| Anderson-Darling Test Statistic | 0.611 |
| Anderson-Darling 5% Critical Value | 0.748 |
| Kolmogorov-Smirnov Test Statistic | 0.105 |
| Kolmogorov-Smirnov 5% Critical Value | 0.123 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 1.169 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 1.17 |

**Data Distribution**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 1.167 |
| 95% Jackknife UCL | 1.168 |
| 95% Standard Bootstrap UCL | 1.167 |
| 95% Bootstrap-t UCL | 1.168 |
| 95% Hall's Bootstrap UCL | 1.169 |
| 95% Percentile Bootstrap UCL | 1.168 |
| 95% BCA Bootstrap UCL | 1.168 |
| 95% Chebyshev(Mean, Sd) UCL | 1.226 |
| 97.5% Chebyshev(Mean, Sd) UCL | 1.267 |
| 99% Chebyshev(Mean, Sd) UCL | 1.348 |

**Potential UCL to Use**

Use 95% Student's-t UCL 1.168

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.

**Yttrium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 52 |
| | | 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 Yttrium was not processed!

Zinc

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 30 |
| Number of Distinct Detected Data | 18 | Number of Non-Detect Data | 22 |
| | | Percent Non-Detects | 42.31% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 3 | Minimum Detected | 1.099 |
| Maximum Detected | 7.4 | Maximum Detected | 2.001 |
| Mean of Detected | 4.027 | Mean of Detected | 1.367 |
| SD of Detected | 1.017 | SD of Detected | 0.221 |
| Minimum Non-Detect | 3 | Minimum Non-Detect | 1.099 |
| Maximum Non-Detect | 3 | Maximum Non-Detect | 1.099 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.818 | Shapiro Wilk Test Statistic | 0.894 |
| 5% Shapiro Wilk Critical Value | 0.927 | 5% 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 | |
|---|---|---|---|
| DL/2 Substitution Method | | DL/2 Substitution Method | |
| Mean | 2.958 | Mean | 0.96 |
| SD | 1.475 | SD | 0.508 |
| 95% DL/2 (t) UCL | 3.3 | 95% H-Stat (DL/2) UCL | 3.398 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 3.149 | Mean in Log Scale | 1.124 |
| SD | 1.378 | SD in Log Scale | 0.353 |
| 95% MLE (t) UCL | 3.469 | Mean in Original Scale | 3.274 |
| 95% MLE (Tiku) UCL | 3.516 | SD in Original Scale | 1.2 |
| | | 95% t UCL | 3.552 |
| | | 95% Percentile Bootstrap UCL | 3.546 |
| | | 95% BCA Bootstrap UCL | 3.592 |
| | | 95% H UCL | 3.572 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 17.72 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 0.227 | |
| nu star | 1063 | |
| | | |
| A-D Test Statistic | 1.229 | Nonparametric Statistics |
| 5% A-D Critical Value | 0.744 | Kaplan-Meier (KM) Method |

| | |
|---|---|
| K-S Test Statistic | 0.744 |
| 5% K-S Critical Value | 0.16 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 7.4 |
| Mean | 2.609 |
| Median | 3.2 |
| SD | 1.909 |
| k star | 0.249 |
| Theta star | 10.48 |
| Nu star | 25.89 |
| AppChi2 | 15.3 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 4.416 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 4.484 |

Note: DL/2 is not a recommended method.

| | |
|---|---|
| Mean | 3.592 |
| SD | 0.913 |
| SE of Mean | 0.129 |
| 95% KM (t) UCL | 3.808 |
| 95% KM (z) UCL | 3.804 |
| 95% KM (jackknife) UCL | 3.807 |
| 95% KM (bootstrap t) UCL | 3.879 |
| 95% KM (BCA) UCL | 3.821 |
| 95% KM (Percentile Bootstrap) UCL | 3.815 |
| 95% KM (Chebyshev) UCL | 4.154 |
| 97.5% KM (Chebyshev) UCL | 4.397 |
| 99% KM (Chebyshev) UCL | 4.874 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 3.808 |
| 95% KM (% Bootstrap) UCL | 3.815 |

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.

**Zirconium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 52 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 52 |
| | | 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 Zirconium was not processed!

From File: INPUT.wst

Summary Statistics for Raw Full Data Sets

| Variable | NumObs | Minimum | Maximum | Mean | Median | Variance | SD | MAD/0.675 | Skewness | Kurtosis | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 38 | 5 | 37.2 | 12.93 | 10.25 | 58.58 | 7.654 | 7.784 | 0.991 | 0.965 | 0.592 |
| LnROS_Aluminum | 38 | 2.791 | 37.2 | 12.82 | 10.25 | 60.62 | 7.786 | 8.41 | 0.924 | 0.851 | 0.607 |
| LnROS_Antimony | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Arsenic | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Barium | 38 | 5.2 | 21.4 | 9.25 | 8.9 | 6.458 | 2.541 | 1.038 | 3.142 | 14.47 | 0.275 |
| LnROS_Beryllium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Bismuth | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Boron | 38 | 1990 | 3970 | 3221 | 3315 | 269855 | 519.5 | 689.4 | -0.493 | -0.518 | 0.161 |
| LnROS_Cadmium | 38 | 0.0272 | 0.15 | 0.0735 | 0.0685 | 0.00101 | 0.0318 | 0.0338 | 0.719 | -0.0805 | 0.433 |
| LnROS_Calcium | 38 | 177000 | 323000 | 261947 | 259500 | 1.823E+09 | 42696 | 57079 | -0.287 | -1.195 | 0.163 |
| LnROS_Cesium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Chromium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Cobalt | 38 | 0.00392 | 0.226 | 0.0571 | 0.0336 | 0.00375 | 0.0612 | 0.0308 | 1.694 | 2.021 | 1.072 |
| LnROS_Copper | 38 | 0.311 | 2.14 | 0.83 | 0.785 | 0.133 | 0.365 | 0.348 | 1.324 | 3.096 | 0.44 |
| LnROS_Gallium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Iron | 38 | 3.649 | 12 | 6.728 | 6.463 | 3.644 | 1.909 | 1.811 | 0.775 | 0.523 | 0.284 |
| LnROS_Lead | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Lithium | 38 | 80 | 149 | 125.5 | 128 | 321.9 | 17.94 | 13.34 | -0.975 | 0.38 | 0.143 |
| LnROS_Magnesium | 38 | 587000 | 965000 | 813763 | 820000 | 1.143E+10 | 106910 | 111193 | -0.551 | -0.648 | 0.131 |
| LnROS_Manganese | 38 | 1.67 | 31.6 | 4.696 | 3.655 | 22.05 | 4.695 | 0.778 | 5.37 | 31.05 | 1 |
| LnROS_Molybdenum | 38 | 4.9 | 9.4 | 7.474 | 7.5 | 1.081 | 1.04 | 0.964 | -0.416 | 0.126 | 0.139 |
| LnROS_Nickel | 38 | 0.207 | 0.79 | 0.408 | 0.389 | 0.0161 | 0.127 | 0.116 | 0.846 | 0.808 | 0.311 |
| LnROS_Phosphorus | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Potassium | 38 | 181000 | 293000 | 247447 | 251500 | 1.279E+09 | 35764 | 47443 | -0.419 | -1.204 | 0.145 |
| LnROS_Rhenium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Rubidium | 38 | 45.1 | 92.7 | 75.53 | 77.4 | 126.2 | 11.23 | 9.711 | -0.84 | 0.421 | 0.149 |
| LnROS_Selenium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Silicon | 38 | 661.3 | 1760 | 1243 | 1320 | 98724 | 314.2 | 311.3 | -0.371 | -0.964 | 0.253 |
| LnROS_Silver | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Sodium | 38 | 4580000 | 8480000 | 6890526 | 7135000 | 1.215E+12 | 1102116 | 1423277 | -0.405 | -0.963 | 0.16 |
| LnROS_Strontium | 38 | 3410 | 5780 | 4806 | 4815 | 418544 | 647 | 674.6 | -0.409 | -0.509 | 0.135 |
| LnROS_Tellurium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Thallium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Thorium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Tin | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Titanium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Tungsten | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Uranium | 38 | 1.34 | 2.56 | 2.038 | 2.055 | 0.08 | 0.283 | 0.23 | -0.324 | 0.186 | 0.139 |
| LnROS_Vanadium | 38 | 0.73 | 1.4 | 1.146 | 1.145 | 0.0246 | 0.157 | 0.163 | -0.704 | 0.371 | 0.137 |
| LnROS_Yttrium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Zinc | 38 | 1.322 | 6.6 | 3.175 | 2.927 | 1.549 | 1.244 | 1.178 | 0.789 | 0.149 | 0.392 |
| LnROS_Zirconium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

Percentiles for Raw Full Data Sets

| Variable | NumObs | 5%ile | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | 99%ile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 38 | 5 | 5 | 5.32 | 6.725 | 10.25 | 18.78 | 19.04 | 21.93 | 24.63 | 32.61 |
| LnROS_Aluminum | 38 | 3.869 | 4.657 | 5.82 | 6.725 | 10.25 | 18.78 | 19.04 | 21.93 | 24.63 | 32.61 |
| LnROS_Antimony | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Arsenic | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Barium | 38 | 6.575 | 7.87 | 8.14 | 8.275 | 8.9 | 9.525 | 9.88 | 10.6 | 11.3 | 18.92 |
| LnROS_Beryllium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Bismuth | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Boron | 38 | 2327 | 2656 | 2784 | 2810 | 3315 | 3693 | 3766 | 3846 | 3870 | 3933 |
| LnROS_Cadmium | 38 | 0.034 | 0.0387 | 0.0461 | 0.0494 | 0.0685 | 0.0945 | 0.0966 | 0.109 | 0.137 | 0.148 |
| LnROS_Calcium | 38 | 193250 | 205100 | 223200 | 229250 | 259500 | 301500 | 304800 | 309000 | 313500 | 322630 |
| LnROS_Cesium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Chromium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Cobalt | 38 | 0.00677 | 0.00925 | 0.0141 | 0.0167 | 0.0336 | 0.064 | 0.086 | 0.148 | 0.213 | 0.222 |
| LnROS_Copper | 38 | 0.386 | 0.436 | 0.55 | 0.555 | 0.785 | 1.043 | 1.09 | 1.216 | 1.353 | 1.896 |
| LnROS_Gallium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Iron | 38 | 4.217 | 4.581 | 5.13 | 5.366 | 6.463 | 7.784 | 8.141 | 9.112 | 9.98 | 11.63 |
| LnROS_Lead | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Lithium | 38 | 90.8 | 97.4 | 114.4 | 120.5 | 128 | 139.8 | 142.6 | 144.3 | 147 | 148.3 |
| LnROS_Magnesium | 38 | 616100 | 650800 | 733800 | 748250 | 820000 | 895500 | 916800 | 938900 | 943800 | 960930 |
| LnROS_Manganese | 38 | 2.093 | 2.961 | 3.194 | 3.245 | 3.655 | 4.318 | 4.588 | 5.786 | 7.484 | 23.4 |
| LnROS_Molybdenum | 38 | 5.795 | 6.25 | 6.74 | 7 | 7.5 | 8.175 | 8.3 | 8.83 | 8.945 | 9.326 |
| LnROS_Nickel | 38 | 0.243 | 0.267 | 0.303 | 0.318 | 0.389 | 0.473 | 0.496 | 0.576 | 0.612 | 0.727 |
| LnROS_Phosphorus | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Potassium | 38 | 187250 | 199000 | 208400 | 216500 | 251500 | 281750 | 284000 | 286300 | 290150 | 292260 |
| LnROS_Rhenium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Rubidium | 38 | 54.18 | 59.78 | 68.92 | 70.48 | 77.4 | 83.68 | 85.28 | 87.41 | 89.05 | 92.07 |
| LnROS_Selenium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Silicon | 38 | 728.4 | 757 | 894 | 987.5 | 1320 | 1460 | 1500 | 1622 | 1658 | 1738 |
| LnROS_Silver | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Sodium | 38 | 5276000 | 5508000 | 5808000 | 5885000 | 7135000 | 7807500 | 7918000 | 8216000 | 8243500 | 8420800 |
| LnROS_Strontium | 38 | 3674 | 3889 | 4320 | 4445 | 4815 | 5298 | 5346 | 5652 | 5746 | 5780 |
| LnROS_Tellurium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Thallium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Thorium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Tin | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Titanium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Tungsten | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Uranium | 38 | 1.561 | 1.679 | 1.852 | 1.888 | 2.055 | 2.188 | 2.25 | 2.403 | 2.481 | 2.553 |
| LnROS_Vanadium | 38 | 0.827 | 0.985 | 1.034 | 1.055 | 1.145 | 1.28 | 1.298 | 1.323 | 1.35 | 1.382 |
| LnROS_Yttrium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Zinc | 38 | 1.618 | 1.815 | 2.125 | 2.262 | 2.927 | 3.9 | 4.3 | 4.92 | 5.23 | 6.156 |
| LnROS_Zirconium | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

## General UCL Statistics for Data Sets with Non-Detects

**User Selected Options**

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

**Aluminum**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 30 |
| Number of Distinct Detected Data | 27 | Number of Non-Detect Data | 8 |
| | | Percent Non-Detects | 21.05% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 5.8 | Minimum Detected | 1.758 |
| Maximum Detected | 37.2 | Maximum Detected | 3.616 |
| Mean of Detected | 15.04 | Mean of Detected | 2.598 |
| SD of Detected | 7.265 | SD of Detected | 0.489 |
| Minimum Non-Detect | 5 | Minimum Non-Detect | 1.609 |
| Maximum Non-Detect | 5 | Maximum Non-Detect | 1.609 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.911 | Shapiro Wilk Test Statistic | 0.945 |
| 5% Shapiro Wilk Critical Value | 0.927 | 5% 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 | |
|---|---|---|---|
| DL/2 Substitution Method | | DL/2 Substitution Method | |
| Mean | 12.4 | Mean | 2.244 |
| SD | 8.259 | SD | 0.819 |
| 95% DL/2 (t) UCL | 14.66 | 95% H-Stat (DL/2) UCL | 17.73 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 11.81 | Mean in Log Scale | 2.361 |
| SD | 9.135 | SD in Log Scale | 0.645 |
| 95% MLE (t) UCL | 14.31 | Mean in Original Scale | 12.82 |
| 95% MLE (Tiku) UCL | 14.38 | SD in Original Scale | 7.786 |
| | | 95% t UCL | 14.95 |
| | | 95% Percentile Bootstrap UCL | 14.93 |
| | | 95% BCA Bootstrap UCL | 15.06 |
| | | 95% H UCL | 16.19 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 4.157 | Data appear Gamma Distributed at 5% Significance Level |
| Theta Star | 3.618 | |
| nu star | 249.4 | |
| | | |
| A-D Test Statistic | 0.646 | **Nonparametric Statistics** |
| 5% A-D Critical Value | 0.748 | Kaplan-Meier (KM) Method |
| K-S Test Statistic | 0.748 | Mean 13.09 |
| 5% K-S Critical Value | 0.16 | SD 7.381 |
| Data appear Gamma Distributed at 5% Significance Level | | SE of Mean 1.218 |
| | | 95% KM (t) UCL 15.15 |
| **Assuming Gamma Distribution** | | 95% KM (z) UCL 15.1 |

| Gamma ROS Statistics using Extrapolated Data | | | |
|---|---|---|---|
| Minimum | 0.000001 | 95% KM (jackknife) UCL | 15.03 |
| Maximum | 37.2 | 95% KM (bootstrap t) UCL | 15.43 |
| Mean | 11.87 | 95% KM (BCA) UCL | 15.46 |
| Median | 10.25 | 95% KM (Percentile Bootstrap) UCL | 15.14 |
| SD | 8.943 | 95% KM (Chebyshev) UCL | 18.4 |
| k star | 0.218 | 97.5% KM (Chebyshev) UCL | 20.7 |
| Theta star | 54.4 | 99% KM (Chebyshev) UCL | 25.21 |
| Nu star | 16.59 | **Potential UCLs to Use** | |
| AppChi2 | 8.378 | 95% KM (Percentile Bootstrap) UCL | 15.14 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 23.51 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 24.21 | | |

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 | 38 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 38 |
| | | 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 Antimony was not processed!

**Arsenic**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 38 |
| | | 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 Arsenic was not processed!

**Barium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 38 | Number of Distinct Observations | 25 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 5.2 | Minimum of Log Data | 1.649 |
| Maximum | 21.4 | Maximum of Log Data | 3.063 |
| Mean | 9.25 | Mean of log Data | 2.197 |

| | | | |
|---|---|---|---|
| Geometric Mean | 8.997 | SD of log Data | 0.227 |
| Median | 8.9 | | |
| SD | 2.541 | | |
| Std. Error of Mean | 0.412 | | |
| Coefficient of Variation | 0.275 | | |
| Skewness | 3.142 | | |

**Relevant UCL Statistics**

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.684 | Shapiro Wilk Test Statistic | 0.833 |
| Shapiro Wilk Critical Value | 0.938 | Shapiro Wilk Critical Value | 0.938 |
| 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 | 9.946 | 95% H-UCL | 9.857 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 10.72 |
| 95% Adjusted-CLT UCL (Chen-1995) | 10.15 | 97.5% Chebyshev (MVUE) UCL | 11.37 |
| 95% Modified-t UCL (Johnson-1978) | 9.981 | 99% Chebyshev (MVUE) UCL | 12.65 |

| Gamma Distribution Test | | Data Distribution |
|---|---|---|
| k star (bias corrected) | 16.79 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 0.551 | |
| MLE of Mean | 9.25 | |
| MLE of Standard Deviation | 2.257 | |
| nu star | 1276 | |
| Approximate Chi Square Value (.05) | 1194 | **Nonparametric Statistics** |
| Adjusted Level of Significance | 0.0434 | 95% CLT UCL 9.928 |
| Adjusted Chi Square Value | 1191 | 95% Jackknife UCL 9.946 |
| | | 95% Standard Bootstrap UCL 9.925 |
| Anderson-Darling Test Statistic | 2.599 | 95% Bootstrap-t UCL 10.39 |
| Anderson-Darling 5% Critical Value | 0.747 | 95% Hall's Bootstrap UCL 13.84 |
| Kolmogorov-Smirnov Test Statistic | 0.197 | 95% Percentile Bootstrap UCL 9.995 |
| Kolmogorov-Smirnov 5% Critical Value | 0.143 | 95% BCA Bootstrap UCL 10.29 |
| Data not Gamma Distributed at 5% Significance Level | | 95% Chebyshev(Mean, Sd) UCL 11.05 |
| | | 97.5% Chebyshev(Mean, Sd) UCL 11.82 |
| **Assuming Gamma Distribution** | | 99% Chebyshev(Mean, Sd) UCL 13.35 |
| 95% Approximate Gamma UCL (Use when n >= 40) | 9.885 | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 9.912 | |

| | |
|---|---|
| Potential UCL to Use | Use 95% Student's-t UCL 9.946 |
| | or 95% Modified-t UCL 9.981 |

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.

**Beryllium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 38 |
| | | 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 Beryllium was not processed!

**Bismuth**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 38 |
| | | 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 Bismuth was not processed!

**Boron**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 38 | Number of Distinct Observations | 35 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 1990 | Minimum of Log Data | 7.596 |
| Maximum | 3970 | Maximum of Log Data | 8.287 |
| Mean | 3221 | Mean of log Data | 8.064 |
| Geometric Mean | 3177 | SD of log Data | 0.172 |
| Median | 3315 | | |
| SD | 519.5 | | |
| Std. Error of Mean | 84.27 | | |
| Coefficient of Variation | 0.161 | | |
| Skewness | -0.493 | | |

**Relevant UCL Statistics**

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.94 | Shapiro Wilk Test Statistic | 0.918 |
| Shapiro Wilk Critical Value | 0.938 | Shapiro Wilk Critical Value | 0.938 |
| Data appear Normal at 5% Significance Level | | Data not Lognormal at 5% Significance Level | |

| Assuming Normal Distribution | | Assuming Lognormal Distribution | |
|---|---|---|---|
| 95% Student's-t UCL | 3363 | 95% H-UCL | 3386 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 3618 |
| 95% Adjusted-CLT UCL (Chen-1995) | 3353 | 97.5% Chebyshev (MVUE) UCL | 3789 |
| 95% Modified-t UCL (Johnson-1978) | 3362 | 99% Chebyshev (MVUE) UCL | 4125 |

| Gamma Distribution Test | | Data Distribution |
|---|---|---|
| k star (bias corrected) | 33.6 | Data appear Normal at 5% Significance Level |
| Theta Star | 95.88 | |
| MLE of Mean | 3221 | |
| MLE of Standard Deviation | 555.8 | |
| nu star | 2553 | |
| Approximate Chi Square Value (.05) | 2437 | **Nonparametric Statistics** |
| Adjusted Level of Significance | 0.0434 | 95% CLT UCL 3360 |
| Adjusted Chi Square Value | 2432 | 95% Jackknife UCL 3363 |
| | | 95% Standard Bootstrap UCL 3357 |
| Anderson-Darling Test Statistic | 0.755 | 95% Bootstrap-t UCL 3357 |

| | |
|---|---|
| Anderson-Darling 5% Critical Value | 0.746 |
| Kolmogorov-Smirnov Test Statistic | 0.113 |
| Kolmogorov-Smirnov 5% Critical Value | 0.143 |

Data follow Appr. Gamma Distribution at 5% Significance Level

| | |
|---|---|
| 95% Hall's Bootstrap UCL | 3355 |
| 95% Percentile Bootstrap UCL | 3353 |
| 95% BCA Bootstrap UCL | 3353 |
| 95% Chebyshev(Mean, Sd) UCL | 3589 |
| 97.5% Chebyshev(Mean, Sd) UCL | 3748 |
| 99% Chebyshev(Mean, Sd) UCL | 4060 |

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 3375 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 3382 |

Potential UCL to Use

Use 95% Student's-t UCL 3363

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 positvely skewed data sets.

**Cadmium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 23 |
| Number of Distinct Detected Data | 22 | Number of Non-Detect Data | 15 |
| | | Percent Non-Detects | 39.47% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.051 | Minimum Detected | -2.976 |
| Maximum Detected | 0.15 | Maximum Detected | -1.897 |
| Mean of Detected | 0.0924 | Mean of Detected | -2.42 |
| SD of Detected | 0.0264 | SD of Detected | 0.283 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.05 | Maximum Non-Detect | -2.996 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.939 | Shapiro Wilk Test Statistic | 0.972 |
| 5% Shapiro Wilk Critical Value | 0.914 | 5% Shapiro Wilk Critical Value | 0.914 |
| 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 | 0.0658 | Mean | -2.921 |
| SD | 0.0391 | SD | 0.665 |
| 95% DL/2 (t) UCL | 0.0765 | 95% H-Stat (DL/2) UCL | 0.0842 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 0.0638 | Mean in Log Scale | -2.702 |
| SD | 0.0433 | SD in Log Scale | 0.438 |
| 95% MLE (t) UCL | 0.0757 | Mean in Original Scale | 0.0735 |
| 95% MLE (Tiku) UCL | 0.0772 | SD in Original Scale | 0.0318 |
| | | 95% t UCL | 0.0822 |
| | | 95% Percentile Bootstrap UCL | 0.0821 |
| | | 95% BCA Bootstrap UCL | 0.0824 |
| | | 95% H UCL | 0.0844 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 11.57 |
| Theta Star | 0.00799 |
| nu star | 532.1 |
| | |
| A-D Test Statistic | 0.323 |
| 5% A-D Critical Value | 0.743 |
| K-S Test Statistic | 0.743 |
| 5% K-S Critical Value | 0.181 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 0.15 |
| Mean | 0.0593 |
| Median | 0.0685 |
| SD | 0.047 |
| k star | 0.27 |
| Theta star | 0.22 |
| Nu star | 20.52 |
| AppChi2 | 11.24 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.108 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.111 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.0761 |
| SD | 0.0285 |
| SE of Mean | 0.00473 |
| 95% KM (t) UCL | 0.084 |
| 95% KM (z) UCL | 0.0838 |
| 95% KM (jackknife) UCL | 0.0831 |
| 95% KM (bootstrap t) UCL | 0.0844 |
| 95% KM (BCA) UCL | 0.0888 |
| 95% KM (Percentile Bootstrap) UCL | 0.086 |
| 95% KM (Chebyshev) UCL | 0.0967 |
| 97.5% KM (Chebyshev) UCL | 0.106 |
| 99% KM (Chebyshev) UCL | 0.123 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.084 |
| 95% KM (Percentile Bootstrap) UCL | 0.086 |

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.

**Calcium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 38 | Number of Distinct Observations | 34 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 177000 |
| Maximum | 323000 |
| Mean | 261947 |
| Geometric Mean | 258393 |
| Median | 259500 |
| SD | 42696 |
| Std. Error of Mean | 6926 |
| Coefficient of Variation | 0.163 |
| Skewness | -0.287 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 12.08 |
| Maximum of Log Data | 12.69 |
| Mean of log Data | 12.46 |
| SD of log Data | 0.17 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.919 |
| Shapiro Wilk Critical Value | 0.938 |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.914 |
| Shapiro Wilk Critical Value | 0.938 |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 273632 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 272995 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 275089 |
| 95% Chebyshev (MVUE) UCL | 293729 |
| 97.5% Chebyshev (MVUE) UCL | 307436 |

| | | | |
|---|---|---|---|
| 95% Modified-t UCL (Johnson-1978) | 273579 | 99% Chebyshev (MVUE) UCL | 334361 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 33.87 |
| Theta Star | 7733 |
| MLE of Mean | 261947 |
| MLE of Standard Deviation | 45007 |
| nu star | 2574 |
| Approximate Chi Square Value (.05) | 2458 |
| Adjusted Level of Significance | 0.0434 |
| Adjusted Chi Square Value | 2453 |
| Anderson-Darling Test Statistic | 1.08 |
| Anderson-Darling 5% Critical Value | 0.746 |
| Kolmogorov-Smirnov Test Statistic | 0.187 |
| Kolmogorov-Smirnov 5% Critical Value | 0.143 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 274405 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 274932 |

**Data Distribution**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 273340 |
| 95% Jackknife UCL | 273632 |
| 95% Standard Bootstrap UCL | 273436 |
| 95% Bootstrap-t UCL | 273445 |
| 95% Hall's Bootstrap UCL | 272353 |
| 95% Percentile Bootstrap UCL | 273263 |
| 95% BCA Bootstrap UCL | 272105 |
| 95% Chebyshev(Mean, Sd) UCL | 292138 |
| 97.5% Chebyshev(Mean, Sd) UCL | 305201 |
| 99% Chebyshev(Mean, Sd) UCL | 330862 |

| | | | |
|---|---|---|---|
| Potential UCL to Use | | Use 95% Student's-t UCL | 273632 |
| | | or 95% Modified-t UCL | 273579 |

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 positvely skewed data sets.

## Cesium

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 38 |
| | | 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 Cesium was not processed!

## Chromium

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 1 |
| Number of Distinct Detected Data | 1 | Number of Non-Detect Data | 37 |
| | | Percent Non-Detects | 97.37% |

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 Chromium was not processed!

Cobalt

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 12 |
| Number of Distinct Detected Data | 11 | Number of Non-Detect Data | 26 |
| | | Percent Non-Detects | 68.42% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.058 | Minimum Detected | -2.847 |
| Maximum Detected | 0.226 | Maximum Detected | -1.487 |
| Mean of Detected | 0.128 | Mean of Detected | -2.17 |
| SD of Detected | 0.0637 | SD of Detected | 0.509 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.05 | Maximum Non-Detect | -2.996 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.873 | Shapiro Wilk Test Statistic | 0.905 |
| 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 | | Assuming Lognormal Distribution | |
|---|---|---|---|
| DL/2 Substitution Method | | DL/2 Substitution Method | |
| Mean | 0.0576 | Mean | -3.209 |
| SD | 0.0598 | SD | 0.767 |
| 95% DL/2 (t) UCL | 0.074 | 95% H-Stat (DL/2) UCL | 0.0711 |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE yields a negative mean | | Mean in Log Scale | -3.373 |
| | | SD in Log Scale | 1.049 |
| | | Mean in Original Scale | 0.0571 |
| | | SD in Original Scale | 0.0612 |
| | | 95% t UCL | 0.0738 |
| | | 95% Percentile Bootstrap UCL | 0.0736 |
| | | 95% BCA Bootstrap UCL | 0.0767 |
| | | 95% H-UCL | 0.0908 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 3.391 | Data appear Normal at 5% Significance Level |
| Theta Star | 0.0378 | |
| nu star | 81.38 | |
| A-D Test Statistic | 0.502 | **Nonparametric Statistics** |
| 5% A-D Critical Value | 0.734 | Kaplan-Meier (KM) Method |
| K-S Test Statistic | 0.734 | Mean 0.0802 |
| 5% K-S Critical Value | 0.246 | SD 0.0473 |
| Data appear Gamma Distributed at 5% Significance Level | | SE of Mean 0.00802 |
| | | 95% KM (t) UCL 0.0937 |
| **Assuming Gamma Distribution** | | 95% KM (z) UCL 0.0934 |
| Gamma ROS Statistics using Extrapolated Data | | 95% KM (jackknife) UCL 0.092 |
| Minimum | 0.000001 | 95% KM (bootstrap t) UCL 0.0961 |

| | | | |
|---|---|---|---|
| Maximum | 0.226 | 95% KM (BCA) UCL | 0.102 |
| Mean | 0.0405 | 95% KM (Percentile Bootstrap) UCL | 0.0999 |
| Median | 0.000001 | 95% KM (Chebyshev) UCL | 0.115 |
| SD | 0.0697 | 97.5% KM (Chebyshev) UCL | 0.13 |
| k star | 0.124 | 99% KM (Chebyshev) UCL | 0.16 |
| Theta star | 0.328 | | |
| Nu star | 9.387 | **Potential UCLs to Use** | |
| AppChi2 | 3.562 | 95% KM (t) UCL | 0.0937 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.107 | 95% KM (Percentile Bootstrap) UCL | 0.0999 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.111 | | |

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.

Copper

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 32 |
| Number of Distinct Detected Data | 26 | Number of Non-Detect Data | 6 |
| | | Percent Non-Detects | 15.79% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.53 | Minimum Detected | -0.635 |
| Maximum Detected | 2.14 | Maximum Detected | 0.761 |
| Mean of Detected | 0.911 | Mean of Detected | -0.151 |
| SD of Detected | 0.34 | SD of Detected | 0.336 |
| Minimum Non-Detect | 0.5 | Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | 0.5 | Maximum Non-Detect | -0.693 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.871 | Shapiro Wilk Test Statistic | 0.957 |
| 5% Shapiro Wilk Critical Value | 0.93 | 5% Shapiro Wilk Critical Value | 0.93 |
| 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 | 0.807 | Mean | -0.346 |
| SD | 0.396 | SD | 0.55 |
| 95% DL/2 (t) UCL | 0.915 | 95% H-Stat (DL/2) UCL | 0.983 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 0.811 | Mean in Log Scale | -0.274 |
| SD | 0.391 | SD in Log Scale | 0.425 |
| 95% MLE (t) UCL | 0.918 | Mean in Original Scale | 0.83 |
| 95% MLE (Tiku) UCL | 0.918 | SD in Original Scale | 0.365 |
| | | 95% t UCL | 0.93 |
| | | 95% Percentile Bootstrap UCL | 0.928 |
| | | 95% BCA Bootstrap UCL | 0.951 |
| | | 95% H UCL | 0.948 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 8.026 | Data appear Gamma Distributed at 5% Significance Level |
| Theta Star | 0.113 | |

| | |
|---|---|
| nu star | 513.7 |
| A-D Test Statistic | 0.396 |
| 5% A-D Critical Value | 0.747 |
| K-S Test Statistic | 0.747 |
| 5% K-S Critical Value | 0.156 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| Gamma ROS Statistics using Extrapolated Data | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 2.14 |
| Mean | 0.774 |
| Median | 0.785 |
| SD | 0.447 |
| k star | 0.482 |
| Theta star | 1.606 |
| Nu star | 36.64 |
| AppChi2 | 23.79 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 1.193 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 1.215 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

| Kaplan-Meier (KM) Method | |
|---|---|
| Mean | 0.851 |
| SD | 0.337 |
| SE of Mean | 0.0556 |
| 95% KM (t) UCL | 0.945 |
| 95% KM (z) UCL | 0.942 |
| 95% KM (jackknife) UCL | 0.942 |
| 95% KM (bootstrap t) UCL | 0.971 |
| 95% KM (BCA) UCL | 0.947 |
| 95% KM (Percentile Bootstrap) UCL | 0.946 |
| 95% KM (Chebyshev) UCL | 1.093 |
| 97.5% KM (Chebyshev) UCL | 1.198 |
| 99% KM (Chebyshev) UCL | 1.404 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (BCA) UCL | 0.947 |

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.

## Gallium

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 38 |
| | | 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 Gallium was not processed!

## Iron

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 2 |
| Number of Distinct Detected Data | 2 | Number of Non-Detect Data | 36 |
| | | Percent Non-Detects | 94.74% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 11 | Minimum Detected | 2.398 |
| Maximum Detected | 12 | Maximum Detected | 2.485 |
| Mean of Detected | 11.5 | Mean of Detected | 2.441 |
| SD of Detected | 0.707 | SD of Detected | 0.0615 |
| Minimum Non-Detect | 10 | Minimum Non-Detect | 2.303 |
| Maximum Non-Detect | 10 | Maximum Non-Detect | 2.303 |

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

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**

| | |
|---|---|
| Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A |

Data not Normal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 5.342 |
| SD | 1.475 |
| 95% DL/2 (t) UCL | 5.746 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE method failed to converge properly**

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A |

Data not Lognormal at 5% Significance Level

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 1.653 |
| SD | 0.189 |
| 95% H-Stat (DL/2) UCL | 5.611 |
| | |
| Log ROS Method | |
| Mean in Log Scale | N/A |
| SD in Log Scale | N/A |
| Mean in Original Scale | N/A |
| SD in Original Scale | N/A |
| 95% t UCL | N/A |
| 95% Percentile Bootstrap UCL | N/A |
| 95% BCA Bootstrap UCL | N/A |
| 95% H-UCL | N/A |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | N/A |
| Theta Star | N/A |
| nu star | N/A |
| | |
| A-D Test Statistic | N/A |
| 5% A-D Critical Value | N/A |
| K-S Test Statistic | N/A |
| 5% K-S Critical Value | N/A |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | N/A |
| Maximum | N/A |
| Mean | N/A |
| Median | N/A |
| SD | N/A |
| k star | N/A |
| Theta star | N/A |
| Nu star | N/A |

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 11.03 |
| SD | 0.16 |
| SE of Mean | 0.0367 |
| 95% KM (t) UCL | 11.09 |
| 95% KM (z) UCL | 11.09 |
| 95% KM (jackknife) UCL | N/A |
| 95% KM (bootstrap t) UCL | N/A |
| 95% KM (BCA) UCL | N/A |
| 95% KM (Percentile Bootstrap) UCL | N/A |
| 95% KM (Chebyshev) UCL | 11.19 |
| 97.5% KM (Chebyshev) UCL | 11.26 |
| 99% KM (Chebyshev) UCL | 11.39 |

Potential UCLs to Use

| | | | |
|---|---|---|---|
| AppChi2 | N/A | 95% KM (t) UCL | 11.09 |
| 95% Gamma Approximate UCL (Use when n >= 40) | N/A | 95% KM (% Bootstrap) UCL | N/A |
| 95% Adjusted Gamma UCL (Use when n < 40) | 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.

Lead

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 38 |
| | | 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 Lead was not processed!

Lithium

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Observations | 38 | Number of Distinct Observations | 28 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 80 | Minimum of Log Data | 4.382 |
| Maximum | 149 | Maximum of Log Data | 5.004 |
| Mean | 125.5 | Mean of log Data | 4.821 |
| Geometric Mean | 124.1 | SD of log Data | 0.157 |
| Median | 128 | | |
| SD | 17.94 | | |
| Std. Error of Mean | 2.911 | | |
| Coefficient of Variation | 0.143 | | |
| Skewness | -0.975 | | |

Relevant UCL Statistics

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.901 | Shapiro Wilk Test Statistic | 0.861 |
| Shapiro Wilk Critical Value | 0.938 | Shapiro Wilk Critical Value | 0.938 |
| 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 | 130.4 | 95% H-UCL | 131.3 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 139.6 |
| 95% Adjusted-CLT UCL (Chen-1995) | 129.8 | 97.5% Chebyshev (MVUE) UCL | 145.6 |
| 95% Modified-t UCL (Johnson-1978) | 130.3 | 99% Chebyshev (MVUE) UCL | 157.5 |

| Gamma Distribution Test | | Data Distribution |
|---|---|---|
| k star (bias corrected) | 41.15 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 3.049 | |
| MLE of Mean | 125.5 | |
| MLE of Standard Deviation | 19.56 | |

| | |
|---|---|
| nu star | 3127 |
| Approximate Chi Square Value (.05) | 2998 |
| Adjusted Level of Significance | 0.0434 |
| Adjusted Chi Square Value | 2993 |
| Anderson-Darling Test Statistic | 1.536 |
| Anderson-Darling 5% Critical Value | 0.746 |
| Kolmogorov-Smirnov Test Statistic | 0.182 |
| Kolmogorov-Smirnov 5% Critical Value | 0.143 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 130.9 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 131.1 |

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 130.3 |
| 95% Jackknife UCL | 130.4 |
| 95% Standard Bootstrap UCL | 130.1 |
| 95% Bootstrap-t UCL | 129.9 |
| 95% Hall's Bootstrap UCL | 129.8 |
| 95% Percentile Bootstrap UCL | 130.4 |
| 95% BCA Bootstrap UCL | 130.1 |
| 95% Chebyshev(Mean, Sd) UCL | 138.2 |
| 97.5% Chebyshev(Mean, Sd) UCL | 143.7 |
| 99% Chebyshev(Mean, Sd) UCL | 154.4 |

**Potential UCL to Use**

| | |
|---|---|
| Use 95% Student's-t UCL | 130.4 |
| or 95% Modified-t UCL | 130.3 |

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.

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 positvely skewed data sets.

**Magnesium**

**General Statistics**

| | |
|---|---|
| Number of Valid Observations | 38 |
| Number of Distinct Observations | 38 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 587000 |
| Maximum | 965000 |
| Mean | 813763 |
| Geometric Mean | 806493 |
| Median | 820000 |
| SD | 106910 |
| Std. Error of Mean | 17343 |
| Coefficient of Variation | 0.131 |
| Skewness | -0.551 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 13.28 |
| Maximum of Log Data | 13.78 |
| Mean of log Data | 13.6 |
| SD of log Data | 0.138 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.931 |
| Shapiro Wilk Critical Value | 0.938 |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.912 |
| Shapiro Wilk Critical Value | 0.938 |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 843023 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 840634 |
| 95% Modified-t UCL (Johnson-1978) | 842764 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 846487 |
| 95% Chebyshev (MVUE) UCL | 893838 |
| 97.5% Chebyshev (MVUE) UCL | 928376 |
| 99% Chebyshev (MVUE) UCL | 996219 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 51.48 |

**Data Distribution**

Data Follow Appr. Gamma Distribution at 5% Significance Level

| | |
|---|---|
| Theta Star | 15806 |
| MLE of Mean | 813763 |
| MLE of Standard Deviation | 113412 |
| nu star | 3913 |
| Approximate Chi Square Value (.05) | 3768 |
| Adjusted Level of Significance | 0.0434 |
| Adjusted Chi Square Value | 3763 |
| Anderson-Darling Test Statistic | 0.848 |
| Anderson-Darling 5% Critical Value | 0.746 |
| Kolmogorov-Smirnov Test Statistic | 0.126 |
| Kolmogorov-Smirnov 5% Critical Value | 0.143 |

Data follow Appr. Gamma Distribution at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 844937 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 846247 |

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 842290 |
| 95% Jackknife UCL | 843023 |
| 95% Standard Bootstrap UCL | 842335 |
| 95% Bootstrap-t UCL | 842504 |
| 95% Hall's Bootstrap UCL | 840135 |
| 95% Percentile Bootstrap UCL | 842368 |
| 95% BCA Bootstrap UCL | 839053 |
| 95% Chebyshev(Mean, Sd) UCL | 889360 |
| 97.5% Chebyshev(Mean, Sd) UCL | 922071 |
| 99% Chebyshev(Mean, Sd) UCL | 986325 |

**Potential UCL to Use**

Use 95% Approximate Gamma UCL 844937

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 positvely skewed data sets.

**Manganese**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 38 | Number of Distinct Observations | 36 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 1.67 |
| Maximum | 31.6 |
| Mean | 4.696 |
| Geometric Mean | 3.983 |
| Median | 3.655 |
| SD | 4.695 |
| Std. Error of Mean | 0.762 |
| Coefficient of Variation | 1 |
| Skewness | 5.37 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 0.513 |
| Maximum of Log Data | 3.453 |
| Mean of log Data | 1.382 |
| SD of log Data | 0.469 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.393 |
| Shapiro Wilk Critical Value | 0.938 |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.796 |
| Shapiro Wilk Critical Value | 0.938 |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 5.981 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 6.658 |
| 95% Modified-t UCL (Johnson-1978) | 6.092 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 5.145 |
| 95% Chebyshev (MVUE) UCL | 5.964 |
| 97.5% Chebyshev (MVUE) UCL | 6.627 |
| 99% Chebyshev (MVUE) UCL | 7.929 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 2.958 |
| Theta Star | 1.588 |
| MLE of Mean | 4.696 |
| MLE of Standard Deviation | 2.731 |
| nu star | 224.8 |
| Approximate Chi Square Value (.05) | 191.1 |
| Adjusted Level of Significance | 0.0434 |
| Adjusted Chi Square Value | 189.8 |
| Anderson-Darling Test Statistic | 3.922 |
| Anderson-Darling 5% Critical Value | 0.754 |
| Kolmogorov-Smirnov Test Statistic | 0.253 |
| Kolmogorov-Smirnov 5% Critical Value | 0.144 |

Data not Gamma Distributed at 5% Significance Level

**Data Distribution**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 5.949 |
| 95% Jackknife UCL | 5.981 |
| 95% Standard Bootstrap UCL | 5.944 |
| 95% Bootstrap-t UCL | 8.928 |
| 95% Hall's Bootstrap UCL | 10.91 |
| 95% Percentile Bootstrap UCL | 6.232 |
| 95% BCA Bootstrap UCL | 6.972 |
| 95% Chebyshev(Mean, Sd) UCL | 8.017 |
| 97.5% Chebyshev(Mean, Sd) UCL | 9.453 |
| 99% Chebyshev(Mean, Sd) UCL | 12.28 |

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 5.525 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 5.562 |

**Potential UCL to Use**

| | |
|---|---|
| Use 95% Student's-t UCL | 5.981 |
| or 95% Modified-t UCL | 6.092 |

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.

**Molybdenum**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 38 | Number of Distinct Observations | 27 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 4.9 |
| Maximum | 9.4 |
| Mean | 7.474 |
| Geometric Mean | 7.399 |
| Median | 7.5 |
| SD | 1.04 |
| Std. Error of Mean | 0.169 |
| Coefficient of Variation | 0.139 |
| Skewness | -0.416 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 1.589 |
| Maximum of Log Data | 2.241 |
| Mean of log Data | 2.001 |
| SD of log Data | 0.147 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.977 |
| Shapiro Wilk Critical Value | 0.938 |

Data appear Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.95 |
| Shapiro Wilk Critical Value | 0.938 |

Data appear Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 7.758 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 7.739 |
| 95% Modified-t UCL (Johnson-1978) | 7.756 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 7.794 |
| 95% Chebyshev (MVUE) UCL | 8.255 |
| 97.5% Chebyshev (MVUE) UCL | 8.592 |
| 99% Chebyshev (MVUE) UCL | 9.254 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 45.87 |

**Data Distribution**

Data appear Normal at 5% Significance Level

| | |
|---|---|
| Theta Star | 0.163 |
| MLE of Mean | 7.474 |
| MLE of Standard Deviation | 1.104 |
| nu star | 3486 |
| Approximate Chi Square Value (.05) | 3350 |
| Adjusted Level of Significance | 0.0434 |
| Adjusted Chi Square Value | 3344 |
| Anderson-Darling Test Statistic | 0.35 |
| Anderson-Darling 5% Critical Value | 0.745 |
| Kolmogorov-Smirnov Test Statistic | 0.104 |
| Kolmogorov-Smirnov 5% Critical Value | 0.143 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 7.778 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 7.79 |

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 7.751 |
| 95% Jackknife UCL | 7.758 |
| 95% Standard Bootstrap UCL | 7.746 |
| 95% Bootstrap-t UCL | 7.736 |
| 95% Hall's Bootstrap UCL | 7.726 |
| 95% Percentile Bootstrap UCL | 7.739 |
| 95% BCA Bootstrap UCL | 7.726 |
| 95% Chebyshev(Mean, Sd) UCL | 8.209 |
| 97.5% Chebyshev(Mean, Sd) UCL | 8.527 |
| 99% Chebyshev(Mean, Sd) UCL | 9.152 |

Potential UCL to Use

Use 95% Student's-t UCL 7.758

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 positvely skewed data sets.

**Nickel**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 8 |
| Number of Distinct Detected Data | 7 | Number of Non-Detect Data | 30 |
| | | Percent Non-Detects | 78.95% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.5 | Minimum Detected | -0.693 |
| Maximum Detected | 0.79 | Maximum Detected | -0.236 |
| Mean of Detected | 0.601 | Mean of Detected | -0.517 |
| SD of Detected | 0.0846 | SD of Detected | 0.131 |
| Minimum Non-Detect | 0.5 | Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | 2 | Maximum Non-Detect | 0.693 |

| | | |
|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | Number treated as Non-Detect | 38 |
| 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 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 | 0.819 |
| 5% Shapiro Wilk Critical Value | 0.818 |

Data appear Normal at 5% Significance Level

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.866 |
| 5% Shapiro Wilk Critical Value | 0.818 |

Data appear Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.344 |
| SD | 0.185 |
| 95% DL/2 (t) UCL | 0.394 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE method failed to converge properly**

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -1.167 |
| SD | 0.411 |
| 95% H-Stat (DL/2) UCL | 0.384 |
| | |
| Log ROS Method | |
| Mean in Log Scale | -0.941 |
| SD in Log Scale | 0.304 |
| Mean in Original Scale | 0.408 |
| SD in Original Scale | 0.127 |
| 95% t UCL | 0.443 |
| 95% Percentile Bootstrap UCL | 0.442 |
| 95% BCA Bootstrap UCL | 0.443 |
| 95% H-UCL | 0.447 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 39.91 |
| Theta Star | 0.0151 |
| nu star | 638.6 |
| | |
| A-D Test Statistic | 0.625 |
| 5% A-D Critical Value | 0.715 |
| K-S Test Statistic | 0.715 |
| 5% K-S Critical Value | 0.293 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 0.79 |
| Mean | 0.193 |
| Median | 0.00848 |
| SD | 0.249 |
| k star | 0.144 |
| Theta star | 1.34 |
| Nu star | 10.94 |
| AppChi2 | 4.54 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.465 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.483 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.522 |
| SD | 0.0556 |
| SE of Mean | 0.00977 |
| 95% KM (t) UCL | 0.538 |
| 95% KM (z) UCL | 0.538 |
| 95% KM (jackknife) UCL | 0.557 |
| 95% KM (bootstrap t) UCL | 0.545 |
| 95% KM (BCA) UCL | 0.589 |
| 95% KM (Percentile Bootstrap) UCL | 0.584 |
| 95% KM (Chebyshev) UCL | 0.564 |
| 97.5% KM (Chebyshev) UCL | 0.583 |
| 99% KM (Chebyshev) UCL | 0.619 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.538 |
| 95% KM (Percentile Bootstrap) UCL | 0.584 |

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.

**Phosphorus**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 38 |
| | | 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 Phosphorus was not processed!

**Potassium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 38 | Number of Distinct Observations | 34 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 181000 | Minimum of Log Data | 12.11 |
| Maximum | 293000 | Maximum of Log Data | 12.59 |
| Mean | 247447 | Mean of log Data | 12.41 |
| Geometric Mean | 244797 | SD of log Data | 0.151 |
| Median | 251500 | | |
| SD | 35764 | | |
| Std. Error of Mean | 5802 | | |
| Coefficient of Variation | 0.145 | | |
| Skewness | -0.419 | | |

**Relevant UCL Statistics**

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.9 | Shapiro Wilk Test Statistic | 0.891 |
| Shapiro Wilk Critical Value | 0.938 | Shapiro Wilk Critical Value | 0.938 |
| 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 | 257235 | 95% H-UCL | 258372 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 274064 |
| 95% Adjusted-CLT UCL (Chen-1995) | 256569 | 97.5% Chebyshev (MVUE) UCL | 285547 |
| 95% Modified-t UCL (Johnson-1978) | 257170 | 99% Chebyshev (MVUE) UCL | 308103 |

| Gamma Distribution Test | | Data Distribution |
|---|---|---|
| k star (bias corrected) | 42.93 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 5764 | |
| MLE of Mean | 247447 | |
| MLE of Standard Deviation | 37766 | |
| nu star | 3263 | |
| Approximate Chi Square Value (.05) | 3131 | **Nonparametric Statistics** |
| Adjusted Level of Significance | 0.0434 | 95% CLT UCL 256990 |
| Adjusted Chi Square Value | 3126 | 95% Jackknife UCL 257235 |
| | | 95% Standard Bootstrap UCL 256878 |
| Anderson-Darling Test Statistic | 1.248 | 95% Bootstrap-t UCL 256644 |
| Anderson-Darling 5% Critical Value | 0.746 | 95% Hall's Bootstrap UCL 256631 |
| Kolmogorov-Smirnov Test Statistic | 0.147 | 95% Percentile Bootstrap UCL 256763 |
| Kolmogorov-Smirnov 5% Critical Value | 0.143 | 95% BCA Bootstrap UCL 257184 |
| Data not Gamma Distributed at 5% Significance Level | | 95% Chebyshev(Mean, Sd) UCL 272736 |
| | | 97.5% Chebyshev(Mean, Sd) UCL 283679 |
| **Assuming Gamma Distribution** | | 99% Chebyshev(Mean, Sd) UCL 305173 |
| 95% Approximate Gamma UCL (Use when n >= 40) | 257858 | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 258296 | |

| Potential UCL to Use | |
|---|---|
| Use 95% Student's-t UCL | 257235 |
| or 95% Modified-t UCL | 257170 |

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 positvely skewed data sets.

## Rhenium

### General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 38 |
| | | 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 Rhenium was not processed!

## Rubidium

### General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Observations | 38 | Number of Distinct Observations | 36 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 45.1 | Minimum of Log Data | 3.809 |
| Maximum | 92.7 | Maximum of Log Data | 4.529 |
| Mean | 75.53 | Mean of log Data | 4.312 |
| Geometric Mean | 74.62 | SD of log Data | 0.163 |
| Median | 77.4 | | |
| SD | 11.23 | | |
| Std. Error of Mean | 1.822 | | |
| Coefficient of Variation | 0.149 | | |
| Skewness | -0.84 | | |

### Relevant UCL Statistics

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.939 | Shapiro Wilk Test Statistic | 0.897 |
| Shapiro Wilk Critical Value | 0.938 | Shapiro Wilk Critical Value | 0.938 |
| Data appear Normal at 5% Significance Level | | Data not Lognormal at 5% Significance Level | |

| Assuming Normal Distribution | | Assuming Lognormal Distribution | |
|---|---|---|---|
| 95% Student's-t UCL | 78.6 | 95% H-UCL | 79.18 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 84.34 |
| 95% Adjusted-CLT UCL (Chen-1995) | 78.26 | 97.5% Chebyshev (MVUE) UCL | 88.12 |
| 95% Modified-t UCL (Johnson-1978) | 78.56 | 99% Chebyshev (MVUE) UCL | 95.56 |

| Gamma Distribution Test | | Data Distribution |
|---|---|---|
| k star (bias corrected) | 38.2 | Data appear Normal at 5% Significance Level |
| Theta Star | 1.977 | |
| MLE of Mean | 75.53 | |

| | |
|---|---|
| MLE of Standard Deviation | 12.22 |
| nu star | 2903 |
| Approximate Chi Square Value (.05) | 2779 |
| Adjusted Level of Significance | 0.0434 |
| Adjusted Chi Square Value | 2774 |
| Anderson-Darling Test Statistic | 0.976 |
| Anderson-Darling 5% Critical Value | 0.746 |
| Kolmogorov-Smirnov Test Statistic | 0.124 |
| Kolmogorov-Smirnov 5% Critical Value | 0.143 |

Data follow Appr. Gamma Distribution at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 78.9 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 79.04 |

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 78.52 |
| 95% Jackknife UCL | 78.6 |
| 95% Standard Bootstrap UCL | 78.57 |
| 95% Bootstrap-t UCL | 78.4 |
| 95% Hall's Bootstrap UCL | 78.3 |
| 95% Percentile Bootstrap UCL | 78.44 |
| 95% BCA Bootstrap UCL | 78.24 |
| 95% Chebyshev(Mean, Sd) UCL | 83.47 |
| 97.5% Chebyshev(Mean, Sd) UCL | 86.91 |
| 99% Chebyshev(Mean, Sd) UCL | 93.66 |

Potential UCL to Use

Use 95% Student's-t UCL 78.6

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.

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 positvely skewed data sets.

**Selenium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 38 |
| | | 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 Selenium was not processed!

**Silicon**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 36 |
| Number of Distinct Detected Data | 29 | Number of Non-Detect Data | 2 |
| | | Percent Non-Detects | 5.26% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 730 | Minimum Detected | 6.593 |
| Maximum Detected | 1760 | Maximum Detected | 7.473 |
| Mean of Detected | 1273 | Mean of Detected | 7.12 |
| SD of Detected | 293.1 | SD of Detected | 0.253 |
| Minimum Non-Detect | 500 | Minimum Non-Detect | 6.215 |
| Maximum Non-Detect | 500 | Maximum Non-Detect | 6.215 |

## UCL Statistics

| Normal Distribution Test with Detected Values Only | |
|---|---|
| Shapiro Wilk Test Statistic | 0.942 |
| 5% Shapiro Wilk Critical Value | 0.935 |
| Data appear Normal at 5% Significance Level | |

| Lognormal Distribution Test with Detected Values Only | |
|---|---|
| Shapiro Wilk Test Statistic | 0.904 |
| 5% Shapiro Wilk Critical Value | 0.935 |
| Data not Lognormal at 5% Significance Level | |

| Assuming Normal Distribution | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 1219 |
| SD | 367.3 |
| 95% DL/2 (t) UCL | 1320 |
| | |
| Maximum Likelihood Estimate(MLE) Method | |
| Mean | 1226 |
| SD | 346.6 |
| 95% MLE (t) UCL | 1321 |
| 95% MLE (Tiku) UCL | 1323 |

| Assuming Lognormal Distribution | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 7.036 |
| SD | 0.437 |
| 95% H-Stat (DL/2) UCL | 1431 |
| | |
| Log ROS Method | |
| Mean in Log Scale | 7.09 |
| SD in Log Scale | 0.279 |
| Mean in Original Scale | 1243 |
| SD in Original Scale | 314.2 |
| 95% t UCL | 1329 |
| 95% Percentile Bootstrap UCL | 1324 |
| 95% BCA Bootstrap UCL | 1328 |
| 95% H UCL | 1353 |

| Gamma Distribution Test with Detected Values Only | |
|---|---|
| k star (bias corrected) | 15.93 |
| Theta Star | 79.92 |
| nu star | 1147 |
| | |
| A-D Test Statistic | 0.94 |
| 5% A-D Critical Value | 0.747 |
| K-S Test Statistic | 0.747 |
| 5% K-S Critical Value | 0.147 |
| Data not Gamma Distributed at 5% Significance Level | |

| Assuming Gamma Distribution | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 155.6 |
| Maximum | 1760 |
| Mean | 1219 |
| Median | 1320 |
| SD | 367.9 |
| k star | 6.39 |
| Theta star | 190.9 |
| Nu star | 485.6 |
| AppChi2 | 435.5 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 1360 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 1366 |

Note: DL/2 is not a recommended method.

| Data Distribution Test with Detected Values Only |
|---|
| Data appear Normal at 5% Significance Level |

| Nonparametric Statistics | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 1245 |
| SD | 306.4 |
| SE of Mean | 50.4 |
| 95% KM (t) UCL | 1330 |
| 95% KM (z) UCL | 1328 |
| 95% KM (jackknife) UCL | 1329 |
| 95% KM (bootstrap t) UCL | 1331 |
| 95% KM (BCA) UCL | 1332 |
| 95% KM (Percentile Bootstrap) UCL | 1325 |
| 95% KM (Chebyshev) UCL | 1464 |
| 97.5% KM (Chebyshev) UCL | 1559 |
| 99% KM (Chebyshev) UCL | 1746 |
| | |
| Potential UCLs to Use | |
| 95% KM (t) UCL | 1330 |
| 95% KM (Percentile Bootstrap) UCL | 1325 |

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.

Silver

## General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 0 |

| | | | |
|---|---|---|---|
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 38 |
| | | 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 Silver was not processed!

**Sodium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 38 | Number of Distinct Observations | 37 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 4580000 |
| Maximum | 8480000 |
| Mean | 6890526 |
| Geometric Mean | 6799254 |
| Median | 7135000 |
| SD | 1102116 |
| Std. Error of Mean | 178787 |
| Coefficient of Variation | 0.16 |
| Skewness | -0.405 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 15.34 |
| Maximum of Log Data | 15.95 |
| Mean of log Data | 15.73 |
| SD of log Data | 0.169 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.928 |
| Shapiro Wilk Critical Value | 0.938 |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.913 |
| Shapiro Wilk Critical Value | 0.938 |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 7192156 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 7172058 |
| 95% Modified-t UCL (Johnson-1978) | 7190199 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 7233769 |
| 95% Chebyshev (MVUE) UCL | 7720112 |
| 97.5% Chebyshev (MVUE) UCL | 8077615 |
| 99% Chebyshev (MVUE) UCL | 8779860 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 34.71 |
| Theta Star | 198537 |
| MLE of Mean | 6890526 |
| MLE of Standard Deviation | 1169625 |
| nu star | 2638 |
| Approximate Chi Square Value (.05) | 2519 |
| Adjusted Level of Significance | 0.0434 |
| Adjusted Chi Square Value | 2515 |
| Anderson-Darling Test Statistic | 0.978 |
| Anderson-Darling 5% Critical Value | 0.746 |
| Kolmogorov-Smirnov Test Statistic | 0.134 |
| Kolmogorov-Smirnov 5% Critical Value | 0.143 |

Data follow Appr. Gamma Distribution at 5% Significance Level

**Data Distribution**

Data Follow Appr. Gamma Distribution at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 7184604 |
| 95% Jackknife UCL | 7192156 |
| 95% Standard Bootstrap UCL | 7179936 |
| 95% Bootstrap-t UCL | 7169407 |
| 95% Hall's Bootstrap UCL | 7168105 |
| 95% Percentile Bootstrap UCL | 7173158 |
| 95% BCA Bootstrap UCL | 7168421 |
| 95% Chebyshev(Mean, Sd) UCL | 7669840 |
| 97.5% Chebyshev(Mean, Sd) UCL | 8007049 |
| 99% Chebyshev(Mean, Sd) UCL | 8669432 |

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 7214136 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 7227803 |

Potential UCL to Use | Use 95% Approximate Gamma UCL 7214136

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 positvely skewed data sets.

Strontium

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Observations | 38 | Number of Distinct Observations | 36 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 3410 | Minimum of Log Data | 8.134 |
| Maximum | 5780 | Maximum of Log Data | 8.662 |
| Mean | 4806 | Mean of log Data | 8.468 |
| Geometric Mean | 4761 | SD of log Data | 0.141 |
| Median | 4815 | | |
| SD | 647 | | |
| Std. Error of Mean | 104.9 | | |
| Coefficient of Variation | 0.135 | | |
| Skewness | -0.409 | | |

Relevant UCL Statistics

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.957 | Shapiro Wilk Test Statistic | 0.94 |
| Shapiro Wilk Critical Value | 0.938 | Shapiro Wilk Critical Value | 0.938 |
| 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 | 4983 | 95% H-UCL | 5002 |
| 95% UCLs (Adjusted for Skewness) | | 95% Chebyshev (MVUE) UCL | 5287 |
| 95% Adjusted-CLT UCL (Chen-1995) | 4971 | 97.5% Chebyshev (MVUE) UCL | 5495 |
| 95% Modified-t UCL (Johnson-1978) | 4981 | 99% Chebyshev (MVUE) UCL | 5903 |

| Gamma Distribution Test | | Data Distribution |
|---|---|---|
| k star (bias corrected) | 49.45 | Data appear Normal at 5% Significance Level |
| Theta Star | 97.18 | |
| MLE of Mean | 4806 | |
| MLE of Standard Deviation | 683.4 | |
| nu star | 3758 | |
| Approximate Chi Square Value (.05) | 3617 | Nonparametric Statistics |
| Adjusted Level of Significance | 0.0434 | 95% CLT UCL 4978 |
| Adjusted Chi Square Value | 3611 | 95% Jackknife UCL 4983 |
| | | 95% Standard Bootstrap UCL 4977 |
| Anderson-Darling Test Statistic | 0.437 | 95% Bootstrap-t UCL 4982 |
| Anderson-Darling 5% Critical Value | 0.745 | 95% Hall's Bootstrap UCL 4970 |
| Kolmogorov-Smirnov Test Statistic | 0.092 | 95% Percentile Bootstrap UCL 4976 |
| Kolmogorov-Smirnov 5% Critical Value | 0.143 | 95% BCA Bootstrap UCL 4983 |
| Data appear Gamma Distributed at 5% Significance Level | | 95% Chebyshev(Mean, Sd) UCL 5263 |
| | | 97.5% Chebyshev(Mean, Sd) UCL 5461 |
| Assuming Gamma Distribution | | 99% Chebyshev(Mean, Sd) UCL 5850 |

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 4993 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 5001 |

**Potential UCL to Use** Use 95% Student's-t UCL 4983

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 positvely skewed data sets.

**Tellurium**

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 38 |
| | | 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 Tellurium was not processed!

**Thallium**

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 38 |
| | | 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!

**Thorium**

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 38 |
| | | 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 Thorium was not processed!

Tin

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 38 |
| | | 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 Tin was not processed!

Titanium

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 38 |
| | | 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 Titanium was not processed!

Tungsten

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 38 |
| | | 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 Tungsten was not processed!

Uranium

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Observations | 38 | Number of Distinct Observations | 35 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 1.34 | Minimum of Log Data | 0.293 |
| Maximum | 2.56 | Maximum of Log Data | 0.94 |
| Mean | 2.038 | Mean of log Data | 0.702 |
| Geometric Mean | 2.018 | SD of log Data | 0.146 |
| Median | 2.055 | | |

| | |
|---|---|
| SD | 0.283 |
| Std. Error of Mean | 0.0459 |
| Coefficient of Variation | 0.139 |
| Skewness | -0.324 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.974 |
| Shapiro Wilk Critical Value | 0.938 |

Data appear Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.952 |
| Shapiro Wilk Critical Value | 0.938 |

Data appear Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 2.116 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 2.111 |
| 95% Modified-t UCL (Johnson-1978) | 2.115 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 2.125 |
| 95% Chebyshev (MVUE) UCL | 2.25 |
| 97.5% Chebyshev (MVUE) UCL | 2.341 |
| 99% Chebyshev (MVUE) UCL | 2.52 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 46.43 |
| Theta Star | 0.0439 |
| MLE of Mean | 2.038 |
| MLE of Standard Deviation | 0.299 |
| nu star | 3529 |
| Approximate Chi Square Value (.05) | 3392 |
| Adjusted Level of Significance | 0.0434 |
| Adjusted Chi Square Value | 3386 |
| Anderson-Darling Test Statistic | 0.424 |
| Anderson-Darling 5% Critical Value | 0.745 |
| Kolmogorov-Smirnov Test Statistic | 0.108 |
| Kolmogorov-Smirnov 5% Critical Value | 0.143 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 2.121 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 2.124 |

**Data Distribution**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 2.114 |
| 95% Jackknife UCL | 2.116 |
| 95% Standard Bootstrap UCL | 2.112 |
| 95% Bootstrap-t UCL | 2.114 |
| 95% Hall's Bootstrap UCL | 2.112 |
| 95% Percentile Bootstrap UCL | 2.112 |
| 95% BCA Bootstrap UCL | 2.112 |
| 95% Chebyshev(Mean, Sd) UCL | 2.238 |
| 97.5% Chebyshev(Mean, Sd) UCL | 2.325 |
| 99% Chebyshev(Mean, Sd) UCL | 2.495 |

**Potential UCL to Use**

Use 95% Student's-t UCL 2.116

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 positvely skewed data sets.

**Vanadium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 38 | Number of Distinct Observations | 26 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 0.73 |
| Maximum | 1.4 |
| Mean | 1.146 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | -0.315 |
| Maximum of Log Data | 0.336 |
| Mean of log Data | 0.127 |

| | | | |
|---|---|---|---|
| Geometric Mean | 1.135 | SD of log Data | 0.147 |
| Median | 1.145 | | |
| SD | 0.157 | | |
| Std. Error of Mean | 0.0254 | | |
| Coefficient of Variation | 0.137 | | |
| Skewness | -0.704 | | |

**Relevant UCL Statistics**

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.95 | Shapiro Wilk Test Statistic | 0.914 |
| Shapiro Wilk Critical Value | 0.938 | Shapiro Wilk Critical Value | 0.938 |
| Data appear Normal at 5% Significance Level | | Data not Lognormal at 5% Significance Level | |

| Assuming Normal Distribution | | Assuming Lognormal Distribution | |
|---|---|---|---|
| 95% Student's-t UCL | 1.189 | 95% H-UCL | 1.196 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 1.267 |
| 95% Adjusted-CLT UCL (Chen-1995) | 1.185 | 97.5% Chebyshev (MVUE) UCL | 1.318 |
| 95% Modified-t UCL (Johnson-1978) | 1.189 | 99% Chebyshev (MVUE) UCL | 1.42 |

| Gamma Distribution Test | | Data Distribution |
|---|---|---|
| k star (bias corrected) | 46.31 | Data appear Normal at 5% Significance Level |
| Theta Star | 0.0248 | |
| MLE of Mean | 1.146 | |
| MLE of Standard Deviation | 0.168 | |
| nu star | 3519 | |
| Approximate Chi Square Value (.05) | 3383 | **Nonparametric Statistics** |
| Adjusted Level of Significance | 0.0434 | 95% CLT UCL 1.188 |
| Adjusted Chi Square Value | 3377 | 95% Jackknife UCL 1.189 |
| | | 95% Standard Bootstrap UCL 1.187 |
| Anderson-Darling Test Statistic | 0.693 | 95% Bootstrap-t UCL 1.187 |
| Anderson-Darling 5% Critical Value | 0.745 | 95% Hall's Bootstrap UCL 1.183 |
| Kolmogorov-Smirnov Test Statistic | 0.113 | 95% Percentile Bootstrap UCL 1.188 |
| Kolmogorov-Smirnov 5% Critical Value | 0.143 | 95% BCA Bootstrap UCL 1.185 |
| Data appear Gamma Distributed at 5% Significance Level | | 95% Chebyshev(Mean, Sd) UCL 1.257 |
| | | 97.5% Chebyshev(Mean, Sd) UCL 1.305 |
| **Assuming Gamma Distribution** | | 99% Chebyshev(Mean, Sd) UCL 1.399 |
| 95% Approximate Gamma UCL (Use when n >= 40) | 1.193 | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 1.195 | |

| Potential UCL to Use | Use 95% Student's-t UCL 1.189 |
|---|---|

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.

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 positvely skewed data sets.

**Yttrium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 38 |
| | | 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 Yttrium was not processed!

Zinc

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 38 | Number of Detected Data | 14 |
| Number of Distinct Detected Data | 9 | Number of Non-Detect Data | 24 |
| | | Percent Non-Detects | 63.16% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 3.1 | Minimum Detected | 1.131 |
| Maximum Detected | 6.6 | Maximum Detected | 1.887 |
| Mean of Detected | 4.507 | Mean of Detected | 1.487 |
| SD of Detected | 0.91 | SD of Detected | 0.198 |
| Minimum Non-Detect | 3 | Minimum Non-Detect | 1.099 |
| Maximum Non-Detect | 3 | Maximum Non-Detect | 1.099 |

UCL Statistics

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.959 | Shapiro Wilk Test Statistic | 0.982 |
| 5% Shapiro Wilk Critical Value | 0.874 | 5% 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 | |
|---|---|---|---|
| DL/2 Substitution Method | | DL/2 Substitution Method | |
| Mean | 2.608 | Mean | 0.804 |
| SD | 1.566 | SD | 0.542 |
| 95% DL/2 (t) UCL | 3.036 | 95% H-Stat (DL/2) UCL | 3.078 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 2.407 | Mean in Log Scale | 1.082 |
| SD | 1.984 | SD in Log Scale | 0.388 |
| 95% MLE (t) UCL | 2.949 | Mean in Original Scale | 3.175 |
| 95% MLE (Tiku) UCL | 3.211 | SD in Original Scale | 1.244 |
| | | 95% t UCL | 3.515 |
| | | 95% Percentile Bootstrap UCL | 3.53 |
| | | 95% BCA Bootstrap UCL | 3.522 |
| | | 95% H UCL | 3.579 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 21.56 | Data appear Normal at 5% Significance Level |
| Theta Star | 0.209 | |
| nu star | 603.7 | |
| | | |
| A-D Test Statistic | 0.198 | Nonparametric Statistics |
| 5% A-D Critical Value | 0.734 | Kaplan-Meier (KM) Method |
| K-S Test Statistic | 0.734 | Mean 3.618 |
| 5% K-S Critical Value | 0.228 | SD 0.863 |
| Data appear Gamma Distributed at 5% Significance Level | | SE of Mean 0.145 |
| | | 95% KM (t) UCL 3.863 |
| Assuming Gamma Distribution | | 95% KM (z) UCL 3.857 |

| Gamma ROS Statistics using Extrapolated Data | | 95% KM (jackknife) UCL | 3.908 |
|---|---|---|---|
| Minimum | 0.000001 | 95% KM (bootstrap t) UCL | 3.867 |
| Maximum | 6.6 | 95% KM (BCA) UCL | 4.205 |
| Mean | 1.991 | 95% KM (Percentile Bootstrap) UCL | 4.147 |
| Median | 1.281 | 95% KM (Chebyshev) UCL | 4.251 |
| SD | 2.13 | 97.5% KM (Chebyshev) UCL | 4.525 |
| k star | 0.146 | 99% KM (Chebyshev) UCL | 5.063 |
| Theta star | 13.68 | | |
| Nu star | 11.06 | **Potential UCLs to Use** | |
| AppChi2 | 4.617 | 95% KM (t) UCL | 3.863 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 4.772 | 95% KM (Percentile Bootstrap) UCL | 4.147 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 4.957 | | |

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.

**Zirconium**

**General Statistics**

| Number of Valid Data | 37 | Number of Detected Data | 0 |
|---|---|---|---|
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 37 |
| | | 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 Zirconium was not processed!

From File: PAHs Input.wst

**Summary Statistics for Raw Full Dataset**

| Variable | NumObs | Minimum | Maximum | Mean | Median | Variance | SD | MAD/0.675 | Skewness | Kurtosis | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_Benzo(a)pyrene | 32 | 0.00125 | 0.073 | 0.0126 | 0.00808 | 0.0001992 | 0.0141 | 0.00705 | 2.875 | 10.46 | 1.123 |

**Percentiles for Raw Full Dataset**

| Variable | NumObs | 5%ile | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | 99%ile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_Benzo(a)pyrene | 32 | 0.00201 | 0.00268 | 0.00358 | 0.00427 | 0.00808 | 0.0153 | 0.0183 | 0.0247 | 0.0333 | 0.062 |

## General UCL Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| From File | PAHs Input.wst |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**Benzo(a)pyrene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 2 |
| Number of Distinct Detected Data | 2 | Number of Non-Detect Data | 30 |
| | | Percent Non-Detects | 93.75% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.023 | Minimum Detected | -3.772 |
| Maximum Detected | 0.073 | Maximum Detected | -2.617 |
| Mean of Detected | 0.048 | Mean of Detected | -3.195 |
| SD of Detected | 0.0354 | SD of Detected | 0.817 |
| Minimum Non-Detect | 0.01 | Minimum Non-Detect | -4.605 |
| Maximum Non-Detect | 0.05 | Maximum Non-Detect | -2.996 |

| | | |
|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | Number treated as Non-Detect | 31 |
| For all methods (except KM, DL/2, and ROS Methods), | Number treated as Detected | 1 |
| Observations < Largest ND are treated as NDs | Single DL Non-Detect Percentage | 96.88% |

**Warning: Data set has only 2 Distinct Detected Values.**

**This may not be adequate enough to compute meaningful and reliable test statistics and estimates.**

**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**

**Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.**

**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 | N/A | Shapiro Wilk Test Statistic | N/A |
| 5% Shapiro Wilk Critical Value | N/A | 5% Shapiro Wilk Critical Value | N/A |
| 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 | 0.0246 | Mean | -3.809 |
| SD | 0.0106 | SD | 0.523 |
| 95% DL/2 (t) UCL | 0.0277 | 95% H-Stat (DL/2) UCL | 0.0305 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |

MLE method failed to converge properly

| | |
|---|---|
| Mean in Log Scale | N/A |
| SD in Log Scale | N/A |
| Mean in Original Scale | N/A |
| SD in Original Scale | N/A |
| 95% t UCL | N/A |
| 95% Percentile Bootstrap UCL | N/A |
| 95% BCA Bootstrap UCL | N/A |
| 95% H-UCL | N/A |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | N/A |
| Theta Star | N/A |
| nu star | N/A |
| | |
| A-D Test Statistic | N/A |
| 5% A-D Critical Value | N/A |
| K-S Test Statistic | N/A |
| 5% K-S Critical Value | N/A |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | N/A |
| Maximum | N/A |
| Mean | N/A |
| Median | N/A |
| SD | N/A |
| k star | N/A |
| Theta star | N/A |
| Nu star | N/A |
| AppChi2 | N/A |
| 95% Gamma Approximate UCL | N/A |
| 95% Adjusted Gamma UCL | N/A |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

Kaplan-Meier (KM) Method

| | |
|---|---|
| Mean | 0.0246 |
| SD | 0.0087 |
| SE of Mean | 0.00217 |
| 95% KM (t) UCL | 0.0283 |
| 95% KM (z) UCL | 0.0281 |
| 95% KM (jackknife) UCL | 0.0573 |
| 95% KM (bootstrap t) UCL | 0.0246 |
| 95% KM (BCA) UCL | 0.073 |
| 95% KM (Percentile Bootstrap) UCL | 0.073 |
| 95% KM (Chebyshev) UCL | 0.034 |
| 97.5% KM (Chebyshev) UCL | 0.0381 |
| 99% KM (Chebyshev) UCL | 0.0462 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.0283 |
| 95% KM (% Bootstrap) UCL | 0.073 |

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.

From File: Metals Input.wst

### Summary Statistics for Raw Full Data Sets

| Variable | NumObs | Minimum | Maximum | Mean | Median | Variance | SD | MAD/0.675 | Skewness | Kurtosis | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_SEDIMENT pH | 7 | 7.18 | 8.8 | 8.39 | 8.62 | 0.337 | 0.581 | 0.193 | -1.948 | 3.644 | 0.0692 |
| LnROS_Copper | 21 | 8.5 | 38.9 | 17.29 | 13.9 | 75.05 | 8.663 | 6.375 | 1.182 | 0.627 | 0.501 |
| LnROS_Nickel | 17 | 4.66 | 9.55 | 7.232 | 7.8 | 2.19 | 1.48 | 1.186 | -0.339 | -0.981 | 0.205 |
| LnROS_Sulfur | 14 | 95.2 | 1680 | 641.1 | 480 | 223553 | 472.8 | 474.4 | 1.058 | 0.583 | 0.738 |
| LnROS_Zinc | 17 | 26.1 | 60 | 47.39 | 49.6 | 109.1 | 10.45 | 12.16 | -0.502 | -0.887 | 0.22 |

### Percentiles for Raw Full Data Sets

| Variable | NumObs | 5%ile | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | 99%ile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_SEDIMENT pH | 7 | 7.456 | 7.732 | 8.204 | 8.36 | 8.62 | 8.705 | 8.732 | 8.77 | 8.785 | 8.797 |
| LnROS_Copper | 21 | 8.71 | 9.5 | 10.7 | 10.9 | 13.9 | 20.5 | 23.2 | 28.8 | 33.7 | 37.86 |
| LnROS_Nickel | 17 | 5.012 | 5.16 | 5.82 | 5.9 | 7.8 | 8.1 | 8.284 | 8.852 | 9.294 | 9.499 |
| LnROS_Sulfur | 14 | 137.3 | 169 | 262 | 325 | 480 | 800 | 852 | 1294 | 1531 | 1650 |
| LnROS_Zinc | 17 | 32.34 | 35.04 | 37.06 | 37.7 | 49.6 | 57.4 | 57.72 | 58.36 | 59.12 | 59.82 |

## General UCL Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| From File | Metals Input.wst |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**SEDIMENT pH**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 7 | Number of Distinct Observations | 6 |

| **Raw Statistics** | | **Log-transformed Statistics** | |
|---|---|---|---|
| Minimum | 7.18 | Minimum of Log Data | 1.971 |
| Maximum | 8.8 | Maximum of Log Data | 2.175 |
| Mean | 8.39 | Mean of log Data | 2.125 |
| Geometric Mean | 8.372 | SD of log Data | 0.073 |
| Median | 8.62 | | |
| SD | 0.581 | | |
| Std. Error of Mean | 0.22 | | |
| Coefficient of Variation | 0.0692 | | |
| Skewness | -1.948 | | |

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 | 0.726 | Shapiro Wilk Test Statistic | 0.712 |
| Shapiro Wilk Critical Value | 0.803 | 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** | |
|---|---|---|---|
| 95% Student's-t UCL | 8.817 | 95% H-UCL | N/A |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 9.4 |
| 95% Adjusted-CLT UCL (Chen-1995) | 8.578 | 97.5% Chebyshev (MVUE) UCL | 9.836 |
| 95% Modified-t UCL (Johnson-1978) | 8.79 | 99% Chebyshev (MVUE) UCL | 10.69 |

| **Gamma Distribution Test** | | **Data Distribution** |
|---|---|---|
| k star (bias corrected) | 129.8 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 0.0646 | |
| MLE of Mean | 8.39 | |
| MLE of Standard Deviation | 0.736 | |

| | |
|---|---|
| nu star | 1817 |
| Approximate Chi Square Value (.05) | 1719 |
| Adjusted Level of Significance | 0.0158 |
| Adjusted Chi Square Value | 1690 |
| Anderson-Darling Test Statistic | 1 |
| Anderson-Darling 5% Critical Value | 0.708 |
| Kolmogorov-Smirnov Test Statistic | 0.381 |
| Kolmogorov-Smirnov 5% Critical Value | 0.311 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 8.868 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 9.021 |

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 8.751 |
| 95% Jackknife UCL | 8.817 |
| 95% Standard Bootstrap UCL | 8.722 |
| 95% Bootstrap-t UCL | 8.676 |
| 95% Hall's Bootstrap UCL | 8.612 |
| 95% Percentile Bootstrap UCL | 8.689 |
| 95% BCA Bootstrap UCL | 8.639 |
| 95% Chebyshev(Mean, Sd) UCL | 9.347 |
| 97.5% Chebyshev(Mean, Sd) UCL | 9.761 |
| 99% Chebyshev(Mean, Sd) UCL | 10.57 |

Potential UCL to Use

Use 95% Student's-t UCL 8.817

or 95% Modified-t UCL 8.79

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.

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 positvely skewed data sets.

**Copper**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 21 | Number of Distinct Observations | 20 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 8.5 |
| Maximum | 38.9 |
| Mean | 17.29 |
| Geometric Mean | 15.57 |
| Median | 13.9 |
| SD | 8.663 |
| Std. Error of Mean | 1.89 |
| Coefficient of Variation | 0.501 |
| Skewness | 1.182 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 2.14 |
| Maximum of Log Data | 3.661 |
| Mean of log Data | 2.745 |
| SD of log Data | 0.457 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.866 |
| Shapiro Wilk Critical Value | 0.908 |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.942 |
| Shapiro Wilk Critical Value | 0.908 |

Data appear Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 20.55 |

**95% UCLs (Adjusted for Skewness)**

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 21.1 |
| 95% Chebyshev (MVUE) UCL | 24.9 |

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 20.92 |
| 95% Modified-t UCL (Johnson-1978) | 20.63 |

| | |
|---|---|
| 97.5% Chebyshev (MVUE) UCL | 28.24 |
| 99% Chebyshev (MVUE) UCL | 34.79 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 4.25 |
| Theta Star | 4.069 |
| MLE of Mean | 17.29 |
| MLE of Standard Deviation | 8.388 |
| nu star | 178.5 |
| Approximate Chi Square Value (.05) | 148.6 |
| Adjusted Level of Significance | 0.0383 |
| Adjusted Chi Square Value | 146.5 |
| Anderson-Darling Test Statistic | 0.594 |
| Anderson-Darling 5% Critical Value | 0.745 |
| Kolmogorov-Smirnov Test Statistic | 0.15 |
| Kolmogorov-Smirnov 5% Critical Value | 0.19 |

Data appear Gamma Distributed at 5% Significance Level

**Data Distribution**

Data appear Gamma Distributed at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 20.4 |
| 95% Jackknife UCL | 20.55 |
| 95% Standard Bootstrap UCL | 20.38 |
| 95% Bootstrap-t UCL | 21.33 |
| 95% Hall's Bootstrap UCL | 21.18 |
| 95% Percentile Bootstrap UCL | 20.36 |
| 95% BCA Bootstrap UCL | 20.92 |
| 95% Chebyshev(Mean, Sd) UCL | 25.53 |
| 97.5% Chebyshev(Mean, Sd) UCL | 29.1 |
| 99% Chebyshev(Mean, Sd) UCL | 36.1 |

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 20.77 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 21.07 |

**Potential UCL to Use**

Use 95% Approximate Gamma UCL 20.77

**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.**

Nickel

## General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Observations | 17 | Number of Distinct Observations | 16 |

### Raw Statistics

| | |
|---|---|
| Minimum | 4.66 |
| Maximum | 9.55 |
| Mean | 7.232 |
| Geometric Mean | 7.079 |
| Median | 7.8 |
| SD | 1.48 |
| Std. Error of Mean | 0.359 |
| Coefficient of Variation | 0.205 |
| Skewness | -0.339 |

### Log-transformed Statistics

| | |
|---|---|
| Minimum of Log Data | 1.539 |
| Maximum of Log Data | 2.257 |
| Mean of log Data | 1.957 |
| SD of log Data | 0.218 |

## Relevant UCL Statistics

### Normal Distribution Test

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.936 |
| Shapiro Wilk Critical Value | 0.892 |

Data appear Normal at 5% Significance Level

### Lognormal Distribution Test

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.913 |
| Shapiro Wilk Critical Value | 0.892 |

Data appear Lognormal at 5% Significance Level

### Assuming Normal Distribution

| | |
|---|---|
| 95% Student's-t UCL | 7.859 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 7.791 |
| 95% Modified-t UCL (Johnson-1978) | 7.854 |

### Assuming Lognormal Distribution

| | |
|---|---|
| 95% H-UCL | 7.998 |
| 95% Chebyshev (MVUE) UCL | 8.917 |
| 97.5% Chebyshev (MVUE) UCL | 9.643 |
| 99% Chebyshev (MVUE) UCL | 11.07 |

### Gamma Distribution Test

| | |
|---|---|
| k star (bias corrected) | 19.43 |
| Theta Star | 0.372 |
| MLE of Mean | 7.232 |
| MLE of Standard Deviation | 1.641 |
| nu star | 660.7 |
| Approximate Chi Square Value (.05) | 602.1 |
| Adjusted Level of Significance | 0.0346 |
| Adjusted Chi Square Value | 596.2 |
| Anderson-Darling Test Statistic | 0.655 |
| Anderson-Darling 5% Critical Value | 0.738 |
| Kolmogorov-Smirnov Test Statistic | 0.208 |
| Kolmogorov-Smirnov 5% Critical Value | 0.209 |

Data appear Gamma Distributed at 5% Significance Level

### Assuming Gamma Distribution

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 7.937 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 8.015 |

### Data Distribution

Data appear Normal at 5% Significance Level

### Nonparametric Statistics

| | |
|---|---|
| 95% CLT UCL | 7.823 |
| 95% Jackknife UCL | 7.859 |
| 95% Standard Bootstrap UCL | 7.811 |
| 95% Bootstrap-t UCL | 7.829 |
| 95% Hall's Bootstrap UCL | 7.776 |
| 95% Percentile Bootstrap UCL | 7.788 |
| 95% BCA Bootstrap UCL | 7.773 |
| 95% Chebyshev(Mean, Sd) UCL | 8.797 |
| 97.5% Chebyshev(Mean, Sd) UCL | 9.474 |
| 99% Chebyshev(Mean, Sd) UCL | 10.8 |

**Potential UCL to Use** Use 95% Student's-t UCL 7.859

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 positvely skewed data sets.

**Sulfur**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 14 | Number of Detected Data | 13 |
| Number of Distinct Detected Data | 11 | Number of Non-Detect Data | 1 |
| | | Percent Non-Detects | 7.14% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 160 | Minimum Detected | 5.075 |
| Maximum Detected | 1680 | Maximum Detected | 7.427 |
| Mean of Detected | 683.1 | Mean of Detected | 6.306 |
| SD of Detected | 464.2 | SD of Detected | 0.714 |
| Minimum Non-Detect | 100 | Minimum Non-Detect | 4.605 |
| Maximum Non-Detect | 100 | Maximum Non-Detect | 4.605 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.888 | Shapiro Wilk Test Statistic | 0.964 |
| 5% Shapiro Wilk Critical Value | 0.866 | 5% 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 | |
|---|---|---|---|
| DL/2 Substitution Method | | DL/2 Substitution Method | |
| Mean | 637.9 | Mean | 6.135 |
| SD | 477 | SD | 0.938 |
| 95% DL/2 (t) UCL | 863.6 | 95% H-Stat (DL/2) UCL | 1445 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 623.9 | Mean in Log Scale | 6.181 |
| SD | 483.1 | SD in Log Scale | 0.831 |
| 95% MLE (t) UCL | 852.5 | Mean in Original Scale | 641.1 |
| 95% MLE (Tiku) UCL | 847.7 | SD in Original Scale | 472.8 |
| | | 95% t UCL | 864.9 |
| | | 95% Percentile Bootstrap UCL | 847.9 |
| | | 95% BCA Bootstrap UCL | 869.3 |
| | | 95% H UCL | 1221 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 1.912 | Data appear Normal at 5% Significance Level |
| Theta Star | 357.2 | |
| nu star | 49.72 | |
| | | |
| A-D Test Statistic | 0.253 | **Nonparametric Statistics** |
| 5% A-D Critical Value | 0.741 | Kaplan-Meier (KM) Method |
| K-S Test Statistic | 0.741 | Mean 645.7 |
| 5% K-S Critical Value | 0.239 | SD 450.3 |
| Data appear Gamma Distributed at 5% Significance Level | | SE of Mean 125.3 |

| | |
|---|---|
| 95% KM (t) UCL | 867.6 |
| 95% KM (z) UCL | 851.8 |
| 95% KM (jackknife) UCL | 865.9 |
| 95% KM (bootstrap t) UCL | 947.7 |
| 95% KM (BCA) UCL | 857.1 |
| 95% KM (Percentile Bootstrap) UCL | 855.7 |
| 95% KM (Chebyshev) UCL | 1192 |
| 97.5% KM (Chebyshev) UCL | 1428 |
| 99% KM (Chebyshev) UCL | 1892 |

**Assuming Gamma Distribution**

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 1680 |
| Mean | 634.3 |
| Median | 480 |
| SD | 481.9 |
| k star | 0.372 |
| Theta star | 1703 |
| Nu star | 10.43 |
| AppChi2 | 4.21 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 1571 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 1787 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 867.6 |
| 95% KM (Percentile Bootstrap) UCL | 855.7 |

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.

**Zinc**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 17 | Number of Distinct Observations | 17 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 26.1 |
| Maximum | 60 |
| Mean | 47.39 |
| Geometric Mean | 46.18 |
| Median | 49.6 |
| SD | 10.45 |
| Std. Error of Mean | 2.533 |
| Coefficient of Variation | 0.22 |
| Skewness | -0.502 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 3.262 |
| Maximum of Log Data | 4.094 |
| Mean of log Data | 3.833 |
| SD of log Data | 0.242 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.92 |
| Shapiro Wilk Critical Value | 0.892 |

Data appear Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.898 |
| Shapiro Wilk Critical Value | 0.892 |

Data appear Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 51.81 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 51.23 |
| 95% Modified-t UCL (Johnson-1978) | 51.76 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 53.08 |
| 95% Chebyshev (MVUE) UCL | 59.7 |
| 97.5% Chebyshev (MVUE) UCL | 64.99 |
| 99% Chebyshev (MVUE) UCL | 75.39 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 16.15 |
| Theta Star | 2.934 |
| MLE of Mean | 47.39 |
| MLE of Standard Deviation | 11.79 |

**Data Distribution**

Data appear Normal at 5% Significance Level

| | |
|---|---|
| nu star | 549.2 |
| Approximate Chi Square Value (.05) | 495.8 |
| Adjusted Level of Significance | 0.0346 |
| Adjusted Chi Square Value | 490.5 |
| | |
| Anderson-Darling Test Statistic | 0.601 |
| Anderson-Darling 5% Critical Value | 0.738 |
| Kolmogorov-Smirnov Test Statistic | 0.177 |
| Kolmogorov-Smirnov 5% Critical Value | 0.209 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 52.49 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 53.06 |

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 51.56 |
| 95% Jackknife UCL | 51.81 |
| 95% Standard Bootstrap UCL | 51.44 |
| 95% Bootstrap-t UCL | 51.62 |
| 95% Hall's Bootstrap UCL | 51.13 |
| 95% Percentile Bootstrap UCL | 51.29 |
| 95% BCA Bootstrap UCL | 51.1 |
| 95% Chebyshev(Mean, Sd) UCL | 58.43 |
| 97.5% Chebyshev(Mean, Sd) UCL | 63.21 |
| 99% Chebyshev(Mean, Sd) UCL | 72.59 |

**Potential UCL to Use**

Use 95% Student's-t UCL 51.81

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 positvely skewed data sets.

From File: PHCs Input.wst

## Summary Statistics for Raw Full Data Sets

| Variable | NumObs | Minimum | Maximum | Mean | Median | Variance | SD | MAD/0.675 | Skewness | Kurtosis | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ROS_EPHw(C10-<C19)1 | 81 | 0.164 | 18900 | 1643 | 97.48 | 14859479 | 3855 | 140.8 | 2.914 | 8.353 | 2.347 |
| ROS_EPHw(C19-C32)1 | 81 | 1.896 | 19200 | 1530 | 245.2 | 10421437 | 3228 | 341.3 | 3.279 | 12.47 | 2.11 |
| LnROS_LEPH | 81 | 0.165 | 18800 | 1639 | 97.59 | 14779171 | 3844 | 141 | 2.912 | 8.336 | 2.345 |
| LnROS_HEPH | 81 | 1.896 | 19200 | 1530 | 245.2 | 10421437 | 3228 | 341.3 | 3.279 | 12.47 | 2.11 |
| LnROS_VPH | 81 | 0.0142 | 26100 | 2319 | 45.14 | 32328420 | 5686 | 66.42 | 2.834 | 7.514 | 2.452 |
| LnROS_VH | 74 | 0.0288 | 29700 | 2905 | 69.04 | 46115409 | 6791 | 100.5 | 2.718 | 6.828 | 2.337 |
| · EPH[C19-C32] + VPH) | 37 | 110 | 55800 | 11789 | 1740 | 261700000 | 16178 | 2328 | 1.414 | 0.776 | 1.372 |
| LnROS_Benzene | 81 | 1.529E-05 | 258 | 15.01 | 0.0863 | 1501 | 38.75 | 0.127 | 4.046 | 20.16 | 2.582 |
| LnROS_Ethylbenzene | 81 | 2.062E-06 | 480 | 32.9 | 0.077 | 8124 | 90.13 | 0.114 | 3.403 | 11.66 | 2.739 |
| LnROS_Styrene | 81 | 0.0008122 | 0.291 | 0.0349 | 0.0158 | 0.003 | 0.0548 | 0.0162 | 2.964 | 8.952 | 1.571 |
| LnROS_Toluene | 81 | 7.029E-06 | 1520 | 96.88 | 0.254 | 69278 | 263.2 | 0.376 | 3.529 | 13.41 | 2.717 |
| LnROS_o-xylene | 81 | 9.348E-06 | 630 | 51.79 | 0.189 | 16383 | 128 | 0.28 | 2.957 | 8.454 | 2.471 |
| LnROS_m,p-xylene | 81 | 8.084E-06 | 1850 | 143.6 | 0.289 | 136754 | 369.8 | 0.428 | 3.111 | 9.423 | 2.576 |
| LnROS_Xylenes | 81 | 3.863E-05 | 2490 | 195.5 | 0.475 | 248045 | 498 | 0.703 | 3.078 | 9.236 | 2.548 |

## Percentiles for Raw Full Data Sets

| Variable | NumObs | 5%ile | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | 99%ile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ROS_EPHw(C10-<C19)1 | 81 | 1.215 | 3.005 | 9.677 | 15.25 | 97.48 | 460 | 1170 | 6520 | 11300 | 17540 |
| ROS_EPHw(C19-C32)1 | 81 | 8.707 | 17.35 | 42.27 | 59.76 | 245.2 | 920 | 1430 | 5250 | 8570 | 13840 |
| LnROS_LEPH | 81 | 1.22 | 3.015 | 9.704 | 15.29 | 97.59 | 460 | 1170 | 6480 | 11200 | 17520 |
| LnROS_HEPH | 81 | 8.707 | 17.35 | 42.27 | 59.76 | 245.2 | 920 | 1430 | 5250 | 8570 | 13840 |
| LnROS_VPH | 81 | 0.178 | 0.558 | 2.441 | 4.334 | 45.14 | 330 | 840 | 9400 | 17300 | 24900 |
| LnROS_VH | 74 | 0.316 | 0.951 | 3.999 | 6.999 | 69.04 | 612.5 | 2384 | 11260 | 20130 | 29408 |
| · EPH[C19-C32] + VPH) | 37 | 264 | 512 | 1106 | 1150 | 1740 | 18190 | 25918 | 37130 | 43380 | 53820 |
| LnROS_Benzene | 81 | 0.000289 | 0.00109 | 0.00612 | 0.012 | 0.0863 | 7.32 | 10.3 | 49.6 | 87.7 | 160.4 |
| LnROS_Ethylbenzene | 81 | 6.242E-05 | 0.0002918 | 0.00214 | 0.00463 | 0.077 | 4.16 | 10 | 72.9 | 209 | 398.4 |
| LnROS_Styrene | 81 | 0.00212 | 0.00327 | 0.00579 | 0.00723 | 0.0158 | 0.0344 | 0.043 | 0.067 | 0.164 | 0.233 |
| LnROS_Toluene | 81 | 0.0002116 | 0.0009867 | 0.0072 | 0.0156 | 0.254 | 18.9 | 23.8 | 372 | 609 | 1160 |
| LnROS_o-xylene | 81 | 0.0002392 | 0.00104 | 0.00688 | 0.0144 | 0.189 | 12.4 | 24.8 | 147 | 371 | 555.6 |
| LnROS_m,p-xylene | 81 | 0.0002574 | 0.00123 | 0.00928 | 0.0203 | 0.289 | 22.9 | 53.4 | 439 | 1020 | 1610 |
| LnROS_Xylenes | 81 | 0.0007359 | 0.00235 | 0.0178 | 0.0354 | 0.475 | 37.8 | 75.6 | 586 | 1390 | 2170 |

## General UCL Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| From File | PHCs Input.wst |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**EPHw(C10-<C19)1**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 81 | Number of Detected Data | 32 |
| Number of Distinct Detected Data | 30 | Number of Non-Detect Data | 49 |
| | | Percent Non-Detects | 60.49% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 210 | Minimum Detected | 5.347 |
| Maximum Detected | 18900 | Maximum Detected | 9.847 |
| Mean of Detected | 4088 | Mean of Detected | 7.328 |
| SD of Detected | 5305 | SD of Detected | 1.512 |
| Minimum Non-Detect | 200 | Minimum Non-Detect | 5.298 |
| Maximum Non-Detect | 200 | Maximum Non-Detect | 5.298 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.749 | Shapiro Wilk Test Statistic | 0.882 |
| 5% Shapiro Wilk Critical Value | 0.93 | 5% Shapiro Wilk Critical Value | 0.93 |
| 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 | 1675 | Mean | 5.681 |
| SD | 3841 | SD | 1.637 |
| 95% DL/2 (t) UCL | 2386 | 95% H-Stat (DL/2) UCL | 1909 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| **MLE yields a negative mean** | | Mean in Log Scale | 4.61 |
| | | SD in Log Scale | 2.761 |
| | | Mean in Original Scale | 1643 |
| | | SD in Original Scale | 3855 |
| | | 95% t UCL | 2355 |
| | | 95% Percentile Bootstrap UCL | 2417 |
| | | 95% BCA Bootstrap UCL | 2559 |
| | | 95% H-UCL | 17407 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 0.585 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 6991 | |
| nu star | 37.42 | |
| | | |
| A-D Test Statistic | 1.611 | **Nonparametric Statistics** |
| 5% A-D Critical Value | 0.799 | Kaplan-Meier (KM) Method |
| K-S Test Statistic | 0.799 | Mean 1742 |

| | |
|---|---|
| 5% K-S Critical Value | 0.163 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 18900 |
| Mean | 1615 |
| Median | 0.000001 |
| SD | 3866 |
| k star | 0.072 |
| Theta star | 22416 |
| Nu star | 11.67 |
| AppChi2 | 5.011 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 3761 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 3822 |

Note: DL/2 is not a recommended method.

| | |
|---|---|
| SD | 3790 |
| SE of Mean | 427.8 |
| 95% KM (t) UCL | 2454 |
| 95% KM (z) UCL | 2446 |
| 95% KM (jackknife) UCL | 2426 |
| 95% KM (bootstrap t) UCL | 2671 |
| 95% KM (BCA) UCL | 2643 |
| 95% KM (Percentile Bootstrap) UCL | 2490 |
| 95% KM (Chebyshev) UCL | 3607 |
| 97.5% KM (Chebyshev) UCL | 4414 |
| 99% KM (Chebyshev) UCL | 5999 |

Potential UCLs to Use

| | |
|---|---|
| 95% KM (Chebyshev) UCL | 3607 |

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.

EPHw(C19-C32)1

**General Statistics**

| | |
|---|---|
| Number of Valid Data | 81 |
| Number of Distinct Detected Data | 32 |

| | |
|---|---|
| Number of Detected Data | 35 |
| Number of Non-Detect Data | 46 |
| Percent Non-Detects | 56.79% |

**Raw Statistics**

| | |
|---|---|
| Minimum Detected | 300 |
| Maximum Detected | 19200 |
| Mean of Detected | 3404 |
| SD of Detected | 4260 |
| Minimum Non-Detect | 200 |
| Maximum Non-Detect | 200 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum Detected | 5.704 |
| Maximum Detected | 9.863 |
| Mean of Detected | 7.461 |
| SD of Detected | 1.169 |
| Minimum Non-Detect | 5.298 |
| Maximum Non-Detect | 5.298 |

**UCL Statistics**

**Normal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.73 |
| 5% Shapiro Wilk Critical Value | 0.934 |

Data not Normal at 5% Significance Level

**Assuming Normal Distribution**

DL/2 Substitution Method

| | |
|---|---|
| Mean | 1528 |
| SD | 3229 |
| 95% DL/2 (t) UCL | 2125 |

| | |
|---|---|
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE yields a negative mean**

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.924 |
| 5% Shapiro Wilk Critical Value | 0.934 |

Data not Lognormal at 5% Significance Level

**Assuming Lognormal Distribution**

DL/2 Substitution Method

| | |
|---|---|
| Mean | 5.839 |
| SD | 1.615 |
| 95% H-Stat (DL/2) UCL | 2132 |

Log ROS Method

| | |
|---|---|
| Mean in Log Scale | 5.528 |
| SD in Log Scale | 2.099 |

| | |
|---|---|
| Mean in Original Scale | 1530 |
| SD in Original Scale | 3228 |
| 95% t UCL | 2127 |
| 95% Percentile Bootstrap UCL | 2146 |
| 95% BCA Bootstrap UCL | 2278 |
| 95% H-UCL | 5156 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.818 |
| Theta Star | 4162 |
| nu star | 57.25 |
| | |
| A-D Test Statistic | 1.523 |
| 5% A-D Critical Value | 0.782 |
| K-S Test Statistic | 0.782 |
| 5% K-S Critical Value | 0.154 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 19200 |
| Mean | 1471 |
| Median | 0.000001 |
| SD | 3254 |
| k star | 0.0765 |
| Theta star | 19213 |
| Nu star | 12.4 |
| AppChi2 | 5.492 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 3321 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 3372 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 1641 |
| SD | 3159 |
| SE of Mean | 356.2 |
| 95% KM (t) UCL | 2234 |
| 95% KM (z) UCL | 2227 |
| 95% KM (jackknife) UCL | 2209 |
| 95% KM (bootstrap t) UCL | 2457 |
| 95% KM (BCA) UCL | 2382 |
| 95% KM (Percentile Bootstrap) UCL | 2283 |
| 95% KM (Chebyshev) UCL | 3194 |
| 97.5% KM (Chebyshev) UCL | 3865 |
| 99% KM (Chebyshev) UCL | 5185 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (BCA) UCL | 2382 |

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.

LEPH

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 81 | Number of Detected Data | 32 |
| Number of Distinct Detected Data | 30 | Number of Non-Detect Data | 49 |
| | | Percent Non-Detects | 60.49% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 210 | Minimum Detected | 5.347 |
| Maximum Detected | 18800 | Maximum Detected | 9.842 |
| Mean of Detected | 4079 | Mean of Detected | 7.327 |
| SD of Detected | 5290 | SD of Detected | 1.511 |
| Minimum Non-Detect | 200 | Minimum Non-Detect | 5.298 |
| Maximum Non-Detect | 200 | Maximum Non-Detect | 5.298 |

## UCL Statistics

### Normal Distribution Test with Detected Values Only

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.749 |
| 5% Shapiro Wilk Critical Value | 0.93 |

Data not Normal at 5% Significance Level

### Assuming Normal Distribution

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 1672 |
| SD | 3830 |
| 95% DL/2 (t) UCL | 2380 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |

MLE yields a negative mean

### Lognormal Distribution Test with Detected Values Only

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.882 |
| 5% Shapiro Wilk Critical Value | 0.93 |

Data not Lognormal at 5% Significance Level

### Assuming Lognormal Distribution

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 5.681 |
| SD | 1.636 |
| 95% H-Stat (DL/2) UCL | 1906 |
| | |
| Log ROS Method | |
| Mean in Log Scale | 4.611 |
| SD in Log Scale | 2.759 |
| Mean in Original Scale | 1639 |
| SD in Original Scale | 3844 |
| 95% t UCL | 2350 |
| 95% Percentile Bootstrap UCL | 2379 |
| 95% BCA Bootstrap UCL | 2521 |
| 95% H-UCL | 17301 |

### Gamma Distribution Test with Detected Values Only

| | |
|---|---|
| k star (bias corrected) | 0.585 |
| Theta Star | 6967 |
| nu star | 37.47 |
| | |
| A-D Test Statistic | 1.609 |
| 5% A-D Critical Value | 0.799 |
| K-S Test Statistic | 0.799 |
| 5% K-S Critical Value | 0.163 |

Data not Gamma Distributed at 5% Significance Level

### Assuming Gamma Distribution

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 18800 |
| Mean | 1611 |
| Median | 0.000001 |
| SD | 3856 |
| k star | 0.0721 |
| Theta star | 22364 |
| Nu star | 11.67 |
| AppChi2 | 5.012 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 3753 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 3813 |

Note: DL/2 is not a recommended method.

### Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

### Nonparametric Statistics

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 1738 |
| SD | 3780 |
| SE of Mean | 426.7 |
| 95% KM (t) UCL | 2448 |
| 95% KM (z) UCL | 2440 |
| 95% KM (jackknife) UCL | 2420 |
| 95% KM (bootstrap t) UCL | 2713 |
| 95% KM (BCA) UCL | 2564 |
| 95% KM (Percentile Bootstrap) UCL | 2455 |
| 95% KM (Chebyshev) UCL | 3598 |
| 97.5% KM (Chebyshev) UCL | 4403 |
| 99% KM (Chebyshev) UCL | 5984 |

### Potential UCLs to Use

| | |
|---|---|
| 95% KM (Chebyshev) UCL | 3598 |

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.

## General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 81 | Number of Detected Data | 35 |
| Number of Distinct Detected Data | 32 | Number of Non-Detect Data | 46 |
| | | Percent Non-Detects | 56.79% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 300 | Minimum Detected | 5.704 |
| Maximum Detected | 19200 | Maximum Detected | 9.863 |
| Mean of Detected | 3404 | Mean of Detected | 7.461 |
| SD of Detected | 4260 | SD of Detected | 1.169 |
| Minimum Non-Detect | 200 | Minimum Non-Detect | 5.298 |
| Maximum Non-Detect | 200 | Maximum Non-Detect | 5.298 |

## UCL Statistics

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.73 | Shapiro Wilk Test Statistic | 0.924 |
| 5% Shapiro Wilk Critical Value | 0.934 | 5% Shapiro Wilk Critical Value | 0.934 |
| 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 | 1528 | Mean | 5.839 |
| SD | 3229 | SD | 1.615 |
| 95% DL/2 (t) UCL | 2125 | 95% H-Stat (DL/2) UCL | 2132 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE yields a negative mean | | Mean in Log Scale | 5.528 |
| | | SD in Log Scale | 2.099 |
| | | Mean in Original Scale | 1530 |
| | | SD in Original Scale | 3228 |
| | | 95% t UCL | 2127 |
| | | 95% Percentile Bootstrap UCL | 2151 |
| | | 95% BCA Bootstrap UCL | 2314 |
| | | 95% H-UCL | 5156 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 0.818 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 4162 | |
| nu star | 57.25 | |
| | | |
| A-D Test Statistic | 1.523 | |
| 5% A-D Critical Value | 0.782 | |
| K-S Test Statistic | 0.782 | |
| 5% K-S Critical Value | 0.154 | |
| Data not Gamma Distributed at 5% Significance Level | | |

| Assuming Gamma Distribution | | Nonparametric Statistics | |
|---|---|---|---|
| Gamma ROS Statistics using Extrapolated Data | | Kaplan-Meier (KM) Method | |
| Minimum | 0.000001 | Mean | 1641 |
| Maximum | 19200 | SD | 3159 |
| Mean | 1471 | SE of Mean | 356.2 |
| Median | 0.000001 | 95% KM (t) UCL | 2234 |
| | | 95% KM (z) UCL | 2227 |
| | | 95% KM (jackknife) UCL | 2209 |
| | | 95% KM (bootstrap t) UCL | 2425 |
| | | 95% KM (BCA) UCL | 2332 |
| | | 95% KM (Percentile Bootstrap) UCL | 2290 |
| | | 95% KM (Chebyshev) UCL | 3194 |

| | | | |
|---|---|---|---|
| SD | 3254 | 97.5% KM (Chebyshev) UCL | 3865 |
| k star | 0.0765 | 99% KM (Chebyshev) UCL | 5185 |
| Theta star | 19213 | | |
| Nu star | 12.4 | **Potential UCLs to Use** | |
| AppChi2 | 5.492 | 95% KM (BCA) UCL | 2332 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 3321 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 3372 | | |

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.

VPH

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 81 | Number of Detected Data | 28 |
| Number of Distinct Detected Data | 27 | Number of Non-Detect Data | 53 |
| | | Percent Non-Detects | 65.43% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 110 | Minimum Detected | 4.7 |
| Maximum Detected | 26100 | Maximum Detected | 10.17 |
| Mean of Detected | 6652 | Mean of Detected | 7.595 |
| SD of Detected | 8126 | SD of Detected | 1.874 |
| Minimum Non-Detect | 100 | Minimum Non-Detect | 4.605 |
| Maximum Non-Detect | 100 | Maximum Non-Detect | 4.605 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.793 | Shapiro Wilk Test Statistic | 0.902 |
| 5% Shapiro Wilk Critical Value | 0.924 | 5% Shapiro Wilk Critical Value | 0.924 |
| 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 | 2332 | Mean | 5.185 |
| SD | 5680 | SD | 2.071 |
| 95% DL/2 (t) UCL | 3383 | 95% H-Stat (DL/2) UCL | 3392 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| **MLE yields a negative mean** | | Mean in Log Scale | 3.843 |
| | | SD in Log Scale | 3.492 |
| | | Mean in Original Scale | 2319 |
| | | SD in Original Scale | 5686 |
| | | 95% t UCL | 3371 |
| | | 95% Percentile Bootstrap UCL | 3475 |
| | | 95% BCA Bootstrap UCL | 3675 |
| | | 95% H-UCL | 167112 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 0.49 | Data Follow Appr. Gamma Distribution at 5% Significance Level |

| | |
|---|---|
| Theta Star | 13572 |
| nu star | 27.45 |

| | |
|---|---|
| A-D Test Statistic | 0.848 |
| 5% A-D Critical Value | 0.808 |
| K-S Test Statistic | 0.808 |
| 5% K-S Critical Value | 0.175 |

Data follow Appr. Gamma Distribution at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 26100 |
| Mean | 2300 |
| Median | 0.000001 |
| SD | 5694 |
| k star | 0.0667 |
| Theta star | 34486 |
| Nu star | 10.8 |
| AppChi2 | 4.449 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 5583 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 5677 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 2371 |
| SD | 5629 |
| SE of Mean | 637 |
| 95% KM (t) UCL | 3431 |
| 95% KM (z) UCL | 3419 |
| 95% KM (jackknife) UCL | 3413 |
| 95% KM (bootstrap t) UCL | 3833 |
| 95% KM (BCA) UCL | 3395 |
| 95% KM (Percentile Bootstrap) UCL | 3393 |
| 95% KM (Chebyshev) UCL | 5148 |
| 97.5% KM (Chebyshev) UCL | 6349 |
| 99% KM (Chebyshev) UCL | 8709 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 3431 |

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.

VH

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 74 | Number of Detected Data | 29 |
| Number of Distinct Detected Data | 29 | Number of Non-Detect Data | 45 |
| | | Percent Non-Detects | 60.81% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 110 | Minimum Detected | 4.7 |
| Maximum Detected | 29700 | Maximum Detected | 10.3 |
| Mean of Detected | 7363 | Mean of Detected | 7.652 |
| SD of Detected | 9294 | SD of Detected | 1.902 |
| Minimum Non-Detect | 100 | Minimum Non-Detect | 4.605 |
| Maximum Non-Detect | 100 | Maximum Non-Detect | 4.605 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.777 | Shapiro Wilk Test Statistic | 0.909 |
| 5% Shapiro Wilk Critical Value | 0.926 | 5% Shapiro Wilk Critical Value | 0.926 |
| 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 | 2916 | Mean | 5.378 |

| | |
|---|---|
| SD | 6786 |
| 95% DL/2 (t) UCL | 4230 |

| | |
|---|---|
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE yields a negative mean**

| | |
|---|---|
| SD | 2.183 |
| 95% H-Stat (DL/2) UCL | 5973 |

| | |
|---|---|
| Log ROS Method | |
| Mean in Log Scale | 4.274 |
| SD in Log Scale | 3.419 |
| Mean in Original Scale | 2905 |
| SD in Original Scale | 6791 |
| 95% t UCL | 4220 |
| 95% Percentile Bootstrap UCL | 4283 |
| 95% BCA Bootstrap UCL | 4487 |
| 95% H-UCL | 210725 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.477 |
| Theta Star | 15438 |
| nu star | 27.66 |

| | |
|---|---|
| A-D Test Statistic | 0.805 |
| 5% A-D Critical Value | 0.811 |
| K-S Test Statistic | 0.811 |
| 5% K-S Critical Value | 0.172 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 29700 |
| Mean | 2886 |
| Median | 0.000001 |
| SD | 6799 |
| k star | 0.0703 |
| Theta star | 41021 |
| Nu star | 10.41 |
| AppChi2 | 4.2 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 7152 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 7288 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data appear Gamma Distributed at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 2952 |
| SD | 6725 |
| SE of Mean | 795.6 |
| 95% KM (t) UCL | 4278 |
| 95% KM (z) UCL | 4261 |
| 95% KM (jackknife) UCL | 4258 |
| 95% KM (bootstrap t) UCL | 4673 |
| 95% KM (BCA) UCL | 4397 |
| 95% KM (Percentile Bootstrap) UCL | 4335 |
| 95% KM (Chebyshev) UCL | 6420 |
| 97.5% KM (Chebyshev) UCL | 7921 |
| 99% KM (Chebyshev) UCL | 10868 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 4278 |

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.

**Total TPH(EPH[C10-C19] + EPH[C19-C32] + VPH)**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 37 | Number of Distinct Observations | 37 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 110 |
| Maximum | 55800 |
| Mean | 11789 |
| Geometric Mean | 3542 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 4.7 |
| Maximum of Log Data | 10.93 |
| Mean of log Data | 8.172 |
| SD of log Data | 1.747 |

| | |
|---|---|
| Median | 1740 |
| SD | 16178 |
| Std. Error of Mean | 2660 |
| Coefficient of Variation | 1.372 |
| Skewness | 1.414 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.726 |
| Shapiro Wilk Critical Value | 0.936 |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.934 |
| Shapiro Wilk Critical Value | 0.936 |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 16279 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 16825 |
| 95% Modified-t UCL (Johnson-1978) | 16383 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 43340 |
| 95% Chebyshev (MVUE) UCL | 39812 |
| 97.5% Chebyshev (MVUE) UCL | 50626 |
| 99% Chebyshev (MVUE) UCL | 71868 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 0.5 |
| Theta Star | 23586 |
| MLE of Mean | 11789 |
| MLE of Standard Deviation | 16675 |
| nu star | 36.99 |
| Approximate Chi Square Value (.05) | 24.07 |
| Adjusted Level of Significance | 0.0431 |
| Adjusted Chi Square Value | 23.61 |
| Anderson-Darling Test Statistic | 1.503 |
| Anderson-Darling 5% Critical Value | 0.81 |
| Kolmogorov-Smirnov Test Statistic | 0.227 |
| Kolmogorov-Smirnov 5% Critical Value | 0.153 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 18120 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 18468 |

**Data Distribution**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 16164 |
| 95% Jackknife UCL | 16279 |
| 95% Standard Bootstrap UCL | 15961 |
| 95% Bootstrap-t UCL | 16954 |
| 95% Hall's Bootstrap UCL | 16438 |
| 95% Percentile Bootstrap UCL | 16190 |
| 95% BCA Bootstrap UCL | 16688 |
| 95% Chebyshev(Mean, Sd) UCL | 23382 |
| 97.5% Chebyshev(Mean, Sd) UCL | 28399 |
| 99% Chebyshev(Mean, Sd) UCL | 38252 |

| | |
|---|---|
| Potential UCL to Use | Use 95% Chebyshev (Mean, Sd) UCL 23382 |

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.

**Benzene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 81 | Number of Detected Data | 41 |
| Number of Distinct Detected Data | 40 | Number of Non-Detect Data | 40 |
| | | Percent Non-Detects | 49.38% |

**Raw Statistics**

| | |
|---|---|
| Minimum Detected | 0.044 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum Detected | -3.124 |

| | |
|---|---|
| Maximum Detected | 258 |
| Mean of Detected | 29.62 |
| SD of Detected | 50.59 |
| Minimum Non-Detect | 0.04 |
| Maximum Non-Detect | 0.08 |

| | |
|---|---|
| Maximum Detected | 5.553 |
| Mean of Detected | 1.491 |
| SD of Detected | 2.534 |
| Minimum Non-Detect | -3.219 |
| Maximum Non-Detect | -2.526 |

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 | 44 |
| Number treated as Detected | 37 |
| Single DL Non-Detect Percentage | 54.32% |

## UCL Statistics

**Normal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.642 |
| 5% Shapiro Wilk Critical Value | 0.941 |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.93 |
| 5% Shapiro Wilk Critical Value | 0.941 |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 15 |
| SD | 38.75 |
| 95% DL/2 (t) UCL | 22.17 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE yields a negative mean**

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -1.169 |
| SD | 3.249 |
| 95% H-Stat (DL/2) UCL | 376.4 |
| | |
| Log ROS Method | |
| Mean in Log Scale | -1.72 |
| SD in Log Scale | 4.062 |
| Mean in Original Scale | 15.01 |
| SD in Original Scale | 38.75 |
| 95% t UCL | 22.17 |
| 95% Percentile Bootstrap UCL | 22.51 |
| 95% BCA Bootstrap UCL | 24.98 |
| 95% H-UCL | 11120 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.344 |
| Theta Star | 86.08 |
| nu star | 28.22 |
| | |
| A-D Test Statistic | 0.511 |
| 5% A-D Critical Value | 0.846 |
| K-S Test Statistic | 0.846 |
| 5% K-S Critical Value | 0.149 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 258 |
| Mean | 14.99 |
| Median | 0.044 |
| SD | 38.75 |
| k star | 0.0981 |
| Theta star | 152.8 |
| Nu star | 15.89 |
| AppChi2 | 7.888 |

**Data Distribution Test with Detected Values Only**

Data appear Gamma Distributed at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 15.02 |
| SD | 38.5 |
| SE of Mean | 4.331 |
| 95% KM (t) UCL | 22.22 |
| 95% KM (z) UCL | 22.14 |
| 95% KM (jackknife) UCL | 22.17 |
| 95% KM (bootstrap t) UCL | 27.05 |
| 95% KM (BCA) UCL | 22.01 |
| 95% KM (Percentile Bootstrap) UCL | 22.09 |
| 95% KM (Chebyshev) UCL | 33.9 |
| 97.5% KM (Chebyshev) UCL | 42.06 |
| 99% KM (Chebyshev) UCL | 58.11 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (BCA) UCL | 22.01 |

| | |
|---|---|
| 95% Gamma Approximate UCL (Use when n >= 40) | 30.21 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 30.61 |

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.

**Ethylbenzene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 81 | Number of Detected Data | 41 |
| Number of Distinct Detected Data | 41 | Number of Non-Detect Data | 40 |
| | | Percent Non-Detects | 49.38% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.062 | Minimum Detected | -2.781 |
| Maximum Detected | 480 | Maximum Detected | 6.174 |
| Mean of Detected | 64.99 | Mean of Detected | 1.6 |
| SD of Detected | 118.8 | SD of Detected | 2.855 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.05 | Maximum Non-Detect | -2.996 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.618 | Shapiro Wilk Test Statistic | 0.922 |
| 5% Shapiro Wilk Critical Value | 0.941 | 5% Shapiro Wilk Critical Value | 0.941 |
| 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 | 32.91 | Mean | -1.012 |
| SD | 90.13 | SD | 3.34 |
| 95% DL/2 (t) UCL | 49.57 | 95% H-Stat (DL/2) UCL | 654.4 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE yields a negative mean | | Mean in Log Scale | -2.147 |
| | | SD in Log Scale | 4.718 |
| | | Mean in Original Scale | 32.9 |
| | | SD in Original Scale | 90.13 |
| | | 95% t UCL | 49.57 |
| | | 95% Percentile Bootstrap UCL | 49.8 |
| | | 95% BCA Bootstrap UCL | 55.27 |
| | | 95% H-UCL | 328416 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 0.269 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 242 | |
| nu star | 22.02 | |
| | | |
| A-D Test Statistic | 1.445 | Nonparametric Statistics |
| 5% A-D Critical Value | 0.871 | Kaplan-Meier (KM) Method |

| | |
|---|---|
| K-S Test Statistic | 0.871 |
| 5% K-S Critical Value | 0.151 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 480 |
| Mean | 32.9 |
| Median | 0.062 |
| SD | 90.13 |
| k star | 0.0919 |
| Theta star | 357.9 |
| Nu star | 14.89 |
| AppChi2 | 7.186 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 68.17 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 69.1 |

Note: DL/2 is not a recommended method.

| | |
|---|---|
| Mean | 32.93 |
| SD | 89.56 |
| SE of Mean | 10.08 |
| 95% KM (t) UCL | 49.69 |
| 95% KM (z) UCL | 49.5 |
| 95% KM (jackknife) UCL | 49.59 |
| 95% KM (bootstrap t) UCL | 58.12 |
| 95% KM (BCA) UCL | 50.17 |
| 95% KM (Percentile Bootstrap) UCL | 50.4 |
| 95% KM (Chebyshev) UCL | 76.84 |
| 97.5% KM (Chebyshev) UCL | 95.85 |
| 99% KM (Chebyshev) UCL | 133.2 |

Potential UCLs to Use

| | |
|---|---|
| 97.5% KM (Chebyshev) UCL | 95.85 |

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.

**Styrene**

**General Statistics**

| | |
|---|---|
| Number of Valid Data | 81 |
| Number of Distinct Detected Data | 10 |

| | |
|---|---|
| Number of Detected Data | 11 |
| Number of Non-Detect Data | 70 |
| Percent Non-Detects | 86.42% |

**Raw Statistics**

| | |
|---|---|
| Minimum Detected | 0.051 |
| Maximum Detected | 0.291 |
| Mean of Detected | 0.147 |
| SD of Detected | 0.0803 |
| Minimum Non-Detect | 0.05 |
| Maximum Non-Detect | 5 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum Detected | -2.976 |
| Maximum Detected | -1.234 |
| Mean of Detected | -2.072 |
| SD of Detected | 0.614 |
| Minimum Non-Detect | -2.996 |
| 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 | 81 |
| 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 | 0.93 |
| 5% Shapiro Wilk Critical Value | 0.85 |

Data appear Normal at 5% Significance Level

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.921 |
| 5% Shapiro Wilk Critical Value | 0.85 |

Data appear Lognormal at 5% Significance Level

**Assuming Normal Distribution**

DL/2 Substitution Method

| | |
|---|---|
| Mean | 0.103 |
| SD | 0.314 |
| 95% DL/2 (t) UCL | 0.161 |

**Assuming Lognormal Distribution**

DL/2 Substitution Method

| | |
|---|---|
| Mean | -3.233 |
| SD | 0.991 |
| 95% H-Stat (DL/2) UCL | 0.0824 |

| | |
|---|---|
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE method failed to converge properly**

| | |
|---|---|
| Log ROS Method | |
| Mean in Log Scale | -4.139 |
| SD in Log Scale | 1.254 |
| Mean in Original Scale | 0.0349 |
| SD in Original Scale | 0.0548 |
| 95% t UCL | 0.045 |
| 95% Percentile Bootstrap UCL | 0.045 |
| 95% BCA Bootstrap UCL | 0.0466 |
| 95% H-UCL | 0.0496 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 2.488 |
| Theta Star | 0.0592 |
| nu star | 54.75 |
| | |
| A-D Test Statistic | 0.353 |
| 5% A-D Critical Value | 0.733 |
| K-S Test Statistic | 0.733 |
| 5% K-S Critical Value | 0.257 |

Data appear Gamma Distributed at 5% Significance Level

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 0.291 |
| Mean | 0.02 |
| Median | 0.000001 |
| SD | 0.0582 |
| k star | 0.103 |
| Theta star | 0.195 |
| Nu star | 16.62 |
| AppChi2 | 8.401 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.0396 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.0401 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.0651 |
| SD | 0.0449 |
| SE of Mean | 0.00542 |
| 95% KM (t) UCL | 0.0741 |
| 95% KM (z) UCL | 0.074 |
| 95% KM (jackknife) UCL | 0.0726 |
| 95% KM (bootstrap t) UCL | 0.0763 |
| 95% KM (BCA) UCL | 0.123 |
| 95% KM (Percentile Bootstrap) UCL | 0.0924 |
| 95% KM (Chebyshev) UCL | 0.0887 |
| 97.5% KM (Chebyshev) UCL | 0.099 |
| 99% KM (Chebyshev) UCL | 0.119 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.0741 |
| 95% KM (Percentile Bootstrap) UCL | 0.0924 |

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.

**Toluene**

**General Statistics**

| | |
|---|---|
| Number of Valid Data | 81 |
| Number of Distinct Detected Data | 41 |

| | |
|---|---|
| Number of Detected Data | 41 |
| Number of Non-Detect Data | 40 |
| Percent Non-Detects | 49.38% |

**Raw Statistics**

| | |
|---|---|
| Minimum Detected | 0.055 |
| Maximum Detected | 1520 |
| Mean of Detected | 191.3 |
| SD of Detected | 346.5 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum Detected | -2.9 |
| Maximum Detected | 7.326 |
| Mean of Detected | 2.803 |
| SD of Detected | 2.915 |

| | | | |
|---|---|---|---|
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.05 | Maximum Non-Detect | -2.996 |

## UCL Statistics

**Normal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.626 |
| 5% Shapiro Wilk Critical Value | 0.941 |

Data not Normal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 96.86 |
| SD | 263.2 |
| 95% DL/2 (t) UCL | 145.5 |
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE yields a negative mean**

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.938 |
| 5% Shapiro Wilk Critical Value | 0.941 |

Data not Lognormal at 5% Significance Level

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -0.403 |
| SD | 3.862 |
| 95% H-Stat (DL/2) UCL | 14510 |
| Log ROS Method | |
| Mean in Log Scale | -0.938 |
| SD in Log Scale | 4.73 |
| Mean in Original Scale | 96.88 |
| SD in Original Scale | 263.2 |
| 95% t UCL | 145.5 |
| 95% Percentile Bootstrap UCL | 147.9 |
| 95% BCA Bootstrap UCL | 160.2 |
| 95% H-UCL | 1186638 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.279 |
| Theta Star | 684.9 |
| nu star | 22.91 |
| A-D Test Statistic | 0.959 |
| 5% A-D Critical Value | 0.866 |
| K-S Test Statistic | 0.866 |
| 5% K-S Critical Value | 0.15 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 1520 |
| Mean | 96.85 |
| Median | 0.055 |
| SD | 263.2 |
| k star | 0.0884 |
| Theta star | 1096 |
| Nu star | 14.32 |
| AppChi2 | 6.789 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 204.2 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 207.1 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 96.88 |
| SD | 261.6 |
| SE of Mean | 29.43 |
| 95% KM (t) UCL | 145.8 |
| 95% KM (z) UCL | 145.3 |
| 95% KM (jackknife) UCL | 145.5 |
| 95% KM (bootstrap t) UCL | 163.7 |
| 95% KM (BCA) UCL | 155 |
| 95% KM (Percentile Bootstrap) UCL | 146.8 |
| 95% KM (Chebyshev) UCL | 225.1 |
| 97.5% KM (Chebyshev) UCL | 280.6 |
| 99% KM (Chebyshev) UCL | 389.7 |

**Potential UCLs to Use**

| | |
|---|---|
| 97.5% KM (Chebyshev) UCL | 280.6 |

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, Maichle, and Lee (2006).

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

o-xylene

### General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 81 | Number of Detected Data | 41 |
| Number of Distinct Detected Data | 41 | Number of Non-Detect Data | 40 |
| | | Percent Non-Detects | 49.38% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.097 | Minimum Detected | -2.333 |
| Maximum Detected | 630 | Maximum Detected | 6.446 |
| Mean of Detected | 102.3 | Mean of Detected | 2.387 |
| SD of Detected | 165.8 | SD of Detected | 2.77 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.05 | Maximum Non-Detect | -2.996 |

### UCL 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 | 0.924 |
| 5% Shapiro Wilk Critical Value | 0.941 | 5% Shapiro Wilk Critical Value | 0.941 |
| 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 | 51.78 | Mean | -0.613 |
| SD | 128 | SD | 3.63 |
| 95% DL/2 (t) UCL | 75.45 | 95% H-Stat (DL/2) UCL | 3723 |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE yields a negative mean | | Mean in Log Scale | -1.175 |
| | | SD in Log Scale | 4.502 |
| | | Mean in Original Scale | 51.79 |
| | | SD in Original Scale | 128 |
| | | 95% t UCL | 75.46 |
| | | 95% Percentile Bootstrap UCL | 76.91 |
| | | 95% BCA Bootstrap UCL | 82.13 |
| | | 95% H-UCL | 232374 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 0.3 | Data Follow Appr. Gamma Distribution at 5% Significance Level |
| Theta Star | 340.3 | |
| nu star | 24.64 | |
| A-D Test Statistic | 0.916 | Nonparametric Statistics |
| 5% A-D Critical Value | 0.857 | Kaplan-Meier (KM) Method |
| K-S Test Statistic | 0.857 | Mean 51.81 |
| 5% K-S Critical Value | 0.15 | SD 127.2 |
| Data follow Appr. Gamma Distribution at 5% Significance Level | | SE of Mean 14.31 |
| | | 95% KM (t) UCL 75.63 |
| Assuming Gamma Distribution | | 95% KM (z) UCL 75.35 |
| Gamma ROS Statistics using Extrapolated Data | | 95% KM (jackknife) UCL 75.48 |

| | | | |
|---|---|---|---|
| Minimum | 0.000001 | 95% KM (bootstrap t) UCL | 82.43 |
| Maximum | 630 | 95% KM (BCA) UCL | 77.89 |
| Mean | 51.77 | 95% KM (Percentile Bootstrap) UCL | 77.89 |
| Median | 0.097 | 95% KM (Chebyshev) UCL | 114.2 |
| SD | 128 | 97.5% KM (Chebyshev) UCL | 141.2 |
| k star | 0.0915 | 99% KM (Chebyshev) UCL | 194.2 |
| Theta star | 565.8 | | |
| Nu star | 14.82 | Potential UCLs to Use | |
| AppChi2 | 7.138 | 95% KM (BCA) UCL | 77.89 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 107.5 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 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.

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General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 81 | Number of Detected Data | 43 |
| Number of Distinct Detected Data | 43 | Number of Non-Detect Data | 38 |
| | | Percent Non-Detects | 46.91% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.067 | Minimum Detected | -2.703 |
| Maximum Detected | 1850 | Maximum Detected | 7.523 |
| Mean of Detected | 270.4 | Mean of Detected | 3.001 |
| SD of Detected | 474.7 | SD of Detected | 3.001 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.05 | Maximum Non-Detect | -2.996 |

UCL Statistics

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.636 | Shapiro Wilk Test Statistic | 0.939 |
| 5% Shapiro Wilk Critical Value | 0.943 | 5% Shapiro Wilk Critical Value | 0.943 |
| 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 | 143.6 | Mean | -0.137 |
| SD | 369.8 | SD | 4.002 |
| 95% DL/2 (t) UCL | 211.9 | 95% H-Stat (DL/2) UCL | 39216 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE yields a negative mean | | Mean in Log Scale | -0.615 |
| | | SD in Log Scale | 4.805 |
| | | Mean in Original Scale | 143.6 |
| | | SD in Original Scale | 369.8 |
| | | 95% t UCL | 212 |
| | | 95% Percentile Bootstrap UCL | 214.7 |
| | | 95% BCA Bootstrap UCL | 233.6 |

| | |
|---|---|
| 95% H-UCL | 2628527 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.267 |
| Theta Star | 1014 |
| nu star | 22.93 |
| | |
| A-D Test Statistic | 1.152 |
| 5% A-D Critical Value | 0.873 |
| K-S Test Statistic | 0.873 |
| 5% K-S Critical Value | 0.147 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 1850 |
| Mean | 143.6 |
| Median | 0.214 |
| SD | 369.8 |
| k star | 0.0893 |
| Theta star | 1608 |
| Nu star | 14.46 |
| AppChi2 | 6.888 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 301.4 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 305.6 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

Kaplan-Meier (KM) Method

| | |
|---|---|
| Mean | 143.6 |
| SD | 367.5 |
| SE of Mean | 41.32 |
| 95% KM (t) UCL | 212.3 |
| 95% KM (z) UCL | 211.5 |
| 95% KM (jackknife) UCL | 212 |
| 95% KM (bootstrap t) UCL | 237.7 |
| 95% KM (BCA) UCL | 217.6 |
| 95% KM (Percentile Bootstrap) UCL | 216 |
| 95% KM (Chebyshev) UCL | 323.7 |
| 97.5% KM (Chebyshev) UCL | 401.6 |
| 99% KM (Chebyshev) UCL | 554.7 |

**Potential UCLs to Use**

| | |
|---|---|
| 97.5% KM (Chebyshev) UCL | 401.6 |

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

**Xylenes**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 81 | Number of Detected Data | 42 |
| Number of Distinct Detected Data | 40 | Number of Non-Detect Data | 39 |
| | | Percent Non-Detects | 48.15% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.089 | Minimum Detected | -2.419 |
| Maximum Detected | 2490 | Maximum Detected | 7.82 |
| Mean of Detected | 376.9 | Mean of Detected | 3.496 |
| SD of Detected | 643.4 | SD of Detected | 2.895 |
| Minimum Non-Detect | 0.071 | Minimum Non-Detect | -2.645 |
| Maximum Non-Detect | 0.075 | Maximum Non-Detect | -2.59 |

| | | |
|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | Number treated as Non-Detect | 39 |
| For all methods (except KM, DL/2, and ROS Methods), | Number treated as Detected | 42 |
| Observations < Largest ND are treated as NDs | Single DL Non-Detect Percentage | 48.15% |

**UCL Statistics**

**Normal Distribution Test with Detected Values Only** | **Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.633 |
| 5% Shapiro Wilk Critical Value | 0.942 |

Data not Normal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 195.5 |
| SD | 498.1 |
| 95% DL/2 (t) UCL | 287.5 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE yields a negative mean**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.888 |
| 5% Shapiro Wilk Critical Value | 0.942 |

Data not Lognormal at 5% Significance Level

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.223 |
| SD | 3.997 |
| 95% H-Stat (DL/2) UCL | 54793 |
| | |
| Log ROS Method | |
| Mean in Log Scale | -0.0844 |
| SD in Log Scale | 4.613 |
| Mean in Original Scale | 195.5 |
| SD in Original Scale | 498 |
| 95% t UCL | 287.6 |
| 95% Percentile Bootstrap UCL | 293.8 |
| 95% BCA Bootstrap UCL | 325.4 |
| 95% H-UCL | 1350133 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.281 |
| Theta Star | 1342 |
| nu star | 23.59 |
| | |
| A-D Test Statistic | 1.044 |
| 5% A-D Critical Value | 0.866 |
| K-S Test Statistic | 0.866 |
| 5% K-S Critical Value | 0.149 |

Data follow Appr. Gamma Distribution at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 2490 |
| Mean | 195.4 |
| Median | 0.313 |
| SD | 498.1 |
| k star | 0.0874 |
| Theta star | 2236 |
| Nu star | 14.16 |
| AppChi2 | 6.68 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 414.2 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 420.1 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data Follow Appr. Gamma Distribution at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 195.5 |
| SD | 495 |
| SE of Mean | 55.66 |
| 95% KM (t) UCL | 288.1 |
| 95% KM (z) UCL | 287 |
| 95% KM (jackknife) UCL | 287.5 |
| 95% KM (bootstrap t) UCL | 321.4 |
| 95% KM (BCA) UCL | 292.4 |
| 95% KM (Percentile Bootstrap) UCL | 294.5 |
| 95% KM (Chebyshev) UCL | 438.1 |
| 97.5% KM (Chebyshev) UCL | 543.1 |
| 99% KM (Chebyshev) UCL | 749.3 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (BCA) UCL | 292.4 |

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

From File: PAHs Input.wst

## Summary Statistics for Raw Full Data Sets

| Variable | NumObs | Minimum | Maximum | Mean | Median | Variance | SD | MAD/0.675 | Skewness | Kurtosis | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ROS_Benzo(ghi)perylene | 81 | 0.0007063 | 0.276 | 0.0277 | 0.0129 | 0.00186 | 0.0432 | 0.0135 | 3.752 | 17.26 | 1.561 |
| LnROS_Fluorene | 81 | 2.317E-06 | 7.05 | 0.292 | 0.00429 | 0.988 | 0.994 | 0.00629 | 4.882 | 27.98 | 3.399 |
| OS_2-Methylnaphthalene | 81 | 5.133E-07 | 106 | 6.126 | 0.0184 | 355.7 | 18.86 | 0.0273 | 3.697 | 13.9 | 3.079 |
| LnROS_Naphthalene | 81 | 6.945E-07 | 59.5 | 3.572 | 0.015 | 121.9 | 11.04 | 0.0222 | 3.686 | 13.52 | 3.091 |
| LnROS_Phenanthrene | 81 | 5.478E-06 | 6.31 | 0.384 | 0.00771 | 1.419 | 1.191 | 0.0113 | 3.62 | 12.72 | 3.098 |
| LnROS_Pyrene | 81 | 2.152E-05 | 2.58 | 0.157 | 0.00947 | 0.201 | 0.448 | 0.0135 | 3.889 | 15.88 | 2.859 |

## Percentiles for Raw Full Data Sets

| Variable | NumObs | 5%ile | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | 99%ile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ROS_Benzo(ghi)perylene | 81 | 0.00175 | 0.00265 | 0.00451 | 0.00554 | 0.0129 | 0.0301 | 0.0369 | 0.075 | 0.095 | 0.23 |
| LnROS_Fluorene | 81 | 2.702E-05 | 8.266E-05 | 0.0003541 | 0.0006263 | 0.00429 | 0.0418 | 0.0746 | 0.426 | 2.23 | 3.842 |
| OS_2-Methylnaphthalene | 81 | 1.374E-05 | 6.08E-05 | 0.000415 | 0.0008757 | 0.0184 | 0.364 | 0.857 | 12.6 | 44.7 | 84.4 |
| LnROS_Naphthalene | 81 | 1.584E-05 | 6.521E-05 | 0.0004056 | 0.0008256 | 0.015 | 0.186 | 0.508 | 6.24 | 27.4 | 52.46 |
| LnROS_Phenanthrene | 81 | 5.68E-05 | 0.0001645 | 0.0006549 | 0.00112 | 0.00771 | 0.066 | 0.1 | 0.309 | 3.37 | 5.342 |
| LnROS_Pyrene | 81 | 0.0001446 | 0.0003425 | 0.00104 | 0.00161 | 0.00947 | 0.0555 | 0.0763 | 0.241 | 1.08 | 2.252 |

## General UCL Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| From File | PAHs Input.wst |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**Benzo(ghi)perylene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 81 | Number of Detected Data | 10 |
| Number of Distinct Detected Data | 9 | Number of Non-Detect Data | 71 |
| | | Percent Non-Detects | 87.65% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.062 | Minimum Detected | -2.781 |
| Maximum Detected | 0.276 | Maximum Detected | -1.287 |
| Mean of Detected | 0.118 | Mean of Detected | -2.26 |
| SD of Detected | 0.0706 | SD of Detected | 0.474 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.05 | Maximum Non-Detect | -2.996 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.681 | Shapiro Wilk Test Statistic | 0.786 |
| 5% Shapiro Wilk Critical Value | 0.842 | 5% Shapiro Wilk Critical Value | 0.842 |
| 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 | 0.0364 | Mean | -3.513 |
| SD | 0.0387 | SD | 0.499 |
| 95% DL/2 (t) UCL | 0.0436 | 95% H-Stat (DL/2) UCL | 0.0374 |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| **MLE yields a negative mean** | | Mean in Log Scale | -4.342 |
| | | SD in Log Scale | 1.251 |
| | | Mean in Original Scale | 0.0277 |
| | | SD in Original Scale | 0.0432 |
| | | 95% t UCL | 0.0357 |
| | | 95% Percentile Bootstrap UCL | 0.0363 |
| | | 95% BCA Bootstrap UCL | 0.0374 |
| | | 95% H-UCL | 0.0403 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 3.119 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 0.0377 | |
| nu star | 62.38 | |
| A-D Test Statistic | 1.305 | **Nonparametric Statistics** |
| 5% A-D Critical Value | 0.729 | Kaplan-Meier (KM) Method |
| K-S Test Statistic | 0.729 | Mean 0.0689 |

| | |
|---|---|
| 5% K-S Critical Value | 0.268 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| Gamma ROS Statistics using Extrapolated Data | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 0.276 |
| Mean | 0.0145 |
| Median | 0.000001 |
| SD | 0.0455 |
| k star | 0.104 |
| Theta star | 0.139 |
| Nu star | 16.87 |
| AppChi2 | 8.583 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.0285 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.0289 |

Note: DL/2 is not a recommended method.

| | |
|---|---|
| SD | 0.0298 |
| SE of Mean | 0.00349 |
| 95% KM (t) UCL | 0.0747 |
| 95% KM (z) UCL | 0.0746 |
| 95% KM (jackknife) UCL | 0.0773 |
| 95% KM (bootstrap t) UCL | 0.0861 |
| 95% KM (BCA) UCL | 0.0914 |
| 95% KM (Percentile Bootstrap) UCL | 0.0893 |
| 95% KM (Chebyshev) UCL | 0.0841 |
| 97.5% KM (Chebyshev) UCL | 0.0906 |
| 99% KM (Chebyshev) UCL | 0.104 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.0747 |
| 95% KM (% Bootstrap) UCL | 0.0893 |

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.

**Fluorene**

**General Statistics**

| | |
|---|---|
| Number of Valid Data | 81 |
| Number of Distinct Detected Data | 12 |

| | |
|---|---|
| Number of Detected Data | 12 |
| Number of Non-Detect Data | 69 |
| Percent Non-Detects | 85.19% |

| Raw Statistics | |
|---|---|
| Minimum Detected | 0.097 |
| Maximum Detected | 7.05 |
| Mean of Detected | 1.884 |
| SD of Detected | 1.984 |
| Minimum Non-Detect | 0.05 |
| Maximum Non-Detect | 0.3 |

| Log-transformed Statistics | |
|---|---|
| Minimum Detected | -2.333 |
| Maximum Detected | 1.953 |
| Mean of Detected | -0.0439 |
| SD of Detected | 1.402 |
| Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | -1.204 |

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 | 72 |
| Number treated as Detected | 9 |
| Single DL Non-Detect Percentage | 88.89% |

**UCL Statistics**

**Normal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.817 |
| 5% Shapiro Wilk Critical Value | 0.859 |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.915 |
| 5% Shapiro Wilk Critical Value | 0.859 |

Data appear Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| DL/2 Substitution Method | |
|---|---|
| Mean | 0.305 |
| SD | 0.99 |
| 95% DL/2 (t) UCL | 0.488 |

**Assuming Lognormal Distribution**

| DL/2 Substitution Method | |
|---|---|
| Mean | -3.078 |
| SD | 1.412 |
| 95% H-Stat (DL/2) UCL | 0.19 |

| | |
|---|---|
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE yields a negative mean**

| | |
|---|---|
| Log ROS Method | |
| Mean in Log Scale | -5.286 |
| SD in Log Scale | 3.273 |
| Mean in Original Scale | 0.292 |
| SD in Original Scale | 0.994 |
| 95% t UCL | 0.476 |
| 95% Percentile Bootstrap UCL | 0.499 |
| 95% BCA Bootstrap UCL | 0.547 |
| 95% H-UCL | 6.8 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.706 |
| Theta Star | 2.668 |
| nu star | 16.95 |
| | |
| A-D Test Statistic | 0.347 |
| 5% A-D Critical Value | 0.761 |
| K-S Test Statistic | 0.761 |
| 5% K-S Critical Value | 0.254 |

Data appear Gamma Distributed at 5% Significance Level

**Data Distribution Test with Detected Values Only**

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 7.05 |
| Mean | 0.279 |
| Median | 0.000001 |
| SD | 0.997 |
| k star | 0.0848 |
| Theta star | 3.291 |
| Nu star | 13.74 |
| AppChi2 | 6.391 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.6 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.608 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.362 |
| SD | 0.968 |
| SE of Mean | 0.112 |
| 95% KM (t) UCL | 0.549 |
| 95% KM (z) UCL | 0.547 |
| 95% KM (jackknife) UCL | 0.515 |
| 95% KM (bootstrap t) UCL | 0.632 |
| 95% KM (BCA) UCL | 0.78 |
| 95% KM (Percentile Bootstrap) UCL | 0.642 |
| 95% KM (Chebyshev) UCL | 0.851 |
| 97.5% KM (Chebyshev) UCL | 1.063 |
| 99% KM (Chebyshev) UCL | 1.48 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.549 |

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.

**2-Methylnaphthalene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 81 | Number of Detected Data | 33 |
| Number of Distinct Detected Data | 33 | Number of Non-Detect Data | 48 |
| | | Percent Non-Detects | 59.26% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.063 | Minimum Detected | -2.765 |
| Maximum Detected | 106 | Maximum Detected | 4.663 |
| Mean of Detected | 15.02 | Mean of Detected | 0.421 |
| SD of Detected | 27.41 | SD of Detected | 2.484 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |

| | | | |
|---|---|---|---|
| Maximum Non-Detect | 0.05 | Maximum Non-Detect | -2.996 |

## UCL Statistics

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.62 | Shapiro Wilk Test Statistic | 0.902 |
| 5% Shapiro Wilk Critical Value | 0.931 | 5% Shapiro Wilk Critical Value | 0.931 |
| 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 | 6.136 | Mean | -2.014 |
| SD | 18.86 | SD | 2.569 |
| 95% DL/2 (t) UCL | 9.623 | 95% H-Stat (DL/2) UCL | 11.7 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE yields a negative mean | | Mean in Log Scale | -3.942 |
| | | SD in Log Scale | 4.529 |
| | | Mean in Original Scale | 6.126 |
| | | SD in Original Scale | 18.86 |
| | | 95% t UCL | 9.613 |
| | | 95% Percentile Bootstrap UCL | 9.954 |
| | | 95% BCA Bootstrap UCL | 10.58 |
| | | 95% H-UCL | 17214 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 0.294 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 51.11 | |
| nu star | 19.4 | |
| | | |
| A-D Test Statistic | 1.744 | Nonparametric Statistics |
| 5% A-D Critical Value | 0.855 | Kaplan-Meier (KM) Method |
| K-S Test Statistic | 0.855 | Mean 6.159 |
| 5% K-S Critical Value | 0.166 | SD 18.73 |
| Data not Gamma Distributed at 5% Significance Level | | SE of Mean 2.114 |
| | | 95% KM (t) UCL 9.676 |
| Assuming Gamma Distribution | | 95% KM (z) UCL 9.635 |
| Gamma ROS Statistics using Extrapolated Data | | 95% KM (jackknife) UCL 9.641 |
| Minimum | 0.000001 | 95% KM (bootstrap t) UCL 11.18 |
| Maximum | 106 | 95% KM (BCA) UCL 9.623 |
| Mean | 6.121 | 95% KM (Percentile Bootstrap) UCL 9.914 |
| Median | 0.000001 | 95% KM (Chebyshev) UCL 15.37 |
| SD | 18.86 | 97.5% KM (Chebyshev) UCL 19.36 |
| k star | 0.0895 | 99% KM (Chebyshev) UCL 27.19 |
| Theta star | 68.42 | |
| Nu star | 14.49 | Potential UCLs to Use |
| AppChi2 | 6.911 | 97.5% KM (Chebyshev) UCL 19.36 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 12.84 | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 13.02 | |

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.

Naphthalene

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 81 | Number of Detected Data | 28 |
| Number of Distinct Detected Data | 28 | Number of Non-Detect Data | 53 |
| | | Percent Non-Detects | 65.43% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.069 | Minimum Detected | -2.674 |
| Maximum Detected | 59.5 | Maximum Detected | 4.086 |
| Mean of Detected | 10.31 | Mean of Detected | 0.486 |
| SD of Detected | 17.01 | SD of Detected | 2.235 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.05 | Maximum Non-Detect | -2.996 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.662 | Shapiro Wilk Test Statistic | 0.914 |
| 5% Shapiro Wilk Critical Value | 0.924 | 5% Shapiro Wilk Critical Value | 0.924 |
| 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 | 3.581 | Mean | -2.246 |
| SD | 11.04 | SD | 2.383 |
| 95% DL/2 (t) UCL | 5.621 | 95% H-Stat (DL/2) UCL | 5.05 |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE yields a negative mean | | Mean in Log Scale | -4.157 |
| | | SD in Log Scale | 4.308 |
| | | Mean in Original Scale | 3.572 |
| | | SD in Original Scale | 11.04 |
| | | 95% t UCL | 5.613 |
| | | 95% Percentile Bootstrap UCL | 5.709 |
| | | 95% BCA Bootstrap UCL | 6.374 |
| | | 95% H-UCL | 3790 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 0.347 | Data Follow Appr. Gamma Distribution at 5% Significance Level |
| Theta Star | 29.7 | |
| nu star | 19.44 | |
| A-D Test Statistic | 1.199 | Nonparametric Statistics |
| 5% A-D Critical Value | 0.841 | Kaplan-Meier (KM) Method |
| K-S Test Statistic | 0.841 | Mean 3.609 |
| 5% K-S Critical Value | 0.178 | SD 10.96 |
| Data follow Appr. Gamma Distribution at 5% Significance Level | | SE of Mean 1.24 |
| | | 95% KM (t) UCL 5.673 |
| Assuming Gamma Distribution | | 95% KM (z) UCL 5.649 |
| Gamma ROS Statistics using Extrapolated Data | | 95% KM (jackknife) UCL 5.633 |
| Minimum | 0.000001 | 95% KM (bootstrap t) UCL 6.695 |

| | | | |
|---|---|---|---|
| Maximum | 59.5 | 95% KM (BCA) UCL | 5.846 |
| Mean | 3.564 | 95% KM (Percentile Bootstrap) UCL | 5.803 |
| Median | 0.000001 | 95% KM (Chebyshev) UCL | 9.015 |
| SD | 11.04 | 97.5% KM (Chebyshev) UCL | 11.35 |
| k star | 0.0872 | 99% KM (Chebyshev) UCL | 15.95 |
| Theta star | 40.87 | | |
| Nu star | 14.13 | Potential UCLs to Use | |
| AppChi2 | 6.658 | 95% KM (t) UCL | 5.673 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 7.562 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 7.669 | | |

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.

**Phenanthrene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 81 | Number of Detected Data | 10 |
| Number of Distinct Detected Data | 10 | Number of Non-Detect Data | 71 |
| | | Percent Non-Detects | 87.65% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.1 | Minimum Detected | -2.303 |
| Maximum Detected | 6.31 | Maximum Detected | 1.842 |
| Mean of Detected | 2.889 | Mean of Detected | 0.529 |
| SD of Detected | 2.152 | SD of Detected | 1.389 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.1 | Maximum Non-Detect | -2.303 |

| | | | |
|---|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | | Number treated as Non-Detect | 71 |
| For all methods (except KM, DL/2, and ROS Methods), | | Number treated as Detected | 10 |
| Observations < Largest ND are treated as NDs | | Single DL Non-Detect Percentage | 87.65% |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.948 | Shapiro Wilk Test Statistic | 0.844 |
| 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 | 0.379 | Mean | -3.144 |
| SD | 1.191 | SD | 1.468 |
| 95% DL/2 (t) UCL | 0.6 | 95% H-Stat (DL/2) UCL | 0.198 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE yields a negative mean | | Mean in Log Scale | -4.76 |
| | | SD in Log Scale | 3.141 |
| | | Mean in Original Scale | 0.384 |
| | | SD in Original Scale | 1.191 |
| | | 95% t UCL | 0.605 |

| | |
|---|---|
| 95% Percentile Bootstrap UCL | 0.617 |
| 95% BCA Bootstrap UCL | 0.673 |
| 95% H-UCL | 6.557 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.82 |
| Theta Star | 3.522 |
| nu star | 16.41 |
| | |
| A-D Test Statistic | 0.437 |
| 5% A-D Critical Value | 0.747 |
| K-S Test Statistic | 0.747 |
| 5% K-S Critical Value | 0.273 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 6.31 |
| Mean | 0.357 |
| Median | 0.000001 |
| SD | 1.198 |
| k star | 0.0816 |
| Theta star | 4.373 |
| Nu star | 13.21 |
| AppChi2 | 6.037 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.781 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.792 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.444 |
| SD | 1.165 |
| SE of Mean | 0.136 |
| 95% KM (t) UCL | 0.671 |
| 95% KM (z) UCL | 0.669 |
| 95% KM (jackknife) UCL | 0.624 |
| 95% KM (bootstrap t) UCL | 0.707 |
| 95% KM (BCA) UCL | 2.075 |
| 95% KM (Percentile Bootstrap) UCL | 1.471 |
| 95% KM (Chebyshev) UCL | 1.039 |
| 97.5% KM (Chebyshev) UCL | 1.296 |
| 99% KM (Chebyshev) UCL | 1.802 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.671 |
| 95% KM (Percentile Bootstrap) UCL | 1.471 |

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.

**Pyrene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 81 | Number of Detected Data | 10 |
| Number of Distinct Detected Data | 10 | Number of Non-Detect Data | 71 |
| | | Percent Non-Detects | 87.65% |

**Raw Statistics**

| | |
|---|---|
| Minimum Detected | 0.071 |
| Maximum Detected | 2.58 |
| Mean of Detected | 1.095 |
| SD of Detected | 0.81 |
| Minimum Non-Detect | 0.05 |
| Maximum Non-Detect | 0.05 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum Detected | -2.645 |
| Maximum Detected | 0.948 |
| Mean of Detected | -0.285 |
| SD of Detected | 1.085 |
| Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | -2.996 |

**UCL Statistics**

**Normal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.944 |

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.907 |

| | |
|---|---|
| 5% Shapiro Wilk Critical Value | 0.842 |

Data appear Normal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.157 |
| SD | 0.446 |
| 95% DL/2 (t) UCL | 0.24 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE yields a negative mean**

| | |
|---|---|
| 5% Shapiro Wilk Critical Value | 0.842 |

Data appear Lognormal at 5% Significance Level

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -3.269 |
| SD | 1.184 |
| 95% H-Stat (DL/2) UCL | 0.106 |
| | |
| Log ROS Method | |
| Mean in Log Scale | -4.646 |
| SD in Log Scale | 2.625 |
| Mean in Original Scale | 0.157 |
| SD in Original Scale | 0.448 |
| 95% t UCL | 0.24 |
| 95% Percentile Bootstrap UCL | 0.247 |
| 95% BCA Bootstrap UCL | 0.267 |
| 95% H-UCL | 1.022 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 1.098 |
| Theta Star | 0.998 |
| nu star | 21.95 |
| | |
| A-D Test Statistic | 0.203 |
| 5% A-D Critical Value | 0.74 |
| K-S Test Statistic | 0.74 |
| 5% K-S Critical Value | 0.271 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 2.58 |
| Mean | 0.135 |
| Median | 0.000001 |
| SD | 0.453 |
| k star | 0.0872 |
| Theta star | 1.551 |
| Nu star | 14.13 |
| AppChi2 | 6.657 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.287 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.291 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.197 |
| SD | 0.432 |
| SE of Mean | 0.0506 |
| 95% KM (t) UCL | 0.282 |
| 95% KM (z) UCL | 0.281 |
| 95% KM (jackknife) UCL | 0.312 |
| 95% KM (bootstrap t) UCL | 0.298 |
| 95% KM (BCA) UCL | 0.924 |
| 95% KM (Percentile Bootstrap) UCL | 0.595 |
| 95% KM (Chebyshev) UCL | 0.418 |
| 97.5% KM (Chebyshev) UCL | 0.513 |
| 99% KM (Chebyshev) UCL | 0.701 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.282 |
| 95% KM (Percentile Bootstrap) UCL | 0.595 |

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.

From File: Metals Input.wst

Summary Statistics for Raw Full Data Sets

| Variable | NumObs | Minimum | Maximum | Mean | Median | Variance | SD | MAD/0.675 | Skewness | Kurtosis | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_SEDIMENT pH | 30 | 5.91 | 8.55 | 7.49 | 7.455 | 0.391 | 0.625 | 0.549 | -0.328 | 0.208 | 0.0834 |
| LnROS_Aluminum | 6 | 11800 | 21900 | 16217 | 15700 | 16049667 | 4006 | 5189 | 0.389 | -1.529 | 0.247 |
| LnROS_Antimony | 32 | 0.0556 | 0.36 | 0.163 | 0.145 | 0.00583 | 0.0764 | 0.0667 | 0.826 | 0.121 | 0.469 |
| LnROS_Arsenic | 32 | 0.518 | 4.74 | 1.756 | 1.6 | 0.818 | 0.905 | 0.704 | 1.375 | 2.549 | 0.515 |
| LnROS_Barium | 32 | 17.9 | 121 | 52.81 | 45.05 | 705.8 | 26.57 | 17.94 | 1.124 | 0.597 | 0.503 |
| LnROS_Beryllium | 32 | 0.136 | 0.51 | 0.307 | 0.285 | 0.0119 | 0.109 | 0.128 | 0.279 | -1.064 | 0.355 |
| LnROS_Bismuth | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Cadmium | 32 | 0.0151 | 0.22 | 0.0535 | 0.0476 | 0.00138 | 0.0371 | 0.0251 | 3.029 | 12.8 | 0.694 |
| LnROS_Calcium | 6 | 2060 | 4440 | 3017 | 2835 | 674027 | 821 | 570.8 | 1.039 | 1.464 | 0.272 |
| LnROS_Chromium | 32 | 6.1 | 25.1 | 14.32 | 14.1 | 15.46 | 3.932 | 3.41 | 0.333 | 0.789 | 0.275 |
| LnROS_Cobalt | 32 | 2.67 | 14.2 | 7.732 | 7.255 | 8.069 | 2.841 | 3.054 | 0.218 | -0.586 | 0.367 |
| LnROS_Chloride | 2 | 128 | 564 | 346 | 346 | 95048 | 308.3 | 323.2 | N/A | N/A | 0.891 |
| LnROS_Copper | 39 | 6.51 | 46.5 | 24.1 | 25.1 | 74.74 | 8.645 | 8.451 | 0.0143 | 0.472 | 0.359 |
| LnROS_Iron | 6 | 16200 | 29800 | 23650 | 23900 | 28979000 | 5383 | 6597 | -0.24 | -1.745 | 0.228 |
| LnROS_Lead | 32 | 2.6 | 11.6 | 5.921 | 5.415 | 4.163 | 2.04 | 1.483 | 0.903 | 0.946 | 0.345 |
| LnROS_Lithium | 6 | 4.6 | 11.9 | 7.533 | 6.7 | 7.823 | 2.797 | 2.372 | 0.765 | -0.729 | 0.371 |
| LnROS_Magnesium | 6 | 4850 | 8280 | 6537 | 6600 | 2245107 | 1498 | 2098 | -0.0315 | -2.578 | 0.229 |
| LnROS_Manganese | 6 | 178 | 537 | 309.3 | 264.5 | 17509 | 132.3 | 95.63 | 1.188 | 0.82 | 0.428 |
| LnROS_Mercury | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Molybdenum | 32 | 0.0232 | 2.18 | 0.391 | 0.213 | 0.228 | 0.478 | 0.207 | 2.398 | 6.286 | 1.221 |
| LnROS_Nickel | 39 | 4.27 | 10.7 | 7.418 | 7.27 | 2.869 | 1.694 | 1.868 | 0.135 | -0.986 | 0.228 |
| LnROS_Phosphorus | 6 | 109.6 | 322 | 198.8 | 190.9 | 6181 | 78.62 | 78.97 | 0.593 | -0.483 | 0.395 |
| LnROS_Potassium | 6 | 1180 | 1700 | 1355 | 1225 | 56870 | 238.5 | 66.72 | 0.985 | -1.586 | 0.176 |
| LnROS_Selenium | 32 | 0.00677 | 0.62 | 0.108 | 0.0603 | 0.017 | 0.13 | 0.058 | 2.47 | 7.175 | 1.209 |
| LnROS_Silver | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Sodium | 8 | 61 | 470 | 211.3 | 220 | 16247 | 127.5 | 103.8 | 1.098 | 1.881 | 0.603 |
| LnROS_Strontium | 6 | 23 | 42.6 | 31.65 | 29.1 | 66.58 | 8.159 | 7.191 | 0.586 | -1.794 | 0.258 |
| LnROS_Sulfur | 13 | 96.94 | 1100 | 414.7 | 312.8 | 94020 | 306.6 | 216.7 | 1.186 | 0.575 | 0.739 |
| LnROS_Thallium | 32 | 0.0235 | 0.186 | 0.0665 | 0.0635 | 0.00108 | 0.0328 | 0.0312 | 1.611 | 4.383 | 0.493 |
| LnROS_Tin | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Titanium | 6 | 211 | 486 | 343.5 | 324 | 8552 | 92.48 | 63.75 | 0.273 | 0.761 | 0.269 |
| LnROS_Uranium | 32 | 0.332 | 1.11 | 0.54 | 0.499 | 0.0323 | 0.18 | 0.12 | 1.492 | 2.434 | 0.333 |
| LnROS_Vanadium | 32 | 26.2 | 92.6 | 64.15 | 69.4 | 271.3 | 16.47 | 10.82 | -0.709 | -0.0297 | 0.257 |
| LnROS_Zinc | 39 | 19 | 69.4 | 51.41 | 53.4 | 132.1 | 11.49 | 8.895 | -1.036 | 1.576 | 0.224 |

Percentiles for Raw Full Data Sets

| Variable | NumObs | 5%ile | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | 99%ile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_SEDIMENT pH | 30 | 6.524 | 6.689 | 7.172 | 7.23 | 7.455 | 7.928 | 8.074 | 8.233 | 8.495 | 8.547 |
| LnROS_Aluminum | 6 | 12000 | 12200 | 12600 | 13050 | 15700 | 18950 | 19600 | 20750 | 21325 | 21785 |
| LnROS_Antimony | 32 | 0.0692 | 0.0791 | 0.1 | 0.108 | 0.145 | 0.213 | 0.228 | 0.276 | 0.3 | 0.341 |
| LnROS_Arsenic | 32 | 0.676 | 0.908 | 1.116 | 1.148 | 1.6 | 2.158 | 2.466 | 2.844 | 3.257 | 4.325 |
| LnROS_Barium | 32 | 24.46 | 26.45 | 32.68 | 35.13 | 45.05 | 66.55 | 75.9 | 93.74 | 105.2 | 119.1 |
| LnROS_Beryllium | 32 | 0.162 | 0.179 | 0.201 | 0.209 | 0.285 | 0.395 | 0.41 | 0.449 | 0.489 | 0.507 |
| LnROS_Bismuth | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Cadmium | 32 | 0.02 | 0.0236 | 0.0281 | 0.0312 | 0.0476 | 0.0643 | 0.0674 | 0.0778 | 0.092 | 0.182 |
| LnROS_Calcium | 6 | 2190 | 2320 | 2580 | 2600 | 2835 | 3265 | 3350 | 3895 | 4168 | 4386 |
| LnROS_Chromium | 32 | 8.037 | 9.888 | 11.7 | 12.25 | 14.1 | 16.53 | 16.68 | 19.19 | 19.64 | 23.46 |
| LnROS_Cobalt | 32 | 3.71 | 4.277 | 5.354 | 5.675 | 7.255 | 9.743 | 10.31 | 11.24 | 11.98 | 13.58 |
| LnROS_Chloride | 2 | 149.8 | 171.6 | 215.2 | 237 | 346 | 455 | 476.8 | 520.4 | 542.2 | 559.6 |
| LnROS_Copper | 39 | 7.58 | 15.44 | 17.3 | 17.75 | 25.1 | 28.85 | 30.14 | 32.28 | 38.7 | 43.54 |
| LnROS_Iron | 6 | 17050 | 17900 | 19600 | 20075 | 23900 | 27950 | 28500 | 29150 | 29475 | 29735 |
| LnROS_Lead | 32 | 3.173 | 3.439 | 4.634 | 4.83 | 5.415 | 6.538 | 7.09 | 8.969 | 9.642 | 11.04 |
| LnROS_Lithium | 6 | 4.85 | 5.1 | 5.6 | 5.65 | 6.7 | 9.175 | 9.7 | 10.8 | 11.35 | 11.79 |
| LnROS_Magnesium | 6 | 4895 | 4940 | 5030 | 5220 | 6600 | 7748 | 7860 | 8070 | 8175 | 8259 |
| LnROS_Manganese | 6 | 189 | 200 | 222 | 229.5 | 264.5 | 361.8 | 390 | 463.5 | 500.3 | 529.7 |
| LnROS_Mercury | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Molybdenum | 32 | 0.0396 | 0.0546 | 0.0853 | 0.102 | 0.213 | 0.518 | 0.564 | 0.775 | 1.385 | 1.985 |
| LnROS_Nickel | 39 | 5.06 | 5.318 | 5.948 | 6.295 | 7.27 | 8.83 | 9.124 | 9.724 | 9.992 | 10.47 |
| LnROS_Phosphorus | 6 | 116.3 | 123.1 | 136.5 | 142.5 | 190.9 | 237.5 | 243 | 282.5 | 302.3 | 318.1 |
| LnROS_Potassium | 6 | 1180 | 1180 | 1180 | 1190 | 1225 | 1523 | 1620 | 1660 | 1680 | 1696 |
| LnROS_Selenium | 32 | 0.0115 | 0.0157 | 0.0244 | 0.0291 | 0.0603 | 0.125 | 0.148 | 0.249 | 0.33 | 0.549 |
| LnROS_Silver | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Sodium | 8 | 74.65 | 88.3 | 108 | 115 | 220 | 244.3 | 251.6 | 323 | 396.5 | 455.3 |
| LnROS_Strontium | 6 | 23.63 | 24.25 | 25.5 | 25.93 | 29.1 | 38.2 | 40.6 | 41.6 | 42.1 | 42.5 |
| LnROS_Sulfur | 13 | 118.9 | 140.1 | 179.8 | 199.6 | 312.8 | 500 | 680 | 800 | 920 | 1064 |
| LnROS_Thallium | 32 | 0.0292 | 0.0334 | 0.04 | 0.043 | 0.0635 | 0.0805 | 0.0912 | 0.101 | 0.111 | 0.163 |
| LnROS_Tin | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Titanium | 6 | 237 | 263 | 315 | 316.5 | 324 | 382.5 | 401 | 443.5 | 464.8 | 481.8 |
| LnROS_Uranium | 32 | 0.354 | 0.366 | 0.386 | 0.434 | 0.499 | 0.598 | 0.675 | 0.722 | 0.892 | 1.06 |
| LnROS_Vanadium | 32 | 33.72 | 38.3 | 48.94 | 54.98 | 69.4 | 73.35 | 73.96 | 78.47 | 86.8 | 91.67 |
| LnROS_Zinc | 39 | 29.61 | 37.94 | 44.94 | 47.1 | 53.4 | 58.15 | 60.18 | 64.46 | 66.88 | 68.72 |

## General UCL Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| From File | Metals Input.wst |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**SEDIMENT pH**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 30 | Number of Distinct Observations | 29 |

| **Raw Statistics** | | **Log-transformed Statistics** | |
|---|---|---|---|
| Minimum | 5.91 | Minimum of Log Data | 1.777 |
| Maximum | 8.55 | Maximum of Log Data | 2.146 |
| Mean | 7.49 | Mean of log Data | 2.01 |
| Geometric Mean | 7.464 | SD of log Data | 0.0853 |
| Median | 7.455 | | |
| SD | 0.625 | | |
| Std. Error of Mean | 0.114 | | |
| Coefficient of Variation | 0.0834 | | |
| Skewness | -0.328 | | |

**Relevant UCL Statistics**

| **Normal Distribution Test** | | **Lognormal Distribution Test** | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.971 | Shapiro Wilk Test Statistic | 0.961 |
| Shapiro Wilk Critical Value | 0.927 | Shapiro Wilk Critical Value | 0.927 |
| 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 | 7.684 | 95% H-UCL | N/A |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 7.999 |
| 95% Adjusted-CLT UCL (Chen-1995) | 7.67 | 97.5% Chebyshev (MVUE) UCL | 8.22 |
| 95% Modified-t UCL (Johnson-1978) | 7.683 | 99% Chebyshev (MVUE) UCL | 8.652 |

| **Gamma Distribution Test** | | **Data Distribution** |
|---|---|---|
| k star (bias corrected) | 130.2 | Data appear Normal at 5% Significance Level |
| Theta Star | 0.0575 | |
| MLE of Mean | 7.49 | |
| MLE of Standard Deviation | 0.656 | |
| nu star | 7814 | |
| Approximate Chi Square Value (.05) | 7610 | **Nonparametric Statistics** |
| Adjusted Level of Significance | 0.041 | 95% CLT UCL 7.678 |
| Adjusted Chi Square Value | 7598 | 95% Jackknife UCL 7.684 |
| | | 95% Standard Bootstrap UCL 7.673 |
| Anderson-Darling Test Statistic | 0.328 | 95% Bootstrap-t UCL 7.676 |
| Anderson-Darling 5% Critical Value | 0.745 | 95% Hall's Bootstrap UCL 7.674 |
| Kolmogorov-Smirnov Test Statistic | 0.134 | 95% Percentile Bootstrap UCL 7.673 |
| Kolmogorov-Smirnov 5% Critical Value | 0.16 | 95% BCA Bootstrap UCL 7.664 |
| Data appear Gamma Distributed at 5% Significance Level | | 95% Chebyshev(Mean, Sd) UCL 7.987 |

| | |
|---|---|
| 97.5% Chebyshev(Mean, Sd) UCL | 8.203 |
| 99% Chebyshev(Mean, Sd) UCL | 8.625 |

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 7.691 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 7.703 |

**Potential UCL to Use** Use 95% Student's-t UCL 7.684

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 positvely skewed data sets.

**Aluminum**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 6 | Number of Distinct Observations | 6 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 11800 | Minimum of Log Data | 9.376 |
| Maximum | 21900 | Maximum of Log Data | 9.994 |
| Mean | 16217 | Mean of log Data | 9.668 |
| Geometric Mean | 15811 | SD of log Data | 0.246 |
| Median | 15700 | | |
| SD | 4006 | | |
| Std. Error of Mean | 1636 | | |
| Coefficient of Variation | 0.247 | | |
| Skewness | 0.389 | | |

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 | 0.94 | Shapiro Wilk Test Statistic | 0.947 |
| 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 | |
|---|---|
| 95% Student's-t UCL | 19512 |
| **95% UCLs (Adjusted for Skewness)** | |
| 95% Adjusted-CLT UCL (Chen-1995) | 19184 |
| 95% Modified-t UCL (Johnson-1978) | 19556 |

| Assuming Lognormal Distribution | |
|---|---|
| 95% H-UCL | 20627 |
| 95% Chebyshev (MVUE) UCL | 23322 |
| 97.5% Chebyshev (MVUE) UCL | 26397 |
| 99% Chebyshev (MVUE) UCL | 32438 |

| Gamma Distribution Test | |
|---|---|
| k star (bias corrected) | 10.06 |
| Theta Star | 1611 |
| MLE of Mean | 16217 |
| MLE of Standard Deviation | 5112 |
| nu star | 120.8 |
| Approximate Chi Square Value (.05) | 96.38 |
| Adjusted Level of Significance | 0.0122 |
| Adjusted Chi Square Value | 88.53 |
| Anderson-Darling Test Statistic | 0.253 |
| Anderson-Darling 5% Critical Value | 0.697 |
| Kolmogorov-Smirnov Test Statistic | 0.176 |
| Kolmogorov-Smirnov 5% Critical Value | 0.332 |

Data appear Gamma Distributed at 5% Significance Level

| Data Distribution |
|---|
| Data appear Normal at 5% Significance Level |

| Nonparametric Statistics | |
|---|---|
| 95% CLT UCL | 18907 |
| 95% Jackknife UCL | 19512 |
| 95% Standard Bootstrap UCL | 18689 |
| 95% Bootstrap-t UCL | 19925 |
| 95% Hall's Bootstrap UCL | 19557 |
| 95% Percentile Bootstrap UCL | 18717 |
| 95% BCA Bootstrap UCL | 19017 |
| 95% Chebyshev(Mean, Sd) UCL | 23346 |
| 97.5% Chebyshev(Mean, Sd) UCL | 26431 |
| 99% Chebyshev(Mean, Sd) UCL | 32490 |

| Assuming Gamma Distribution | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 20318 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 22121 |

| Potential UCL to Use | |
|---|---|
| Use 95% Student's-t UCL | 19512 |

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 | 32 | Number of Detected Data | 26 |
| Number of Distinct Detected Data | 16 | Number of Non-Detect Data | 6 |
| | | Percent Non-Detects | 18.75% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.1 | Minimum Detected | -2.303 |
| Maximum Detected | 0.36 | Maximum Detected | -1.022 |
| Mean of Detected | 0.183 | Mean of Detected | -1.763 |
| SD of Detected | 0.0699 | SD of Detected | 0.362 |
| Minimum Non-Detect | 0.1 | Minimum Non-Detect | -2.303 |
| Maximum Non-Detect | 0.1 | Maximum Non-Detect | -2.303 |

UCL Statistics

**Normal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.907 |
| 5% Shapiro Wilk Critical Value | 0.92 |

Data not Normal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.158 |
| SD | 0.082 |
| 95% DL/2 (t) UCL | 0.183 |
| | |
| Maximum Likelihood Estimate(MLE) Method | |
| Mean | 0.158 |
| SD | 0.0821 |
| 95% MLE (t) UCL | 0.183 |
| 95% MLE (Tiku) UCL | 0.183 |

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.956 |
| 5% Shapiro Wilk Critical Value | 0.92 |

Data appear Lognormal at 5% Significance Level

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -1.994 |
| SD | 0.587 |
| 95% H-Stat (DL/2) UCL | 0.2 |
| | |
| Log ROS Method | |
| Mean in Log Scale | -1.922 |
| SD in Log Scale | 0.474 |
| Mean in Original Scale | 0.163 |
| SD in Original Scale | 0.0764 |
| 95% t UCL | 0.186 |
| 95% Percentile Bootstrap UCL | 0.185 |
| 95% BCA Bootstrap UCL | 0.186 |
| 95% H UCL | 0.193 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 6.99 |
| Theta Star | 0.0262 |
| nu star | 363.5 |
| | |
| A-D Test Statistic | 0.484 |
| 5% A-D Critical Value | 0.745 |
| K-S Test Statistic | 0.745 |
| 5% K-S Critical Value | 0.171 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 0.36 |
| Mean | 0.15 |
| Median | 0.145 |
| SD | 0.0945 |
| k star | 0.406 |
| Theta star | 0.369 |
| Nu star | 25.95 |
| AppChi2 | 15.34 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.253 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.261 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data appear Gamma Distributed at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.168 |
| SD | 0.0698 |
| SE of Mean | 0.0126 |
| 95% KM (t) UCL | 0.189 |
| 95% KM (z) UCL | 0.188 |
| 95% KM (jackknife) UCL | 0.189 |
| 95% KM (bootstrap t) UCL | 0.193 |
| 95% KM (BCA) UCL | 0.188 |
| 95% KM (Percentile Bootstrap) UCL | 0.189 |
| 95% KM (Chebyshev) UCL | 0.222 |
| 97.5% KM (Chebyshev) UCL | 0.246 |
| 99% KM (Chebyshev) UCL | 0.293 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (BCA) UCL | 0.188 |

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 | 32 | Number of Distinct Observations | 31 |

### Raw Statistics

| | |
|---|---|
| Minimum | 0.518 |
| Maximum | 4.74 |
| Mean | 1.756 |
| Geometric Mean | 1.559 |
| Median | 1.6 |
| SD | 0.905 |
| Std. Error of Mean | 0.16 |
| Coefficient of Variation | 0.515 |
| Skewness | 1.375 |

### Log-transformed Statistics

| | |
|---|---|
| Minimum of Log Data | -0.658 |
| Maximum of Log Data | 1.556 |
| Mean of log Data | 0.444 |
| SD of log Data | 0.497 |

## Relevant UCL Statistics

### Normal Distribution Test

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.902 |
| Shapiro Wilk Critical Value | 0.93 |

Data not Normal at 5% Significance Level

### Lognormal Distribution Test

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.991 |
| Shapiro Wilk Critical Value | 0.93 |

Data appear Lognormal at 5% Significance Level

### Assuming Normal Distribution

| | |
|---|---|
| 95% Student's-t UCL | 2.027 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 2.06 |
| 95% Modified-t UCL (Johnson-1978) | 2.033 |

### Assuming Lognormal Distribution

| | |
|---|---|
| 95% H-UCL | 2.096 |
| 95% Chebyshev (MVUE) UCL | 2.46 |
| 97.5% Chebyshev (MVUE) UCL | 2.764 |
| 99% Chebyshev (MVUE) UCL | 3.362 |

### Gamma Distribution Test

| | |
|---|---|
| k star (bias corrected) | 3.986 |
| Theta Star | 0.44 |
| MLE of Mean | 1.756 |
| MLE of Standard Deviation | 0.879 |
| nu star | 255.1 |
| Approximate Chi Square Value (.05) | 219.1 |
| Adjusted Level of Significance | 0.0416 |
| Adjusted Chi Square Value | 217.4 |
| Anderson-Darling Test Statistic | 0.238 |
| Anderson-Darling 5% Critical Value | 0.75 |
| Kolmogorov-Smirnov Test Statistic | 0.122 |
| Kolmogorov-Smirnov 5% Critical Value | 0.156 |

Data appear Gamma Distributed at 5% Significance Level

### Data Distribution

Data appear Gamma Distributed at 5% Significance Level

### Nonparametric Statistics

| | |
|---|---|
| 95% CLT UCL | 2.019 |
| 95% Jackknife UCL | 2.027 |
| 95% Standard Bootstrap UCL | 2.007 |
| 95% Bootstrap-t UCL | 2.084 |
| 95% Hall's Bootstrap UCL | 2.123 |
| 95% Percentile Bootstrap UCL | 2.022 |
| 95% BCA Bootstrap UCL | 2.05 |
| 95% Chebyshev(Mean, Sd) UCL | 2.453 |
| 97.5% Chebyshev(Mean, Sd) UCL | 2.754 |
| 99% Chebyshev(Mean, Sd) UCL | 3.347 |

### Assuming Gamma Distribution

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 2.044 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 2.061 |

### Potential UCL to Use

Use 95% Approximate Gamma UCL 2.044

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 | 32 | Number of Distinct Observations | 31 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 17.9 | Minimum of Log Data | 2.885 |
| Maximum | 121 | Maximum of Log Data | 4.796 |
| Mean | 52.81 | Mean of log Data | 3.855 |
| Geometric Mean | 47.23 | SD of log Data | 0.475 |
| Median | 45.05 | | |
| SD | 26.57 | | |
| Std. Error of Mean | 4.697 | | |
| Coefficient of Variation | 0.503 | | |
| Skewness | 1.124 | | |

**Relevant UCL Statistics**

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.888 | Shapiro Wilk Test Statistic | 0.976 |
| Shapiro Wilk Critical Value | 0.93 | Shapiro Wilk Critical Value | 0.93 |
| 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 | 60.78 | 95% H-UCL | 62.25 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 72.74 |
| 95% Adjusted-CLT UCL (Chen-1995) | 61.54 | 97.5% Chebyshev (MVUE) UCL | 81.43 |
| 95% Modified-t UCL (Johnson-1978) | 60.93 | 99% Chebyshev (MVUE) UCL | 98.49 |

| Gamma Distribution Test | | Data Distribution |
|---|---|---|
| k star (bias corrected) | 4.223 | Data appear Gamma Distributed at 5% Significance Level |
| Theta Star | 12.5 | |
| MLE of Mean | 52.81 | |
| MLE of Standard Deviation | 25.7 | |
| nu star | 270.3 | |
| Approximate Chi Square Value (.05) | 233.2 | **Nonparametric Statistics** |
| Adjusted Level of Significance | 0.0416 | 95% CLT UCL 60.54 |
| Adjusted Chi Square Value | 231.4 | 95% Jackknife UCL 60.78 |
| | | 95% Standard Bootstrap UCL 60.35 |
| Anderson-Darling Test Statistic | 0.498 | 95% Bootstrap-t UCL 62.15 |
| Anderson-Darling 5% Critical Value | 0.749 | 95% Hall's Bootstrap UCL 61.63 |
| Kolmogorov-Smirnov Test Statistic | 0.115 | 95% Percentile Bootstrap UCL 60.78 |
| Kolmogorov-Smirnov 5% Critical Value | 0.156 | 95% BCA Bootstrap UCL 60.92 |
| Data appear Gamma Distributed at 5% Significance Level | | 95% Chebyshev(Mean, Sd) UCL 73.28 |
| | | 97.5% Chebyshev(Mean, Sd) UCL 82.14 |
| **Assuming Gamma Distribution** | | 99% Chebyshev(Mean, Sd) UCL 99.54 |
| 95% Approximate Gamma UCL (Use when n >= 40) | 61.21 | |

95% Adjusted Gamma UCL (Use when n < 40) 61.69

Potential UCL to Use

Use 95% Approximate Gamma UCL 61.21

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.

**Beryllium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 25 |
| Number of Distinct Detected Data | 21 | Number of Non-Detect Data | 7 |
| | | Percent Non-Detects | 21.88% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.2 | Minimum Detected | -1.609 |
| Maximum Detected | 0.51 | Maximum Detected | -0.673 |
| Mean of Detected | 0.344 | Mean of Detected | -1.103 |
| SD of Detected | 0.0931 | SD of Detected | 0.278 |
| Minimum Non-Detect | 0.2 | Minimum Non-Detect | -1.609 |
| Maximum Non-Detect | 0.2 | Maximum Non-Detect | -1.609 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.954 | Shapiro Wilk Test Statistic | 0.958 |
| 5% Shapiro Wilk Critical Value | 0.918 | 5% 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 | |
|---|---|---|---|
| DL/2 Substitution Method | | DL/2 Substitution Method | |
| Mean | 0.291 | Mean | -1.366 |
| SD | 0.131 | SD | 0.56 |
| 95% DL/2 (t) UCL | 0.33 | 95% H-Stat (DL/2) UCL | 0.364 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 0.297 | Mean in Log Scale | -1.245 |
| SD | 0.123 | SD in Log Scale | 0.371 |
| 95% MLE (t) UCL | 0.334 | Mean in Original Scale | 0.307 |
| 95% MLE (Tiku) UCL | 0.335 | SD in Original Scale | 0.109 |
| | | 95% t UCL | 0.34 |
| | | 95% Percentile Bootstrap UCL | 0.338 |
| | | 95% BCA Bootstrap UCL | 0.338 |
| | | 95% H UCL | 0.349 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 12.28 | Data appear Normal at 5% Significance Level |
| Theta Star | 0.028 | |
| nu star | 614.1 | |

| | |
|---|---|
| A-D Test Statistic | 0.322 |
| 5% A-D Critical Value | 0.744 |
| K-S Test Statistic | 0.744 |
| 5% K-S Critical Value | 0.174 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 0.51 |
| Mean | 0.278 |
| Median | 0.285 |
| SD | 0.152 |
| k star | 0.489 |
| Theta star | 0.568 |
| Nu star | 31.32 |
| AppChi2 | 19.53 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.446 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.457 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.313 |
| SD | 0.1 |
| SE of Mean | 0.0181 |
| 95% KM (t) UCL | 0.343 |
| 95% KM (z) UCL | 0.342 |
| 95% KM (jackknife) UCL | 0.342 |
| 95% KM (bootstrap t) UCL | 0.343 |
| 95% KM (BCA) UCL | 0.346 |
| 95% KM (Percentile Bootstrap) UCL | 0.343 |
| 95% KM (Chebyshev) UCL | 0.391 |
| 97.5% KM (Chebyshev) UCL | 0.425 |
| 99% KM (Chebyshev) UCL | 0.492 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.343 |
| 95% KM (Percentile Bootstrap) UCL | 0.343 |

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.

## Bismuth

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 6 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 6 |
| | | 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 Bismuth was not processed!

## Cadmium

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 14 |
| Number of Distinct Detected Data | 11 | Number of Non-Detect Data | 18 |
| | | Percent Non-Detects | 56.25% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.051 | Minimum Detected | -2.976 |

| | |
|---|---|
| Maximum Detected | 0.22 |
| Mean of Detected | 0.0781 |
| SD of Detected | 0.043 |
| Minimum Non-Detect | 0.05 |
| Maximum Non-Detect | 0.1 |

| | |
|---|---|
| Maximum Detected | -1.514 |
| Mean of Detected | -2.633 |
| SD of Detected | 0.375 |
| Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | -2.303 |

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 | 31 |
| Number treated as Detected | 1 |
| Single DL Non-Detect Percentage | 96.88% |

## UCL Statistics

**Normal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.578 |
| 5% Shapiro Wilk Critical Value | 0.874 |

Data not Normal at 5% Significance Level

**Assuming Normal Distribution**

DL/2 Substitution Method

| | |
|---|---|
| Mean | 0.0522 |
| SD | 0.0373 |
| 95% DL/2 (t) UCL | 0.0633 |

| | |
|---|---|
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE method failed to converge properly**

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.765 |
| 5% Shapiro Wilk Critical Value | 0.874 |

Data not Lognormal at 5% Significance Level

**Assuming Lognormal Distribution**

DL/2 Substitution Method

| | |
|---|---|
| Mean | -3.118 |
| SD | 0.552 |
| 95% H-Stat (DL/2) UCL | 0.0626 |

Log ROS Method

| | |
|---|---|
| Mean in Log Scale | -3.09 |
| SD in Log Scale | 0.558 |
| Mean in Original Scale | 0.0535 |
| SD in Original Scale | 0.0371 |
| 95% t UCL | 0.0646 |
| 95% Percentile Bootstrap UCL | 0.0649 |
| 95% BCA Bootstrap UCL | 0.0693 |
| 95% H-UCL | 0.0648 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 4.889 |
| Theta Star | 0.016 |
| nu star | 136.9 |

| | |
|---|---|
| A-D Test Statistic | 1.449 |
| 5% A-D Critical Value | 0.737 |
| K-S Test Statistic | 0.737 |
| 5% K-S Critical Value | 0.229 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 0.22 |
| Mean | 0.04 |
| Median | 0.0361 |
| SD | 0.0478 |
| k star | 0.184 |

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

Kaplan-Meier (KM) Method

| | |
|---|---|
| Mean | 0.0641 |
| SD | 0.0306 |
| SE of Mean | 0.0057 |
| 95% KM (t) UCL | 0.0738 |
| 95% KM (z) UCL | 0.0735 |
| 95% KM (jackknife) UCL | 0.0736 |
| 95% KM (bootstrap t) UCL | 0.0871 |
| 95% KM (BCA) UCL | 0.076 |
| 95% KM (Percentile Bootstrap) UCL | 0.0748 |
| 95% KM (Chebyshev) UCL | 0.089 |
| 97.5% KM (Chebyshev) UCL | 0.0997 |
| 99% KM (Chebyshev) UCL | 0.121 |

| | |
|---|---|
| Theta star | 0.218 |
| Nu star | 11.77 |
| AppChi2 | 5.074 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.0928 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.0973 |

Note: DL/2 is not a recommended method.

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.0738 |
| 95% KM (% Bootstrap) UCL | 0.0748 |

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.

Calcium

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 6 | Number of Distinct Observations | 6 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 2060 | Minimum of Log Data | 7.63 |
| Maximum | 4440 | Maximum of Log Data | 8.398 |
| Mean | 3017 | Mean of log Data | 7.983 |
| Geometric Mean | 2930 | SD of log Data | 0.261 |
| Median | 2835 | | |
| SD | 821 | | |
| Std. Error of Mean | 335.2 | | |
| Coefficient of Variation | 0.272 | | |
| Skewness | 1.039 | | |

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 | 0.937 | Shapiro Wilk Test Statistic | 0.979 |
| 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 | 3692 | 95% H-UCL | 3903 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 4415 |
| 95% Adjusted-CLT UCL (Chen-1995) | 3720 | 97.5% Chebyshev (MVUE) UCL | 5021 |

| | |
|---|---|
| 95% Modified-t UCL (Johnson-1978) | 3716 |
| 99% Chebyshev (MVUE) UCL | 6212 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 8.788 |
| Theta Star | 343.3 |
| MLE of Mean | 3017 |
| MLE of Standard Deviation | 1018 |
| nu star | 105.5 |
| Approximate Chi Square Value (.05) | 82.75 |
| Adjusted Level of Significance | 0.0122 |
| Adjusted Chi Square Value | 75.51 |
| Anderson-Darling Test Statistic | 0.224 |
| Anderson-Darling 5% Critical Value | 0.697 |
| Kolmogorov-Smirnov Test Statistic | 0.167 |
| Kolmogorov-Smirnov 5% Critical Value | 0.332 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 3844 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 4213 |

**Data Distribution**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 3568 |
| 95% Jackknife UCL | 3692 |
| 95% Standard Bootstrap UCL | 3521 |
| 95% Bootstrap-t UCL | 4091 |
| 95% Hall's Bootstrap UCL | 6863 |
| 95% Percentile Bootstrap UCL | 3582 |
| 95% BCA Bootstrap UCL | 3665 |
| 95% Chebyshev(Mean, Sd) UCL | 4478 |
| 97.5% Chebyshev(Mean, Sd) UCL | 5110 |
| 99% Chebyshev(Mean, Sd) UCL | 6352 |

| | |
|---|---|
| Potential UCL to Use | Use 95% Student's-t UCL 3692 |

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 | 32 | Number of Distinct Observations | 30 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 6.1 |
| Maximum | 25.1 |
| Mean | 14.32 |
| Geometric Mean | 13.77 |
| Median | 14.1 |
| SD | 3.932 |
| Std. Error of Mean | 0.695 |
| Coefficient of Variation | 0.275 |
| Skewness | 0.333 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 1.808 |
| Maximum of Log Data | 3.223 |
| Mean of log Data | 2.623 |
| SD of log Data | 0.293 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.982 |
| Shapiro Wilk Critical Value | 0.93 |

Data appear Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.965 |
| Shapiro Wilk Critical Value | 0.93 |

Data appear Lognormal at 5% Significance Level

| Assuming Normal Distribution | |
|---|---|
| 95% Student's-t UCL | 15.5 |
| **95% UCLs (Adjusted for Skewness)** | |
| 95% Adjusted-CLT UCL (Chen-1995) | 15.51 |
| 95% Modified-t UCL (Johnson-1978) | 15.51 |

| Assuming Lognormal Distribution | |
|---|---|
| 95% H-UCL | 15.8 |
| 95% Chebyshev (MVUE) UCL | 17.65 |
| 97.5% Chebyshev (MVUE) UCL | 19.07 |
| 99% Chebyshev (MVUE) UCL | 21.87 |

| Gamma Distribution Test | |
|---|---|
| k star (bias corrected) | 11.74 |
| Theta Star | 1.22 |
| MLE of Mean | 14.32 |
| MLE of Standard Deviation | 4.179 |
| nu star | 751.5 |
| Approximate Chi Square Value (.05) | 688.9 |
| Adjusted Level of Significance | 0.0416 |
| Adjusted Chi Square Value | 685.7 |
| Anderson-Darling Test Statistic | 0.274 |
| Anderson-Darling 5% Critical Value | 0.746 |
| Kolmogorov-Smirnov Test Statistic | 0.0914 |
| Kolmogorov-Smirnov 5% Critical Value | 0.155 |

Data appear Gamma Distributed at 5% Significance Level

| Assuming Gamma Distribution | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 15.62 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 15.7 |

**Data Distribution**

Data appear Normal at 5% Significance Level

| Nonparametric Statistics | |
|---|---|
| 95% CLT UCL | 15.46 |
| 95% Jackknife UCL | 15.5 |
| 95% Standard Bootstrap UCL | 15.48 |
| 95% Bootstrap-t UCL | 15.62 |
| 95% Hall's Bootstrap UCL | 15.58 |
| 95% Percentile Bootstrap UCL | 15.41 |
| 95% BCA Bootstrap UCL | 15.51 |
| 95% Chebyshev(Mean, Sd) UCL | 17.35 |
| 97.5% Chebyshev(Mean, Sd) UCL | 18.66 |
| 99% Chebyshev(Mean, Sd) UCL | 21.24 |

| Potential UCL to Use | Use 95% Student's-t UCL 15.5 |
|---|---|

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.

**Cobalt**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 32 | Number of Distinct Observations | 32 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 2.67 | Minimum of Log Data | 0.982 |
| Maximum | 14.2 | Maximum of Log Data | 2.653 |
| Mean | 7.732 | Mean of log Data | 1.972 |
| Geometric Mean | 7.186 | SD of log Data | 0.405 |
| Median | 7.255 | | |
| SD | 2.841 | | |
| Std. Error of Mean | 0.502 | | |
| Coefficient of Variation | 0.367 | | |
| Skewness | 0.218 | | |

**Relevant UCL Statistics**

**Normal Distribution Test** | **Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.976 |
| Shapiro Wilk Critical Value | 0.93 |

Data appear Normal at 5% Significance Level

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.959 |
| Shapiro Wilk Critical Value | 0.93 |

Data appear Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 8.583 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 8.579 |
| 95% Modified-t UCL (Johnson-1978) | 8.586 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 8.929 |
| 95% Chebyshev (MVUE) UCL | 10.28 |
| 97.5% Chebyshev (MVUE) UCL | 11.36 |
| 99% Chebyshev (MVUE) UCL | 13.48 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 6.355 |
| Theta Star | 1.217 |
| MLE of Mean | 7.732 |
| MLE of Standard Deviation | 3.067 |
| nu star | 406.7 |
| Approximate Chi Square Value (.05) | 361 |
| Adjusted Level of Significance | 0.0416 |
| Adjusted Chi Square Value | 358.7 |
| Anderson-Darling Test Statistic | 0.304 |
| Anderson-Darling 5% Critical Value | 0.747 |
| Kolmogorov-Smirnov Test Statistic | 0.141 |
| Kolmogorov-Smirnov 5% Critical Value | 0.156 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 8.712 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 8.768 |

**Data Distribution**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 8.558 |
| 95% Jackknife UCL | 8.583 |
| 95% Standard Bootstrap UCL | 8.541 |
| 95% Bootstrap-t UCL | 8.618 |
| 95% Hall's Bootstrap UCL | 8.599 |
| 95% Percentile Bootstrap UCL | 8.547 |
| 95% BCA Bootstrap UCL | 8.598 |
| 95% Chebyshev(Mean, Sd) UCL | 9.921 |
| 97.5% Chebyshev(Mean, Sd) UCL | 10.87 |
| 99% Chebyshev(Mean, Sd) UCL | 12.73 |

**Potential UCL to Use**

Use 95% Student's-t UCL 8.583

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.

**Chloride**

**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 Chloride 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 | 39 | Number of Distinct Observations | 37 |

### Raw Statistics

| | |
|---|---|
| Minimum | 6.51 |
| Maximum | 46.5 |
| Mean | 24.1 |
| Geometric Mean | 22.23 |
| Median | 25.1 |
| SD | 8.645 |
| Std. Error of Mean | 1.384 |
| Coefficient of Variation | 0.359 |
| Skewness | 0.0143 |

### Log-transformed Statistics

| | |
|---|---|
| Minimum of Log Data | 1.873 |
| Maximum of Log Data | 3.839 |
| Mean of log Data | 3.101 |
| SD of log Data | 0.445 |

## Relevant UCL Statistics

### Normal Distribution Test

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.973 |
| Shapiro Wilk Critical Value | 0.939 |

Data appear Normal at 5% Significance Level

### Lognormal Distribution Test

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.875 |
| Shapiro Wilk Critical Value | 0.939 |

Data not Lognormal at 5% Significance Level

### Assuming Normal Distribution

| | |
|---|---|
| 95% Student's-t UCL | 26.43 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 26.38 |
| 95% Modified-t UCL (Johnson-1978) | 26.43 |

### Assuming Lognormal Distribution

| | |
|---|---|
| 95% H-UCL | 28.1 |
| 95% Chebyshev (MVUE) UCL | 32.35 |
| 97.5% Chebyshev (MVUE) UCL | 35.77 |
| 99% Chebyshev (MVUE) UCL | 42.47 |

### Gamma Distribution Test

| | |
|---|---|
| k star (bias corrected) | 5.884 |
| Theta Star | 4.096 |
| MLE of Mean | 24.1 |
| MLE of Standard Deviation | 9.935 |
| nu star | 459 |
| Approximate Chi Square Value (.05) | 410.3 |
| Adjusted Level of Significance | 0.0437 |
| Adjusted Chi Square Value | 408.5 |
| Anderson-Darling Test Statistic | 0.983 |
| Anderson-Darling 5% Critical Value | 0.75 |
| Kolmogorov-Smirnov Test Statistic | 0.125 |
| Kolmogorov-Smirnov 5% Critical Value | 0.142 |

Data follow Appr. Gamma Distribution at 5% Significance Level

### Assuming Gamma Distribution

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 26.96 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 27.08 |

### Data Distribution

Data appear Normal at 5% Significance Level

### Nonparametric Statistics

| | |
|---|---|
| 95% CLT UCL | 26.38 |
| 95% Jackknife UCL | 26.43 |
| 95% Standard Bootstrap UCL | 26.35 |
| 95% Bootstrap-t UCL | 26.49 |
| 95% Hall's Bootstrap UCL | 26.59 |
| 95% Percentile Bootstrap UCL | 26.36 |
| 95% BCA Bootstrap UCL | 26.39 |
| 95% Chebyshev(Mean, Sd) UCL | 30.13 |
| 97.5% Chebyshev(Mean, Sd) UCL | 32.74 |
| 99% Chebyshev(Mean, Sd) UCL | 37.87 |

### Potential UCL to Use

Use 95% Student's-t UCL 26.43

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.

Iron

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 6 | Number of Distinct Observations | 6 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 16200 | Minimum of Log Data | 9.693 |
| Maximum | 29800 | Maximum of Log Data | 10.3 |
| Mean | 23650 | Mean of log Data | 10.05 |
| Geometric Mean | 23114 | SD of log Data | 0.238 |
| Median | 23900 | | |
| SD | 5383 | | |
| Std. Error of Mean | 2198 | | |
| Coefficient of Variation | 0.228 | | |
| Skewness | -0.24 | | |

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 | 0.939 | Shapiro Wilk Test Statistic | 0.933 |
| 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 | 28078 | 95% H-UCL | 29824 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 33699 |
| 95% Adjusted-CLT UCL (Chen-1995) | 27035 | 97.5% Chebyshev (MVUE) UCL | 38040 |
| 95% Modified-t UCL (Johnson-1978) | 28043 | 99% Chebyshev (MVUE) UCL | 46568 |

| Gamma Distribution Test | | Data Distribution |
|---|---|---|
| k star (bias corrected) | 11.09 | Data appear Normal at 5% Significance Level |
| Theta Star | 2132 | |
| MLE of Mean | 23650 | |
| MLE of Standard Deviation | 7100 | |

| | |
|---|---|
| nu star | 133.1 |
| Approximate Chi Square Value (.05) | 107.5 |
| Adjusted Level of Significance | 0.0122 |
| Adjusted Chi Square Value | 99.15 |
| Anderson-Darling Test Statistic | 0.289 |
| Anderson-Darling 5% Critical Value | 0.697 |
| Kolmogorov-Smirnov Test Statistic | 0.218 |
| Kolmogorov-Smirnov 5% Critical Value | 0.332 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 29295 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 31756 |

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 27265 |
| 95% Jackknife UCL | 28078 |
| 95% Standard Bootstrap UCL | 26993 |
| 95% Bootstrap-t UCL | 27836 |
| 95% Hall's Bootstrap UCL | 26278 |
| 95% Percentile Bootstrap UCL | 27033 |
| 95% BCA Bootstrap UCL | 26867 |
| 95% Chebyshev(Mean, Sd) UCL | 33230 |
| 97.5% Chebyshev(Mean, Sd) UCL | 37375 |
| 99% Chebyshev(Mean, Sd) UCL | 45517 |

Potential UCL to Use — Use 95% Student's-t UCL 28078

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 positvely skewed data sets.

**Lead**

**General Statistics**

| | |
|---|---|
| Number of Valid Observations | 32 |
| Number of Distinct Observations | 31 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 2.6 |
| Maximum | 11.6 |
| Mean | 5.921 |
| Geometric Mean | 5.6 |
| Median | 5.415 |
| SD | 2.04 |
| Std. Error of Mean | 0.361 |
| Coefficient of Variation | 0.345 |
| Skewness | 0.903 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 0.956 |
| Maximum of Log Data | 2.451 |
| Mean of log Data | 1.723 |
| SD of log Data | 0.341 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.937 |
| Shapiro Wilk Critical Value | 0.93 |

Data appear Normal at 5% Significance Level

**Assuming Normal Distribution**

95% Student's-t UCL 6.532

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.977 |
| Shapiro Wilk Critical Value | 0.93 |

Data appear Lognormal at 5% Significance Level

**Assuming Lognormal Distribution**

95% H-UCL 6.634

| | |
|---|---|
| **95% UCLs (Adjusted for Skewness)** | |
| 95% Adjusted-CLT UCL (Chen-1995) | 6.575 |
| 95% Modified-t UCL (Johnson-1978) | 6.542 |
| 95% Chebyshev (MVUE) UCL | 7.513 |
| 97.5% Chebyshev (MVUE) UCL | 8.201 |
| 99% Chebyshev (MVUE) UCL | 9.553 |

| | |
|---|---|
| **Gamma Distribution Test** | |
| k star (bias corrected) | 8.298 |
| Theta Star | 0.714 |
| MLE of Mean | 5.921 |
| MLE of Standard Deviation | 2.055 |
| nu star | 531.1 |
| Approximate Chi Square Value (.05) | 478.6 |
| Adjusted Level of Significance | 0.0416 |
| Adjusted Chi Square Value | 476 |
| Anderson-Darling Test Statistic | 0.388 |
| Anderson-Darling 5% Critical Value | 0.747 |
| Kolmogorov-Smirnov Test Statistic | 0.101 |
| Kolmogorov-Smirnov 5% Critical Value | 0.155 |

Data appear Gamma Distributed at 5% Significance Level

| | |
|---|---|
| **Assuming Gamma Distribution** | |
| 95% Approximate Gamma UCL (Use when n >= 40) | 6.569 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 6.606 |

**Data Distribution**

Data appear Normal at 5% Significance Level

| | |
|---|---|
| **Nonparametric Statistics** | |
| 95% CLT UCL | 6.514 |
| 95% Jackknife UCL | 6.532 |
| 95% Standard Bootstrap UCL | 6.515 |
| 95% Bootstrap-t UCL | 6.605 |
| 95% Hall's Bootstrap UCL | 6.627 |
| 95% Percentile Bootstrap UCL | 6.538 |
| 95% BCA Bootstrap UCL | 6.558 |
| 95% Chebyshev(Mean, Sd) UCL | 7.493 |
| 97.5% Chebyshev(Mean, Sd) UCL | 8.173 |
| 99% Chebyshev(Mean, Sd) UCL | 9.509 |

| | |
|---|---|
| Potential UCL to Use | Use 95% Student's-t UCL 6.532 |

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.

**Lithium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 6 | Number of Distinct Observations | 6 |

| | | | |
|---|---|---|---|
| **Raw Statistics** | | **Log-transformed Statistics** | |
| Minimum | 4.6 | Minimum of Log Data | 1.526 |
| Maximum | 11.9 | Maximum of Log Data | 2.477 |
| Mean | 7.533 | Mean of log Data | 1.964 |
| Geometric Mean | 7.127 | SD of log Data | 0.362 |
| Median | 6.7 | | |
| SD | 2.797 | | |
| Std. Error of Mean | 1.142 | | |
| Coefficient of Variation | 0.371 | | |
| Skewness | 0.765 | | |

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 | 0.921 |
| Shapiro Wilk Critical Value | 0.788 |

Data appear Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.952 |
| Shapiro Wilk Critical Value | 0.788 |

Data appear Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 9.834 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 9.792 |
| 95% Modified-t UCL (Johnson-1978) | 9.894 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 11.11 |
| 95% Chebyshev (MVUE) UCL | 12.36 |
| 97.5% Chebyshev (MVUE) UCL | 14.46 |
| 99% Chebyshev (MVUE) UCL | 18.57 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 4.704 |
| Theta Star | 1.602 |
| MLE of Mean | 7.533 |
| MLE of Standard Deviation | 3.473 |
| nu star | 56.44 |
| Approximate Chi Square Value (.05) | 40.18 |
| Adjusted Level of Significance | 0.0122 |
| Adjusted Chi Square Value | 35.28 |
| Anderson-Darling Test Statistic | 0.284 |
| Anderson-Darling 5% Critical Value | 0.698 |
| Kolmogorov-Smirnov Test Statistic | 0.241 |
| Kolmogorov-Smirnov 5% Critical Value | 0.333 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 10.58 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 12.05 |

**Data Distribution**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 9.411 |
| 95% Jackknife UCL | 9.834 |
| 95% Standard Bootstrap UCL | 9.237 |
| 95% Bootstrap-t UCL | 10.81 |
| 95% Hall's Bootstrap UCL | 10.84 |
| 95% Percentile Bootstrap UCL | 9.233 |
| 95% BCA Bootstrap UCL | 9.45 |
| 95% Chebyshev(Mean, Sd) UCL | 12.51 |
| 97.5% Chebyshev(Mean, Sd) UCL | 14.66 |
| 99% Chebyshev(Mean, Sd) UCL | 18.89 |

**Potential UCL to Use** Use 95% Student's-t UCL 9.834

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.

**Magnesium**

## General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Observations | 6 | Number of Distinct Observations | 6 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 4850 | Minimum of Log Data | 8.487 |
| Maximum | 8280 | Maximum of Log Data | 9.022 |
| Mean | 6537 | Mean of log Data | 8.763 |
| Geometric Mean | 6391 | SD of log Data | 0.235 |
| Median | 6600 | | |
| SD | 1498 | | |
| Std. Error of Mean | 611.7 | | |
| Coefficient of Variation | 0.229 | | |
| Skewness | -0.0315 | | |

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 | 0.879 | Shapiro Wilk Test Statistic | 0.876 |
| 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 | 7769 | 95% H-UCL | 8204 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 9267 |
| 95% Adjusted-CLT UCL (Chen-1995) | 7534 | 97.5% Chebyshev (MVUE) UCL | 10447 |
| 95% Modified-t UCL (Johnson-1978) | 7768 | 99% Chebyshev (MVUE) UCL | 12766 |

| Gamma Distribution Test | | Data Distribution |
|---|---|---|
| k star (bias corrected) | 11.26 | Data appear Normal at 5% Significance Level |
| Theta Star | 580.6 | |
| MLE of Mean | 6537 | |
| MLE of Standard Deviation | 1948 | |
| nu star | 135.1 | |
| Approximate Chi Square Value (.05) | 109.2 | **Nonparametric Statistics** |
| Adjusted Level of Significance | 0.0122 | 95% CLT UCL 7543 |
| Adjusted Chi Square Value | 100.8 | 95% Jackknife UCL 7769 |
| | | 95% Standard Bootstrap UCL 7463 |
| Anderson-Darling Test Statistic | 0.449 | 95% Bootstrap-t UCL 7789 |
| Anderson-Darling 5% Critical Value | 0.697 | 95% Hall's Bootstrap UCL 7200 |
| Kolmogorov-Smirnov Test Statistic | 0.25 | 95% Percentile Bootstrap UCL 7448 |

| | |
|---|---|
| Kolmogorov-Smirnov 5% Critical Value | 0.332 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 8084 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 8757 |

| | |
|---|---|
| 95% BCA Bootstrap UCL | 7453 |
| 95% Chebyshev(Mean, Sd) UCL | 9203 |
| 97.5% Chebyshev(Mean, Sd) UCL | 10357 |
| 99% Chebyshev(Mean, Sd) UCL | 12623 |

Potential UCL to Use

Use 95% Student's-t UCL 7769

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 positvely skewed data sets.

Manganese

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 6 | Number of Distinct Observations | 6 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 178 | Minimum of Log Data | 5.182 |
| Maximum | 537 | Maximum of Log Data | 6.286 |
| Mean | 309.3 | Mean of log Data | 5.665 |
| Geometric Mean | 288.6 | SD of log Data | 0.4 |
| Median | 264.5 | | |
| SD | 132.3 | | |
| Std. Error of Mean | 54.02 | | |
| Coefficient of Variation | 0.428 | | |
| Skewness | 1.188 | | |

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 | 0.897 | Shapiro Wilk Test Statistic | 0.962 |

| | |
|---|---|
| Shapiro Wilk Critical Value | 0.788 |

Data appear Normal at 5% Significance Level

| | |
|---|---|
| Shapiro Wilk Critical Value | 0.788 |

Data appear Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 418.2 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 426.2 |
| 95% Modified-t UCL (Johnson-1978) | 422.6 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 481.3 |
| 95% Chebyshev (MVUE) UCL | 527.4 |
| 97.5% Chebyshev (MVUE) UCL | 622.2 |
| 99% Chebyshev (MVUE) UCL | 808.4 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 3.794 |
| Theta Star | 81.53 |
| MLE of Mean | 309.3 |
| MLE of Standard Deviation | 158.8 |
| nu star | 45.53 |
| Approximate Chi Square Value (.05) | 31.05 |
| Adjusted Level of Significance | 0.0122 |
| Adjusted Chi Square Value | 26.81 |
| Anderson-Darling Test Statistic | 0.284 |
| Anderson-Darling 5% Critical Value | 0.698 |
| Kolmogorov-Smirnov Test Statistic | 0.234 |
| Kolmogorov-Smirnov 5% Critical Value | 0.333 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 453.6 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 525.4 |

**Data Distribution**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 398.2 |
| 95% Jackknife UCL | 418.2 |
| 95% Standard Bootstrap UCL | 390.4 |
| 95% Bootstrap-t UCL | 574 |
| 95% Hall's Bootstrap UCL | 1050 |
| 95% Percentile Bootstrap UCL | 393 |
| 95% BCA Bootstrap UCL | 416.7 |
| 95% Chebyshev(Mean, Sd) UCL | 544.8 |
| 97.5% Chebyshev(Mean, Sd) UCL | 646.7 |
| 99% Chebyshev(Mean, Sd) UCL | 846.8 |

**Potential UCL to Use**

Use 95% Student's-t UCL 418.2

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.

**Mercury**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 26 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 26 |
| | | 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 Mercury was not processed!

Molybdenum

## General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 10 |
| Number of Distinct Detected Data | 10 | Number of Non-Detect Data | 22 |
| | | Percent Non-Detects | 68.75% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.5 | Minimum Detected | -0.693 |
| Maximum Detected | 2.18 | Maximum Detected | 0.779 |
| Mean of Detected | 0.914 | Mean of Detected | -0.228 |
| SD of Detected | 0.567 | SD of Detected | 0.523 |
| Minimum Non-Detect | 0.5 | Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | 0.5 | Maximum Non-Detect | -0.693 |

## UCL Statistics

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.763 | Shapiro Wilk Test Statistic | 0.835 |
| 5% Shapiro Wilk Critical Value | 0.842 | 5% Shapiro Wilk Critical Value | 0.842 |
| 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 | 0.458 | Mean | -1.024 |
| SD | 0.437 | SD | 0.614 |
| 95% DL/2 (t) UCL | 0.589 | 95% H-Stat (DL/2) UCL | 0.542 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 0.0595 | Mean in Log Scale | -1.521 |
| SD | 0.802 | SD in Log Scale | 1.117 |
| 95% MLE (t) UCL | 0.3 | Mean in Original Scale | 0.391 |
| 95% MLE (Tiku) UCL | 0.472 | SD in Original Scale | 0.478 |
| | | 95% t UCL | 0.534 |
| | | 95% Percentile Bootstrap UCL | 0.543 |
| | | 95% BCA Bootstrap UCL | 0.581 |
| | | 95% H UCL | 0.684 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 2.712 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 0.337 | |
| nu star | 54.24 | |
| | | |
| A-D Test Statistic | 0.886 | Nonparametric Statistics |
| 5% A-D Critical Value | 0.73 | Kaplan-Meier (KM) Method |
| K-S Test Statistic | 0.73 | Mean 0.629 |
| 5% K-S Critical Value | 0.268 | SD 0.357 |
| Data not Gamma Distributed at 5% Significance Level | | SE of Mean 0.0665 |
| | | 95% KM (t) UCL 0.742 |
| Assuming Gamma Distribution | | 95% KM (z) UCL 0.739 |
| Gamma ROS Statistics using Extrapolated Data | | 95% KM (jackknife) UCL 0.733 |

| | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 2.18 |
| Mean | 0.286 |
| Median | 0.000001 |
| SD | 0.528 |
| k star | 0.11 |
| Theta star | 2.607 |
| Nu star | 7.012 |
| AppChi2 | 2.177 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.92 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.984 |

Note: DL/2 is not a recommended method.

| | |
|---|---|
| 95% KM (bootstrap t) UCL | 0.865 |
| 95% KM (BCA) UCL | 0.784 |
| 95% KM (Percentile Bootstrap) UCL | 0.752 |
| 95% KM (Chebyshev) UCL | 0.919 |
| 97.5% KM (Chebyshev) UCL | 1.045 |
| 99% KM (Chebyshev) UCL | 1.291 |

Potential UCLs to Use

| | |
|---|---|
| 95% KM (t) UCL | 0.742 |
| 95% KM (% Bootstrap) UCL | 0.752 |

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.

Nickel

General Statistics

| | |
|---|---|
| Number of Valid Observations | 39 |
| Number of Distinct Observations | 39 |

Raw Statistics

| | |
|---|---|
| Minimum | 4.27 |
| Maximum | 10.7 |
| Mean | 7.418 |
| Geometric Mean | 7.226 |
| Median | 7.27 |
| SD | 1.694 |
| Std. Error of Mean | 0.271 |
| Coefficient of Variation | 0.228 |
| Skewness | 0.135 |

Log-transformed Statistics

| | |
|---|---|
| Minimum of Log Data | 1.452 |
| Maximum of Log Data | 2.37 |
| Mean of log Data | 1.978 |
| SD of log Data | 0.235 |

Relevant UCL Statistics

Normal Distribution Test

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.963 |
| Shapiro Wilk Critical Value | 0.939 |

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.966 |
| Shapiro Wilk Critical Value | 0.939 |

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

| | |
|---|---|
| 95% Student's-t UCL | 7.875 |

95% UCLs (Adjusted for Skewness)

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 7.871 |
| 95% Modified-t UCL (Johnson-1978) | 7.876 |

Assuming Lognormal Distribution

| | |
|---|---|
| 95% H-UCL | 7.941 |
| 95% Chebyshev (MVUE) UCL | 8.652 |
| 97.5% Chebyshev (MVUE) UCL | 9.183 |
| 99% Chebyshev (MVUE) UCL | 10.23 |

Gamma Distribution Test

| | |
|---|---|
| k star (bias corrected) | 17.75 |
| Theta Star | 0.418 |
| MLE of Mean | 7.418 |
| MLE of Standard Deviation | 1.761 |

Data Distribution

Data appear Normal at 5% Significance Level

| | |
|---|---|
| nu star | 1384 |
| Approximate Chi Square Value (.05) | 1299 |
| Adjusted Level of Significance | 0.0437 |
| Adjusted Chi Square Value | 1296 |
| Anderson-Darling Test Statistic | 0.348 |
| Anderson-Darling 5% Critical Value | 0.747 |
| Kolmogorov-Smirnov Test Statistic | 0.082 |
| Kolmogorov-Smirnov 5% Critical Value | 0.141 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 7.906 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 7.926 |

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 7.864 |
| 95% Jackknife UCL | 7.875 |
| 95% Standard Bootstrap UCL | 7.849 |
| 95% Bootstrap-t UCL | 7.915 |
| 95% Hall's Bootstrap UCL | 7.842 |
| 95% Percentile Bootstrap UCL | 7.874 |
| 95% BCA Bootstrap UCL | 7.847 |
| 95% Chebyshev(Mean, Sd) UCL | 8.6 |
| 97.5% Chebyshev(Mean, Sd) UCL | 9.112 |
| 99% Chebyshev(Mean, Sd) UCL | 10.12 |

Potential UCL to Use

Use 95% Student's-t UCL 7.875

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.

**Phosphorus**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 6 | Number of Detected Data | 3 |
| Number of Distinct Detected Data | 3 | Number of Non-Detect Data | 3 |
| | | Percent Non-Detects | 50.00% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 221 | Minimum Detected | 5.398 |
| Maximum Detected | 322 | Maximum Detected | 5.775 |
| Mean of Detected | 262 | Mean of Detected | 5.555 |
| SD of Detected | 53.11 | SD of Detected | 0.196 |
| Minimum Non-Detect | 50 | Minimum Non-Detect | 3.912 |
| Maximum Non-Detect | 50 | Maximum Non-Detect | 3.912 |

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 | 0.904 | Shapiro Wilk Test Statistic | 0.924 |
| 5% Shapiro Wilk Critical Value | 0.767 | 5% Shapiro Wilk Critical Value | 0.767 |

Data appear Normal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 143.5 |
| SD | 134.1 |
| 95% DL/2 (t) UCL | 253.8 |
| | |
| Maximum Likelihood Estimate(MLE) Method | |
| Mean | 81.54 |
| SD | 200.3 |
| 95% MLE (t) UCL | 246.4 |
| 95% MLE (Tiku) UCL | 284.4 |

Data appear Lognormal at 5% Significance Level

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 4.387 |
| SD | 1.286 |
| 95% H-Stat (DL/2) UCL | 3480 |
| | |
| Log ROS Method | |
| Mean in Log Scale | 5.226 |
| SD in Log Scale | 0.4 |
| Mean in Original Scale | 198.8 |
| SD in Original Scale | 78.62 |
| 95% t UCL | 263.5 |
| 95% Percentile Bootstrap UCL | 248.3 |
| 95% BCA Bootstrap UCL | 255.6 |
| 95% H UCL | 310.4 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | N/A |
| Theta Star | N/A |
| nu star | N/A |
| | |
| A-D Test Statistic | N/A |
| 5% A-D Critical Value | N/A |
| K-S Test Statistic | N/A |
| 5% K-S Critical Value | N/A |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | N/A |
| Maximum | N/A |
| Mean | N/A |
| Median | N/A |
| SD | N/A |
| k star | N/A |
| Theta star | N/A |
| Nu star | N/A |
| AppChi2 | N/A |
| 95% Gamma Approximate UCL (Use when n >= 40) | N/A |
| 95% Adjusted Gamma UCL (Use when n < 40) | N/A |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 241.5 |
| SD | 36.89 |
| SE of Mean | 18.44 |
| 95% KM (t) UCL | 278.7 |
| 95% KM (z) UCL | 271.8 |
| 95% KM (jackknife) UCL | 274.8 |
| 95% KM (bootstrap t) UCL | 321.8 |
| 95% KM (BCA) UCL | 322 |
| 95% KM (Percentile Bootstrap) UCL | 322 |
| 95% KM (Chebyshev) UCL | 321.9 |
| 97.5% KM (Chebyshev) UCL | 356.7 |
| 99% KM (Chebyshev) UCL | 425 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 278.7 |
| 95% KM (Percentile Bootstrap) UCL | 322 |

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.

**Potassium**

## General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Observations | 6 | Number of Distinct Observations | 5 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 1180 | Minimum of Log Data | 7.073 |
| Maximum | 1700 | Maximum of Log Data | 7.438 |
| Mean | 1355 | Mean of log Data | 7.199 |
| Geometric Mean | 1339 | SD of log Data | 0.168 |
| Median | 1225 | | |
| SD | 238.5 | | |
| Std. Error of Mean | 97.36 | | |
| Coefficient of Variation | 0.176 | | |
| Skewness | 0.985 | | |

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 | 0.74 | Shapiro Wilk Test Statistic | 0.746 |
| Shapiro Wilk Critical Value | 0.788 | Shapiro Wilk Critical Value | 0.788 |
| 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 | 1551 | 95% H-UCL | 1581 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 1759 |
| 95% Adjusted-CLT UCL (Chen-1995) | 1557 | 97.5% Chebyshev (MVUE) UCL | 1935 |
| 95% Modified-t UCL (Johnson-1978) | 1558 | 99% Chebyshev (MVUE) UCL | 2279 |

| Gamma Distribution Test | | Data Distribution |
|---|---|---|
| k star (bias corrected) | 20.78 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 65.2 | |
| MLE of Mean | 1355 | |
| MLE of Standard Deviation | 297.2 | |
| nu star | 249.4 | |
| Approximate Chi Square Value (.05) | 213.8 | **Nonparametric Statistics** |
| Adjusted Level of Significance | 0.0122 | 95% CLT UCL 1515 |
| Adjusted Chi Square Value | 201.9 | 95% Jackknife UCL 1551 |
| | | 95% Standard Bootstrap UCL 1499 |
| Anderson-Darling Test Statistic | 0.883 | 95% Bootstrap-t UCL 2878 |
| Anderson-Darling 5% Critical Value | 0.697 | 95% Hall's Bootstrap UCL 3273 |

| | | | |
|---|---|---|---|
| Kolmogorov-Smirnov Test Statistic | 0.379 | 95% Percentile Bootstrap UCL | 1513 |
| Kolmogorov-Smirnov 5% Critical Value | 0.332 | 95% BCA Bootstrap UCL | 1520 |
| Data not Gamma Distributed at 5% Significance Level | | 95% Chebyshev(Mean, Sd) UCL | 1779 |
| | | 97.5% Chebyshev(Mean, Sd) UCL | 1963 |
| **Assuming Gamma Distribution** | | 99% Chebyshev(Mean, Sd) UCL | 2324 |
| 95% Approximate Gamma UCL (Use when n >= 40) | 1580 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 1674 | | |
| **Potential UCL to Use** | | Use 95% Student's-t UCL | 1551 |
| | | or 95% Modified-t UCL | 1558 |

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.

**Selenium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 6 |
| Number of Distinct Detected Data | 6 | Number of Non-Detect Data | 26 |
| | | Percent Non-Detects | 81.25% |

| **Raw Statistics** | | **Log-transformed Statistics** | |
|---|---|---|---|
| Minimum Detected | 0.2 | Minimum Detected | -1.609 |
| Maximum Detected | 0.62 | Maximum Detected | -0.478 |
| Mean of Detected | 0.33 | Mean of Detected | -1.186 |
| SD of Detected | 0.156 | SD of Detected | 0.411 |
| Minimum Non-Detect | 0.2 | Minimum Non-Detect | -1.609 |
| Maximum Non-Detect | 0.2 | Maximum Non-Detect | -1.609 |

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 | 0.815 | Shapiro Wilk Test Statistic | 0.902 |
| 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 | 0.143 | Mean | -2.093 |
| SD | 0.111 | SD | 0.473 |
| 95% DL/2 (t) UCL | 0.176 | 95% H-Stat (DL/2) UCL | 0.162 |

| | |
|---|---|
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE yields a negative mean**

| | |
|---|---|
| Log ROS Method | |
| Mean in Log Scale | -2.792 |
| SD in Log Scale | 1.098 |
| Mean in Original Scale | 0.108 |
| SD in Original Scale | 0.13 |
| 95% t UCL | 0.147 |
| 95% Percentile Bootstrap UCL | 0.147 |
| 95% BCA Bootstrap UCL | 0.159 |
| 95% H-UCL | 0.185 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 3.429 |
| Theta Star | 0.0962 |
| nu star | 41.14 |
| | |
| A-D Test Statistic | 0.461 |
| 5% A-D Critical Value | 0.698 |
| K-S Test Statistic | 0.698 |
| 5% K-S Critical Value | 0.333 |

Data appear Gamma Distributed at 5% Significance Level

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 0.62 |
| Mean | 0.0619 |
| Median | 0.000001 |
| SD | 0.145 |
| k star | 0.106 |
| Theta star | 0.582 |
| Nu star | 6.809 |
| AppChi2 | 2.066 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.204 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.218 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.224 |
| SD | 0.0798 |
| SE of Mean | 0.0155 |
| 95% KM (t) UCL | 0.251 |
| 95% KM (z) UCL | 0.25 |
| 95% KM (jackknife) UCL | 0.253 |
| 95% KM (bootstrap t) UCL | 0.284 |
| 95% KM (BCA) UCL | 0.298 |
| 95% KM (Percentile Bootstrap) UCL | 0.283 |
| 95% KM (Chebyshev) UCL | 0.292 |
| 97.5% KM (Chebyshev) UCL | 0.321 |
| 99% KM (Chebyshev) UCL | 0.378 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.251 |
| 95% KM (Percentile Bootstrap) UCL | 0.283 |

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.

**Silver**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 32 |
| | | 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 Silver was not processed!

**Sodium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 8 | Number of Distinct Observations | 8 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 61 | Minimum of Log Data | 4.111 |
| Maximum | 470 | Maximum of Log Data | 6.153 |
| Mean | 211.3 | Mean of log Data | 5.185 |
| Geometric Mean | 178.5 | SD of log Data | 0.644 |
| Median | 220 | | |
| SD | 127.5 | | |
| Std. Error of Mean | 45.07 | | |
| Coefficient of Variation | 0.603 | | |
| Skewness | 1.098 | | |

Warning: There are only 8 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 | 0.9 | Shapiro Wilk Test Statistic | 0.954 |
| Shapiro Wilk Critical Value | 0.818 | Shapiro Wilk Critical Value | 0.818 |
| 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 | 296.6 | 95% H-UCL | 415.4 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 428 |
| 95% Adjusted-CLT UCL (Chen-1995) | 304.1 | 97.5% Chebyshev (MVUE) UCL | 520.9 |
| 95% Modified-t UCL (Johnson-1978) | 299.5 | 99% Chebyshev (MVUE) UCL | 703.3 |

| Gamma Distribution Test | | Data Distribution |
|---|---|---|
| k star (bias corrected) | 2.039 | Data appear Normal at 5% Significance Level |
| Theta Star | 103.6 | |
| MLE of Mean | 211.3 | |
| MLE of Standard Deviation | 147.9 | |
| nu star | 32.62 | |
| Approximate Chi Square Value (.05) | 20.57 | **Nonparametric Statistics** |
| Adjusted Level of Significance | 0.0195 | 95% CLT UCL 285.4 |
| Adjusted Chi Square Value | 18.19 | 95% Jackknife UCL 296.6 |
| | | 95% Standard Bootstrap UCL 281 |
| Anderson-Darling Test Statistic | 0.292 | 95% Bootstrap-t UCL 324.1 |

| | |
|---|---|
| Anderson-Darling 5% Critical Value | 0.721 |
| Kolmogorov-Smirnov Test Statistic | 0.196 |
| Kolmogorov-Smirnov 5% Critical Value | 0.296 |

Data appear Gamma Distributed at 5% Significance Level

| | |
|---|---|
| 95% Hall's Bootstrap UCL | 358.9 |
| 95% Percentile Bootstrap UCL | 282.4 |
| 95% BCA Bootstrap UCL | 300.1 |
| 95% Chebyshev(Mean, Sd) UCL | 407.7 |
| 97.5% Chebyshev(Mean, Sd) UCL | 492.7 |
| 99% Chebyshev(Mean, Sd) UCL | 659.6 |

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 335.1 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 379 |

**Potential UCL to Use**

Use 95% Student's-t UCL 296.6

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.

**Strontium**

**General Statistics**

| | |
|---|---|
| Number of Valid Observations | 6 |
| Number of Distinct Observations | 6 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 23 |
| Maximum | 42.6 |
| Mean | 31.65 |
| Geometric Mean | 30.81 |
| Median | 29.1 |
| SD | 8.159 |
| Std. Error of Mean | 3.331 |
| Coefficient of Variation | 0.258 |
| Skewness | 0.586 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 3.135 |
| Maximum of Log Data | 3.752 |
| Mean of log Data | 3.428 |
| 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 | 0.886 |
| Shapiro Wilk Critical Value | 0.788 |

Data appear Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.911 |
| Shapiro Wilk Critical Value | 0.788 |

Data appear Lognormal at 5% Significance Level

| Assuming Normal Distribution | |
|---|---|
| 95% Student's-t UCL | 38.36 |
| **95% UCLs (Adjusted for Skewness)** | |
| 95% Adjusted-CLT UCL (Chen-1995) | 37.98 |
| 95% Modified-t UCL (Johnson-1978) | 38.5 |

| Assuming Lognormal Distribution | |
|---|---|
| 95% H-UCL | 40.52 |
| 95% Chebyshev (MVUE) UCL | 45.83 |
| 97.5% Chebyshev (MVUE) UCL | 51.97 |
| 99% Chebyshev (MVUE) UCL | 64.03 |

| Gamma Distribution Test | |
|---|---|
| k star (bias corrected) | 9.486 |
| Theta Star | 3.337 |
| MLE of Mean | 31.65 |
| MLE of Standard Deviation | 10.28 |
| nu star | 113.8 |
| Approximate Chi Square Value (.05) | 90.2 |
| Adjusted Level of Significance | 0.0122 |
| Adjusted Chi Square Value | 82.61 |
| Anderson-Darling Test Statistic | 0.381 |
| Anderson-Darling 5% Critical Value | 0.697 |
| Kolmogorov-Smirnov Test Statistic | 0.218 |
| Kolmogorov-Smirnov 5% Critical Value | 0.332 |

Data appear Gamma Distributed at 5% Significance Level

| Assuming Gamma Distribution | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 39.94 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 43.61 |

**Data Distribution**

Data appear Normal at 5% Significance Level

| Nonparametric Statistics | |
|---|---|
| 95% CLT UCL | 37.13 |
| 95% Jackknife UCL | 38.36 |
| 95% Standard Bootstrap UCL | 36.81 |
| 95% Bootstrap-t UCL | 43.8 |
| 95% Hall's Bootstrap UCL | 45.68 |
| 95% Percentile Bootstrap UCL | 36.52 |
| 95% BCA Bootstrap UCL | 37.15 |
| 95% Chebyshev(Mean, Sd) UCL | 46.17 |
| 97.5% Chebyshev(Mean, Sd) UCL | 52.45 |
| 99% Chebyshev(Mean, Sd) UCL | 64.79 |

| Potential UCL to Use | |
|---|---|
| Use 95% Student's-t UCL | 38.36 |

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.

**Sulfur**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 13 | Number of Detected Data | 4 |
| Number of Distinct Detected Data | 3 | Number of Non-Detect Data | 9 |
| | | Percent Non-Detects | 69.23% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 500 | Minimum Detected | 6.215 |
| Maximum Detected | 1100 | Maximum Detected | 7.003 |
| Mean of Detected | 800 | Mean of Detected | 6.647 |
| SD of Detected | 244.9 | SD of Detected | 0.325 |
| Minimum Non-Detect | 500 | Minimum Non-Detect | 6.215 |
| Maximum Non-Detect | 500 | Maximum Non-Detect | 6.215 |

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

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.944 |
| 5% Shapiro Wilk Critical Value | 0.748 |

Data appear Normal at 5% Significance Level

### Lognormal Distribution Test with Detected Values Only

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.927 |
| 5% Shapiro Wilk Critical Value | 0.748 |

Data appear Lognormal at 5% Significance Level

### Assuming Normal Distribution

DL/2 Substitution Method

| | |
|---|---|
| Mean | 419.2 |
| SD | 291.2 |
| 95% DL/2 (t) UCL | 563.2 |

Maximum Likelihood Estimate(MLE) Method

| | |
|---|---|
| Mean | 281 |
| SD | 448 |
| 95% MLE (t) UCL | 502.4 |
| 95% MLE (Tiku) UCL | 656.9 |

### Assuming Lognormal Distribution

DL/2 Substitution Method

| | |
|---|---|
| Mean | 5.868 |
| SD | 0.564 |
| 95% H-Stat (DL/2) UCL | 592.2 |

Log ROS Method

| | |
|---|---|
| Mean in Log Scale | 5.784 |
| SD in Log Scale | 0.733 |
| Mean in Original Scale | 414.7 |
| SD in Original Scale | 306.6 |
| 95% t UCL | 566.3 |
| 95% Percentile Bootstrap UCL | 555.1 |
| 95% BCA Bootstrap UCL | 580.8 |
| 95% H UCL | 709.3 |

### Gamma Distribution Test with Detected Values Only

| | |
|---|---|
| k star (bias corrected) | 3.507 |
| Theta Star | 228.1 |
| nu star | 28.06 |
| A-D Test Statistic | 0.344 |
| 5% A-D Critical Value | 0.657 |
| K-S Test Statistic | 0.657 |
| 5% K-S Critical Value | 0.395 |

Data appear Gamma Distributed at 5% Significance Level

### Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 1100 |
| Mean | 254 |
| Median | 0.000001 |
| SD | 399.1 |
| k star | 0.107 |
| Theta star | 2373 |
| Nu star | 2.783 |
| AppChi2 | 0.311 |

### Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

### Nonparametric Statistics

Kaplan-Meier (KM) Method

| | |
|---|---|
| Mean | 592.3 |
| SD | 181.7 |
| SE of Mean | 58.19 |
| 95% KM (t) UCL | 696 |
| 95% KM (z) UCL | 688 |
| 95% KM (jackknife) UCL | N/A |
| 95% KM (bootstrap t) UCL | N/A |
| 95% KM (BCA) UCL | N/A |
| 95% KM (Percentile Bootstrap) UCL | N/A |
| 95% KM (Chebyshev) UCL | 846 |
| 97.5% KM (Chebyshev) UCL | 955.7 |
| 99% KM (Chebyshev) UCL | 1171 |

### Potential UCLs to Use

| | |
|---|---|
| 95% KM (t) UCL | 696 |

| | | | |
|---|---|---|---|
| 95% Gamma Approximate UCL (Use when n >= 40) | 2272 | 95% KM (Percentile Bootstrap) UCL | N/A |
| 95% Adjusted Gamma UCL (Use when n < 40) | 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.

**Thallium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 22 |
| Number of Distinct Detected Data | 19 | Number of Non-Detect Data | 10 |
| | | Percent Non-Detects | 31.25% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.05 | Minimum Detected | -2.996 |
| Maximum Detected | 0.186 | Maximum Detected | -1.682 |
| Mean of Detected | 0.0805 | Mean of Detected | -2.573 |
| SD of Detected | 0.0302 | SD of Detected | 0.318 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.05 | Maximum Non-Detect | -2.996 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.802 | Shapiro Wilk Test Statistic | 0.932 |
| 5% Shapiro Wilk Critical Value | 0.911 | 5% 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 | |
|---|---|---|---|
| DL/2 Substitution Method | | DL/2 Substitution Method | |
| Mean | 0.0631 | Mean | -2.922 |
| SD | 0.0361 | SD | 0.587 |
| 95% DL/2 (t) UCL | 0.0739 | 95% H-Stat (DL/2) UCL | 0.079 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 0.0629 | Mean in Log Scale | -2.816 |
| SD | 0.0375 | SD in Log Scale | 0.464 |
| 95% MLE (t) UCL | 0.0742 | Mean in Original Scale | 0.0665 |
| 95% MLE (Tiku) UCL | 0.0748 | SD in Original Scale | 0.0328 |
| | | 95% t UCL | 0.0763 |
| | | 95% Percentile Bootstrap UCL | 0.0765 |
| | | 95% BCA Bootstrap UCL | 0.0781 |
| | | 95% H UCL | 0.0781 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 8.316 | Data appear Gamma Distributed at 5% Significance Level |
| Theta Star | 0.00967 | |
| nu star | 365.9 | |

| | |
|---|---|
| A-D Test Statistic | 0.534 |
| 5% A-D Critical Value | 0.744 |
| K-S Test Statistic | 0.744 |
| 5% K-S Critical Value | 0.185 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 0.186 |
| Mean | 0.0568 |
| Median | 0.0635 |
| SD | 0.0437 |
| k star | 0.313 |
| Theta star | 0.182 |
| Nu star | 20.03 |
| AppChi2 | 10.87 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.105 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.108 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.0709 |
| SD | 0.0282 |
| SE of Mean | 0.00511 |
| 95% KM (t) UCL | 0.0796 |
| 95% KM (z) UCL | 0.0793 |
| 95% KM (jackknife) UCL | 0.0793 |
| 95% KM (bootstrap t) UCL | 0.0831 |
| 95% KM (BCA) UCL | 0.0798 |
| 95% KM (Percentile Bootstrap) UCL | 0.0799 |
| 95% KM (Chebyshev) UCL | 0.0932 |
| 97.5% KM (Chebyshev) UCL | 0.103 |
| 99% KM (Chebyshev) UCL | 0.122 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (Percentile Bootstrap) UCL | 0.0799 |

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.

Tin

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 32 | Number of Detected Data | 0 |
| Number of Distinct Detected Data | 0 | Number of Non-Detect Data | 32 |
| | | 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 Tin was not processed!

Titanium

## General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Observations | 6 | Number of Distinct Observations | 6 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 211 | Minimum of Log Data | 5.352 |
| Maximum | 486 | Maximum of Log Data | 6.186 |
| Mean | 343.5 | Mean of log Data | 5.808 |
| Geometric Mean | 332.8 | SD of log Data | 0.279 |
| Median | 324 | | |
| SD | 92.48 | | |
| Std. Error of Mean | 37.75 | | |
| Coefficient of Variation | 0.269 | | |
| Skewness | 0.273 | | |

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 | 0.95 | Shapiro Wilk Test Statistic | 0.94 |
| 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 | 419.6 | 95% H-UCL | 455.1 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 514.7 |
| 95% Adjusted-CLT UCL (Chen-1995) | 410.1 | 97.5% Chebyshev (MVUE) UCL | 588.7 |
| 95% Modified-t UCL (Johnson-1978) | 420.3 | 99% Chebyshev (MVUE) UCL | 734 |

| Gamma Distribution Test | | Data Distribution |
|---|---|---|
| k star (bias corrected) | 8.125 | Data appear Normal at 5% Significance Level |
| Theta Star | 42.28 | |
| MLE of Mean | 343.5 | |
| MLE of Standard Deviation | 120.5 | |
| nu star | 97.5 | |
| Approximate Chi Square Value (.05) | 75.72 | **Nonparametric Statistics** |
| Adjusted Level of Significance | 0.0122 | 95% CLT UCL 405.6 |
| Adjusted Chi Square Value | 68.82 | 95% Jackknife UCL 419.6 |
| | | 95% Standard Bootstrap UCL 401 |

| | |
|---|---|
| Anderson-Darling Test Statistic | 0.318 |
| Anderson-Darling 5% Critical Value | 0.698 |
| Kolmogorov-Smirnov Test Statistic | 0.232 |
| Kolmogorov-Smirnov 5% Critical Value | 0.332 |

Data appear Gamma Distributed at 5% Significance Level

| | |
|---|---|
| 95% Bootstrap-t UCL | 439.3 |
| 95% Hall's Bootstrap UCL | 507.6 |
| 95% Percentile Bootstrap UCL | 402.7 |
| 95% BCA Bootstrap UCL | 400.7 |
| 95% Chebyshev(Mean, Sd) UCL | 508.1 |
| 97.5% Chebyshev(Mean, Sd) UCL | 579.3 |
| 99% Chebyshev(Mean, Sd) UCL | 719.1 |

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 442.3 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 486.7 |

Potential UCL to Use

Use 95% Student's-t UCL 419.6

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.

**Uranium**

**General Statistics**

| | |
|---|---|
| Number of Valid Observations | 32 |
| Number of Distinct Observations | 30 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 0.332 |
| Maximum | 1.11 |
| Mean | 0.54 |
| Geometric Mean | 0.516 |
| Median | 0.499 |
| SD | 0.18 |
| Std. Error of Mean | 0.0318 |
| Coefficient of Variation | 0.333 |
| Skewness | 1.492 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | -1.103 |
| Maximum of Log Data | 0.104 |
| Mean of log Data | -0.662 |
| SD of log Data | 0.297 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.867 |
| Shapiro Wilk Critical Value | 0.93 |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.947 |
| Shapiro Wilk Critical Value | 0.93 |

Data appear Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 0.594 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 0.601 |
| 95% Modified-t UCL (Johnson-1978) | 0.595 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 0.594 |
| 95% Chebyshev (MVUE) UCL | 0.664 |
| 97.5% Chebyshev (MVUE) UCL | 0.718 |
| 99% Chebyshev (MVUE) UCL | 0.825 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 10.08 |
| Theta Star | 0.0536 |
| MLE of Mean | 0.54 |
| MLE of Standard Deviation | 0.17 |
| nu star | 645.4 |

**Data Distribution**

Data Follow Appr. Gamma Distribution at 5% Significance Level

| | |
|---|---|
| Approximate Chi Square Value (.05) | 587.4 |
| Adjusted Level of Significance | 0.0416 |
| Adjusted Chi Square Value | 584.5 |
| Anderson-Darling Test Statistic | 0.692 |
| Anderson-Darling 5% Critical Value | 0.746 |
| Kolmogorov-Smirnov Test Statistic | 0.167 |
| Kolmogorov-Smirnov 5% Critical Value | 0.155 |

Data follow Appr. Gamma Distribution at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 0.593 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.596 |

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 0.592 |
| 95% Jackknife UCL | 0.594 |
| 95% Standard Bootstrap UCL | 0.592 |
| 95% Bootstrap-t UCL | 0.605 |
| 95% Hall's Bootstrap UCL | 0.615 |
| 95% Percentile Bootstrap UCL | 0.594 |
| 95% BCA Bootstrap UCL | 0.602 |
| 95% Chebyshev(Mean, Sd) UCL | 0.679 |
| 97.5% Chebyshev(Mean, Sd) UCL | 0.739 |
| 99% Chebyshev(Mean, Sd) UCL | 0.856 |

**Potential UCL to Use**

Use 95% Approximate Gamma UCL 0.593

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 | 32 |
| Number of Distinct Observations | 32 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 26.2 |
| Maximum | 92.6 |
| Mean | 64.15 |
| Geometric Mean | 61.64 |
| Median | 69.4 |
| SD | 16.47 |
| Std. Error of Mean | 2.912 |
| Coefficient of Variation | 0.257 |
| Skewness | -0.709 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 3.266 |
| Maximum of Log Data | 4.528 |
| Mean of log Data | 4.121 |
| SD of log Data | 0.305 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.928 |
| Shapiro Wilk Critical Value | 0.93 |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.86 |
| Shapiro Wilk Critical Value | 0.93 |

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 69.09 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 68.55 |
| 95% Modified-t UCL (Johnson-1978) | 69.03 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 71.28 |
| 95% Chebyshev (MVUE) UCL | 79.93 |
| 97.5% Chebyshev (MVUE) UCL | 86.61 |
| 99% Chebyshev (MVUE) UCL | 99.73 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 11.52 |

**Data Distribution**

Data do not follow a Discernable Distribution (0.05)

| | |
|---|---|
| Theta Star | 5.567 |
| MLE of Mean | 64.15 |
| MLE of Standard Deviation | 18.9 |
| nu star | 737.5 |
| Approximate Chi Square Value (.05) | 675.5 |
| Adjusted Level of Significance | 0.0416 |
| Adjusted Chi Square Value | 672.3 |
| Anderson-Darling Test Statistic | 1.545 |
| Anderson-Darling 5% Critical Value | 0.746 |
| Kolmogorov-Smirnov Test Statistic | 0.188 |
| Kolmogorov-Smirnov 5% Critical Value | 0.155 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 70.04 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 70.37 |

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 68.94 |
| 95% Jackknife UCL | 69.09 |
| 95% Standard Bootstrap UCL | 68.98 |
| 95% Bootstrap-t UCL | 68.62 |
| 95% Hall's Bootstrap UCL | 68.63 |
| 95% Percentile Bootstrap UCL | 68.84 |
| 95% BCA Bootstrap UCL | 68.31 |
| 95% Chebyshev(Mean, Sd) UCL | 76.84 |
| 97.5% Chebyshev(Mean, Sd) UCL | 82.33 |
| 99% Chebyshev(Mean, Sd) UCL | 93.12 |

| | |
|---|---|
| Potential UCL to Use | Use 95% Student's-t UCL 69.09 |
| | or 95% Modified-t UCL 69.03 |

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 positvely skewed data sets.

**Zinc**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 39 | Number of Distinct Observations | 38 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 19 |
| Maximum | 69.4 |
| Mean | 51.41 |
| Geometric Mean | 49.77 |
| Median | 53.4 |
| SD | 11.49 |
| Std. Error of Mean | 1.84 |
| Coefficient of Variation | 0.224 |
| Skewness | -1.036 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 2.944 |
| Maximum of Log Data | 4.24 |
| Mean of log Data | 3.907 |
| SD of log Data | 0.281 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.925 |
| Shapiro Wilk Critical Value | 0.939 |

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.8 |
| Shapiro Wilk Critical Value | 0.939 |

Data not Normal at 5% Significance Level

Data not Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 54.51 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 54.11 |
| 95% Modified-t UCL (Johnson-1978) | 54.46 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 56.15 |
| 95% Chebyshev (MVUE) UCL | 62.04 |
| 97.5% Chebyshev (MVUE) UCL | 66.5 |
| 99% Chebyshev (MVUE) UCL | 75.27 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 14.36 |
| Theta Star | 3.58 |
| MLE of Mean | 51.41 |
| MLE of Standard Deviation | 13.57 |
| nu star | 1120 |
| Approximate Chi Square Value (.05) | 1043 |
| Adjusted Level of Significance | 0.0437 |
| Adjusted Chi Square Value | 1040 |
| Anderson-Darling Test Statistic | 1.549 |
| Anderson-Darling 5% Critical Value | 0.747 |
| Kolmogorov-Smirnov Test Statistic | 0.159 |
| Kolmogorov-Smirnov 5% Critical Value | 0.141 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 55.19 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 55.34 |

**Data Distribution**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 54.44 |
| 95% Jackknife UCL | 54.51 |
| 95% Standard Bootstrap UCL | 54.43 |
| 95% Bootstrap-t UCL | 54.14 |
| 95% Hall's Bootstrap UCL | 54.18 |
| 95% Percentile Bootstrap UCL | 54.35 |
| 95% BCA Bootstrap UCL | 54.22 |
| 95% Chebyshev(Mean, Sd) UCL | 59.43 |
| 97.5% Chebyshev(Mean, Sd) UCL | 62.9 |
| 99% Chebyshev(Mean, Sd) UCL | 69.72 |

**Potential UCL to Use**

Use 95% Student's-t UCL 54.51

or 95% Modified-t UCL 54.46

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.

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 positvely skewed data sets.

From File: Metals Input.wst

### Summary Statistics for Raw Full Data Sets

| Variable | NumObs | Minimum | Maximum | Mean | Median | Variance | SD | MAD/0.675 | Skewness | Kurtosis | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_SEDIMENT pH | 6 | 7.14 | 9.21 | 7.958 | 7.74 | 0.682 | 0.826 | 0.756 | 0.653 | -1.207 | 0.104 |
| LnROS_Copper | 9 | 14.9 | 47.3 | 26.79 | 22.8 | 111.3 | 10.55 | 6.375 | 1.046 | 0.315 | 0.394 |
| LnROS_Nickel | 8 | 8.1 | 13.8 | 11.21 | 11.25 | 3.939 | 1.985 | 2.439 | -0.23 | -1.009 | 0.177 |
| LnROS_Sulfur | 6 | 240 | 1300 | 654.1 | 490 | 197504 | 444.4 | 322.6 | 0.764 | -1.522 | 0.679 |
| LnROS_Zinc | 8 | 36 | 64.5 | 54.41 | 56.85 | 110.9 | 10.53 | 9.044 | -0.827 | -0.536 | 0.194 |

### Percentiles for Raw Full Data Sets

| Variable | NumObs | 5%ile | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | 99%ile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_SEDIMENT pH | 6 | 7.185 | 7.23 | 7.32 | 7.335 | 7.74 | 8.475 | 8.6 | 8.905 | 9.058 | 9.18 |
| LnROS_Copper | 9 | 16.34 | 17.78 | 19.1 | 19.5 | 22.8 | 31.8 | 34.56 | 40.42 | 43.86 | 46.61 |
| LnROS_Nickel | 8 | 8.524 | 8.947 | 9.626 | 9.903 | 11.25 | 12.78 | 13.02 | 13.45 | 13.63 | 13.77 |
| LnROS_Sulfur | 6 | 256.2 | 272.4 | 304.9 | 323.6 | 490 | 975 | 1100 | 1200 | 1250 | 1290 |
| LnROS_Zinc | 8 | 38.45 | 40.9 | 46.68 | 49.9 | 56.85 | 62.33 | 63.2 | 64.29 | 64.4 | 64.48 |

## General UCL Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| From File | Metals Input.wst |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**SEDIMENT pH**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 6 | Number of Distinct Observations | 6 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 7.14 | Minimum of Log Data | 1.966 |
| Maximum | 9.21 | Maximum of Log Data | 2.22 |
| Mean | 7.958 | Mean of log Data | 2.07 |
| Geometric Mean | 7.924 | SD of log Data | 0.102 |
| Median | 7.74 | | |
| SD | 0.826 | | |
| Std. Error of Mean | 0.337 | | |
| Coefficient of Variation | 0.104 | | |
| Skewness | 0.653 | | |

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 | 0.902 | Shapiro Wilk Test Statistic | 0.906 |
| 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 | 8.638 | 95% H-UCL | 8.703 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 9.402 |
| 95% Adjusted-CLT UCL (Chen-1995) | 8.609 | 97.5% Chebyshev (MVUE) UCL | 10.03 |
| 95% Modified-t UCL (Johnson-1978) | 8.653 | 99% Chebyshev (MVUE) UCL | 11.25 |

| Gamma Distribution Test | | Data Distribution |
|---|---|---|
| k star (bias corrected) | 57.22 | Data appear Normal at 5% Significance Level |
| Theta Star | 0.139 | |
| MLE of Mean | 7.958 | |
| MLE of Standard Deviation | 1.052 | |

| | |
|---|---|
| nu star | 686.6 |
| Approximate Chi Square Value (.05) | 626.8 |
| Adjusted Level of Significance | 0.0122 |
| Adjusted Chi Square Value | 606 |
| Anderson-Darling Test Statistic | 0.381 |
| Anderson-Darling 5% Critical Value | 0.696 |
| Kolmogorov-Smirnov Test Statistic | 0.278 |
| Kolmogorov-Smirnov 5% Critical Value | 0.332 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 8.718 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 9.018 |

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 8.513 |
| 95% Jackknife UCL | 8.638 |
| 95% Standard Bootstrap UCL | 8.449 |
| 95% Bootstrap-t UCL | 8.734 |
| 95% Hall's Bootstrap UCL | 8.528 |
| 95% Percentile Bootstrap UCL | 8.477 |
| 95% BCA Bootstrap UCL | 8.498 |
| 95% Chebyshev(Mean, Sd) UCL | 9.428 |
| 97.5% Chebyshev(Mean, Sd) UCL | 10.06 |
| 99% Chebyshev(Mean, Sd) UCL | 11.31 |

Potential UCL to Use

Use 95% Student's-t UCL 8.638

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 | 9 | Number of Distinct Observations | 9 |

| **Raw Statistics** | | **Log-transformed Statistics** | |
|---|---|---|---|
| Minimum | 14.9 | Minimum of Log Data | 2.701 |
| Maximum | 47.3 | Maximum of Log Data | 3.857 |
| Mean | 26.79 | Mean of log Data | 3.225 |
| Geometric Mean | 25.15 | SD of log Data | 0.371 |
| Median | 22.8 | | |
| SD | 10.55 | | |
| Std. Error of Mean | 3.517 | | |
| Coefficient of Variation | 0.394 | | |
| Skewness | 1.046 | | |

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 | 0.905 | Shapiro Wilk Test Statistic | 0.965 |
| Shapiro Wilk Critical Value | 0.829 | Shapiro Wilk Critical Value | 0.829 |

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 | 33.33 | 95% H-UCL | 35.45 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 41.23 |

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 33.88 |
| 95% Modified-t UCL (Johnson-1978) | 33.53 |

| | |
|---|---|
| 97.5% Chebyshev (MVUE) UCL | 47.51 |
| 99% Chebyshev (MVUE) UCL | 59.85 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 5.45 |
| Theta Star | 4.915 |
| MLE of Mean | 26.79 |
| MLE of Standard Deviation | 11.47 |
| nu star | 98.11 |
| Approximate Chi Square Value (.05) | 76.26 |
| Adjusted Level of Significance | 0.0231 |
| Adjusted Chi Square Value | 72.21 |
| Anderson-Darling Test Statistic | 0.294 |
| Anderson-Darling 5% Critical Value | 0.722 |
| Kolmogorov-Smirnov Test Statistic | 0.184 |
| Kolmogorov-Smirnov 5% Critical Value | 0.28 |

Data appear Gamma Distributed at 5% Significance Level

**Data Distribution**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 32.57 |
| 95% Jackknife UCL | 33.33 |
| 95% Standard Bootstrap UCL | 32.35 |
| 95% Bootstrap-t UCL | 37.03 |
| 95% Hall's Bootstrap UCL | 36.43 |
| 95% Percentile Bootstrap UCL | 32.71 |
| 95% BCA Bootstrap UCL | 33.04 |
| 95% Chebyshev(Mean, Sd) UCL | 42.12 |
| 97.5% Chebyshev(Mean, Sd) UCL | 48.75 |
| 99% Chebyshev(Mean, Sd) UCL | 61.78 |

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 34.46 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 36.4 |

**Potential UCL to Use**

Use 95% Student's-t UCL 33.33

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.

**Nickel**

**General Statistics**

| | |
|---|---|
| Number of Valid Observations | 8 |
| Number of Distinct Observations | 8 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 8.1 |
| Maximum | 13.8 |
| Mean | 11.21 |
| Geometric Mean | 11.05 |
| Median | 11.25 |
| SD | 1.985 |
| Std. Error of Mean | 0.702 |
| Coefficient of Variation | 0.177 |
| Skewness | -0.23 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 2.092 |
| Maximum of Log Data | 2.625 |
| Mean of log Data | 2.403 |
| SD of log Data | 0.184 |

Warning: There are only 8 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 | 0.967 |
| Shapiro Wilk Critical Value | 0.818 |

Data appear Normal at 5% Significance Level

| Lognormal Distribution Test | |
|---|---|
| Shapiro Wilk Test Statistic | 0.958 |
| Shapiro Wilk Critical Value | 0.818 |

Data appear Lognormal at 5% Significance Level

| Assuming Normal Distribution | |
|---|---|
| 95% Student's-t UCL | 12.54 |
| **95% UCLs (Adjusted for Skewness)** | |
| 95% Adjusted-CLT UCL (Chen-1995) | 12.31 |
| 95% Modified-t UCL (Johnson-1978) | 12.53 |

| Assuming Lognormal Distribution | |
|---|---|
| 95% H-UCL | 12.85 |
| 95% Chebyshev (MVUE) UCL | 14.4 |
| 97.5% Chebyshev (MVUE) UCL | 15.77 |
| 99% Chebyshev (MVUE) UCL | 18.47 |

| Gamma Distribution Test | |
|---|---|
| k star (bias corrected) | 21.94 |
| Theta Star | 0.511 |
| MLE of Mean | 11.21 |
| MLE of Standard Deviation | 2.394 |
| nu star | 351 |
| Approximate Chi Square Value (.05) | 308.6 |
| Adjusted Level of Significance | 0.0195 |
| Adjusted Chi Square Value | 298.5 |
| Anderson-Darling Test Statistic | 0.201 |
| Anderson-Darling 5% Critical Value | 0.715 |
| Kolmogorov-Smirnov Test Statistic | 0.151 |
| Kolmogorov-Smirnov 5% Critical Value | 0.294 |

Data appear Gamma Distributed at 5% Significance Level

| Assuming Gamma Distribution | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 12.76 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 13.19 |

**Data Distribution**

Data appear Normal at 5% Significance Level

| Nonparametric Statistics | |
|---|---|
| 95% CLT UCL | 12.37 |
| 95% Jackknife UCL | 12.54 |
| 95% Standard Bootstrap UCL | 12.32 |
| 95% Bootstrap-t UCL | 12.56 |
| 95% Hall's Bootstrap UCL | 12.26 |
| 95% Percentile Bootstrap UCL | 12.26 |
| 95% BCA Bootstrap UCL | 12.2 |
| 95% Chebyshev(Mean, Sd) UCL | 14.27 |
| 97.5% Chebyshev(Mean, Sd) UCL | 15.6 |
| 99% Chebyshev(Mean, Sd) UCL | 18.2 |

**Potential UCL to Use** Use 95% Student's-t UCL 12.54

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.

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 positvely skewed data sets.

**Sulfur**

**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 | 240 | Minimum Detected | 5.481 |
| Maximum Detected | 1300 | Maximum Detected | 7.17 |
| Mean of Detected | 724 | Mean of Detected | 6.398 |

| | | | |
|---|---|---|---|
| SD of Detected | 458.6 | SD of Detected | 0.709 |
| Minimum Non-Detect | 500 | Minimum Non-Detect | 6.215 |
| Maximum Non-Detect | 500 | Maximum Non-Detect | 6.215 |

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**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.917 |
| 5% Shapiro Wilk Critical Value | 0.762 |

Data appear Normal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 645 |
| SD | 453.5 |
| 95% DL/2 (t) UCL | 1018 |
| | |
| Maximum Likelihood Estimate(MLE) Method | |
| Mean | 528.6 |
| SD | 567.8 |
| 95% MLE (t) UCL | 995.7 |
| 95% MLE (Tiku) UCL | 1103 |

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.945 |
| 5% Shapiro Wilk Critical Value | 0.762 |

Data appear Lognormal at 5% Significance Level

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 6.252 |
| SD | 0.729 |
| 95% H-Stat (DL/2) UCL | 1956 |
| | |
| Log ROS Method | |
| Mean in Log Scale | 6.285 |
| SD in Log Scale | 0.692 |
| Mean in Original Scale | 654.1 |
| SD in Original Scale | 444.4 |
| 95% t UCL | 1020 |
| 95% Percentile Bootstrap UCL | 940 |
| 95% BCA Bootstrap UCL | 970 |
| 95% H UCL | 1808 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 1.267 |
| Theta Star | 571.3 |
| nu star | 12.67 |
| | |
| A-D Test Statistic | 0.274 |
| 5% A-D Critical Value | 0.683 |
| K-S Test Statistic | 0.683 |
| 5% K-S Critical Value | 0.36 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 240 |
| Maximum | 1300 |
| Mean | 650.5 |
| Median | 490 |
| SD | 447.9 |
| k star | 1.408 |
| Theta star | 462 |

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 655 |
| SD | 406 |
| SE of Mean | 186 |
| 95% KM (t) UCL | 1030 |
| 95% KM (z) UCL | 960.9 |
| 95% KM (jackknife) UCL | 1025 |
| 95% KM (bootstrap t) UCL | 1331 |
| 95% KM (BCA) UCL | 960 |
| 95% KM (Percentile Bootstrap) UCL | 963.3 |
| 95% KM (Chebyshev) UCL | 1466 |
| 97.5% KM (Chebyshev) UCL | 1816 |
| 99% KM (Chebyshev) UCL | 2506 |

| | |
|---|---|
| Nu star | 16.9 |
| AppChi2 | 8.597 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 1278 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 1672 |

Note: DL/2 is not a recommended method.

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 1030 |
| 95% KM (Percentile Bootstrap) UCL | 963.3 |

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

Zinc

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 8 | Number of Distinct Observations | 8 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 36 |
| Maximum | 64.5 |
| Mean | 54.41 |
| Geometric Mean | 53.42 |
| Median | 56.85 |
| SD | 10.53 |
| Std. Error of Mean | 3.723 |
| Coefficient of Variation | 0.194 |
| Skewness | -0.827 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 3.584 |
| Maximum of Log Data | 4.167 |
| Mean of log Data | 3.978 |
| SD of log Data | 0.211 |

Warning: There are only 8 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 | 0.878 |
| Shapiro Wilk Critical Value | 0.818 |

Data appear Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.857 |
| Shapiro Wilk Critical Value | 0.818 |

Data appear Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 61.47 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 59.37 |
| 95% Modified-t UCL (Johnson-1978) | 61.29 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 63.86 |
| 95% Chebyshev (MVUE) UCL | 72.25 |
| 97.5% Chebyshev (MVUE) UCL | 79.95 |
| 99% Chebyshev (MVUE) UCL | 95.06 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 17.16 |
| Theta Star | 3.171 |
| MLE of Mean | 54.41 |
| MLE of Standard Deviation | 13.14 |
| nu star | 274.5 |
| Approximate Chi Square Value (.05) | 237.2 |
| Adjusted Level of Significance | 0.0195 |

**Data Distribution**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 60.54 |

| | |
|---|---|
| Adjusted Chi Square Value | 228.3 |
| Anderson-Darling Test Statistic | 0.537 |
| Anderson-Darling 5% Critical Value | 0.716 |
| Kolmogorov-Smirnov Test Statistic | 0.258 |
| Kolmogorov-Smirnov 5% Critical Value | 0.294 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 62.99 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 65.42 |

| | |
|---|---|
| 95% Jackknife UCL | 61.47 |
| 95% Standard Bootstrap UCL | 60.2 |
| 95% Bootstrap-t UCL | 60.14 |
| 95% Hall's Bootstrap UCL | 59.26 |
| 95% Percentile Bootstrap UCL | 59.88 |
| 95% BCA Bootstrap UCL | 59.48 |
| 95% Chebyshev(Mean, Sd) UCL | 70.64 |
| 97.5% Chebyshev(Mean, Sd) UCL | 77.66 |
| 99% Chebyshev(Mean, Sd) UCL | 91.46 |

| | |
|---|---|
| Potential UCL to Use | Use 95% Student's-t UCL 61.47 |

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 positvely skewed data sets.

From File: PHCs Input.wst

### Summary Statistics for Raw Full Data Sets

| Variable | NumObs | Minimum | Maximum | Mean | Median | Variance | SD | MAD/0.675 | Skewness | Kurtosis | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ROS_EPHw(C10-<C19)1 | 28 | 26.16 | 1520 | 264.1 | 163.9 | 89138 | 298.6 | 155.3 | 3.018 | 11.5 | 1.131 |
| nROS_EPHw(C19-C32)1 | 28 | 57.9 | 2180 | 542.8 | 293.8 | 244004 | 494 | 288.6 | 1.589 | 3.064 | 0.91 |
| LnROS_LEPH | 28 | 26.16 | 1520 | 264.1 | 163.9 | 89138 | 298.6 | 155.3 | 3.018 | 11.5 | 1.131 |
| LnROS_HEPH | 28 | 57.58 | 2170 | 541.4 | 292.7 | 242794 | 492.7 | 289 | 1.581 | 3.012 | 0.91 |
| · EPH[C19-C32] + VPH) | 16 | 220 | 2890 | 1188 | 1230 | 489483 | 699.6 | 541.1 | 0.734 | 0.959 | 0.589 |

### Percentiles for Raw Full Data Sets

| Variable | NumObs | 5%ile | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | 99%ile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ROS_EPHw(C10-<C19)1 | 28 | 40 | 52.16 | 75.73 | 87.97 | 163.9 | 345 | 378 | 481 | 647 | 1301 |
| nROS_EPHw(C19-C32)1 | 28 | 87.73 | 113.8 | 163.8 | 189.6 | 293.8 | 892.5 | 918 | 1071 | 1296 | 1967 |
| LnROS_LEPH | 28 | 40 | 52.16 | 75.73 | 87.97 | 163.9 | 345 | 378 | 481 | 647 | 1301 |
| LnROS_HEPH | 28 | 87.3 | 113.2 | 163.1 | 188.8 | 292.7 | 892.5 | 912 | 1071 | 1296 | 1959 |
| · EPH[C19-C32] + VPH) | 16 | 235 | 360 | 490 | 760 | 1230 | 1490 | 1580 | 1930 | 2178 | 2748 |

## General UCL Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| From File | PHCs Input.wst |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**EPHw(C10-<C19)1**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 28 | Number of Detected Data | 13 |
| Number of Distinct Detected Data | 11 | Number of Non-Detect Data | 15 |
| | | Percent Non-Detects | 53.57% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 220 | Minimum Detected | 5.394 |
| Maximum Detected | 1520 | Maximum Detected | 7.326 |
| Mean of Detected | 460.8 | Mean of Detected | 5.972 |
| SD of Detected | 346.4 | SD of Detected | 0.531 |
| Minimum Non-Detect | 200 | Minimum Non-Detect | 5.298 |
| Maximum Non-Detect | 200 | Maximum Non-Detect | 5.298 |

**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 | 0.885 |
| 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 | | Assuming Lognormal Distribution | |
|---|---|---|---|
| DL/2 Substitution Method | | DL/2 Substitution Method | |
| Mean | 267.5 | Mean | 5.24 |
| SD | 294.8 | SD | 0.78 |
| 95% DL/2 (t) UCL | 362.4 | 95% H-Stat (DL/2) UCL | 355.8 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 110.4 | Mean in Log Scale | 5.136 |
| SD | 449.6 | SD in Log Scale | 0.956 |
| 95% MLE (t) UCL | 255.1 | Mean in Original Scale | 264.1 |
| 95% MLE (Tiku) UCL | 298.4 | SD in Original Scale | 298.6 |
| | | 95% t UCL | 360.2 |
| | | 95% Percentile Bootstrap UCL | 359.7 |
| | | 95% BCA Bootstrap UCL | 386.5 |
| | | 95% H UCL | 417.8 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 2.569 | Data Follow Appr. Gamma Distribution at 5% Significance Level |
| Theta Star | 179.3 | |
| nu star | 66.8 | |
| | | |
| A-D Test Statistic | 0.826 | **Nonparametric Statistics** |
| 5% A-D Critical Value | 0.739 | Kaplan-Meier (KM) Method |
| K-S Test Statistic | 0.739 | Mean 331.8 |

| | |
|---|---|
| 5% K-S Critical Value | 0.238 |

Data follow Appr. Gamma Distribution at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 1520 |
| Mean | 213.9 |
| Median | 0.000001 |
| SD | 328.8 |
| k star | 0.098 |
| Theta star | 2183 |
| Nu star | 5.488 |
| AppChi2 | 1.384 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 848.2 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 930.2 |

Note: DL/2 is not a recommended method.

| | |
|---|---|
| SD | 256.6 |
| SE of Mean | 50.47 |
| 95% KM (t) UCL | 417.8 |
| 95% KM (z) UCL | 414.8 |
| 95% KM (jackknife) UCL | 415.9 |
| 95% KM (bootstrap t) UCL | 529.1 |
| 95% KM (BCA) UCL | 443.6 |
| 95% KM (Percentile Bootstrap) UCL | 423.2 |
| 95% KM (Chebyshev) UCL | 551.8 |
| 97.5% KM (Chebyshev) UCL | 647 |
| 99% KM (Chebyshev) UCL | 834 |

Potential UCLs to Use

| | |
|---|---|
| 95% KM (t) UCL | 417.8 |

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

EPHw(C19-C32)1

**General Statistics**

| | |
|---|---|
| Number of Valid Data | 28 |
| Number of Distinct Detected Data | 15 |

| | |
|---|---|
| Number of Detected Data | 15 |
| Number of Non-Detect Data | 13 |
| Percent Non-Detects | 46.43% |

**Raw Statistics**

| | |
|---|---|
| Minimum Detected | 240 |
| Maximum Detected | 2180 |
| Mean of Detected | 858.7 |
| SD of Detected | 484.8 |
| Minimum Non-Detect | 200 |
| Maximum Non-Detect | 200 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum Detected | 5.481 |
| Maximum Detected | 7.687 |
| Mean of Detected | 6.608 |
| SD of Detected | 0.579 |
| Minimum Non-Detect | 5.298 |
| Maximum Non-Detect | 5.298 |

**UCL Statistics**

**Normal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.894 |
| 5% Shapiro Wilk Critical Value | 0.881 |

Data appear Normal at 5% Significance Level

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.964 |
| 5% Shapiro Wilk Critical Value | 0.881 |

Data appear Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 506.4 |
| SD | 519.9 |
| 95% DL/2 (t) UCL | 673.8 |
| Maximum Likelihood Estimate(MLE) Method | |
| Mean | 278.4 |
| SD | 775.6 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 5.678 |
| SD | 1.1 |
| 95% H-Stat (DL/2) UCL | 924.1 |
| Log ROS Method | |
| Mean in Log Scale | 5.897 |
| SD in Log Scale | 0.945 |

| | |
|---|---|
| 95% MLE (t) UCL | 528 |
| 95% MLE (Tiku) UCL | 575 |

| | |
|---|---|
| Mean in Original Scale | 542.8 |
| SD in Original Scale | 494 |
| 95% t UCL | 701.8 |
| 95% Percentile Bootstrap UCL | 689.6 |
| 95% BCA Bootstrap UCL | 727.1 |
| 95% H UCL | 878.4 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 2.893 |
| Theta Star | 296.8 |
| nu star | 86.8 |

| | |
|---|---|
| A-D Test Statistic | 0.247 |
| 5% A-D Critical Value | 0.742 |
| K-S Test Statistic | 0.742 |
| 5% K-S Critical Value | 0.223 |

Data appear Gamma Distributed at 5% Significance Level

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Assuming Gamma Distribution**

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 2180 |
| Mean | 460 |
| Median | 260 |
| SD | 558.6 |
| k star | 0.105 |
| Theta star | 4371 |
| Nu star | 5.894 |
| AppChi2 | 1.586 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 1710 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 1866 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

Kaplan-Meier (KM) Method

| | |
|---|---|
| Mean | 571.4 |
| SD | 461.2 |
| SE of Mean | 90.22 |
| 95% KM (t) UCL | 725.1 |
| 95% KM (z) UCL | 719.8 |
| 95% KM (jackknife) UCL | 711.5 |
| 95% KM (bootstrap t) UCL | 762.6 |
| 95% KM (BCA) UCL | 842.1 |
| 95% KM (Percentile Bootstrap) UCL | 760.7 |
| 95% KM (Chebyshev) UCL | 964.7 |
| 97.5% KM (Chebyshev) UCL | 1135 |
| 99% KM (Chebyshev) UCL | 1469 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 725.1 |
| 95% KM (Percentile Bootstrap) UCL | 760.7 |

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

LEPH

**General Statistics**

| | |
|---|---|
| Number of Valid Data | 28 |
| Number of Distinct Detected Data | 11 |

| | |
|---|---|
| Number of Detected Data | 13 |
| Number of Non-Detect Data | 15 |
| Percent Non-Detects | 53.57% |

**Raw Statistics**

| | |
|---|---|
| Minimum Detected | 220 |
| Maximum Detected | 1520 |
| Mean of Detected | 460.8 |
| SD of Detected | 346.4 |
| Minimum Non-Detect | 200 |
| Maximum Non-Detect | 200 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum Detected | 5.394 |
| Maximum Detected | 7.326 |
| Mean of Detected | 5.972 |
| SD of Detected | 0.531 |
| Minimum Non-Detect | 5.298 |
| Maximum Non-Detect | 5.298 |

## UCL Statistics

### Normal Distribution Test with Detected Values Only

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.656 |
| 5% Shapiro Wilk Critical Value | 0.866 |

Data not Normal at 5% Significance Level

### Lognormal Distribution Test with Detected Values Only

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.885 |
| 5% Shapiro Wilk Critical Value | 0.866 |

Data appear Lognormal at 5% Significance Level

### Assuming Normal Distribution

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 267.5 |
| SD | 294.8 |
| 95% DL/2 (t) UCL | 362.4 |
| | |
| Maximum Likelihood Estimate(MLE) Method | |
| Mean | 110.4 |
| SD | 449.6 |
| 95% MLE (t) UCL | 255.1 |
| 95% MLE (Tiku) UCL | 298.4 |

### Assuming Lognormal Distribution

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 5.24 |
| SD | 0.78 |
| 95% H-Stat (DL/2) UCL | 355.8 |
| | |
| Log ROS Method | |
| Mean in Log Scale | 5.136 |
| SD in Log Scale | 0.956 |
| Mean in Original Scale | 264.1 |
| SD in Original Scale | 298.6 |
| 95% t UCL | 360.2 |
| 95% Percentile Bootstrap UCL | 369 |
| 95% BCA Bootstrap UCL | 409.3 |
| 95% H UCL | 417.8 |

### Gamma Distribution Test with Detected Values Only

| | |
|---|---|
| k star (bias corrected) | 2.569 |
| Theta Star | 179.3 |
| nu star | 66.8 |
| | |
| A-D Test Statistic | 0.826 |
| 5% A-D Critical Value | 0.739 |
| K-S Test Statistic | 0.739 |
| 5% K-S Critical Value | 0.238 |

Data follow Appr. Gamma Distribution at 5% Significance Level

### Assuming Gamma Distribution

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 1520 |
| Mean | 213.9 |
| Median | 0.000001 |
| SD | 328.8 |
| k star | 0.098 |
| Theta star | 2183 |
| Nu star | 5.488 |
| AppChi2 | 1.384 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 848.2 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 930.2 |

Note: DL/2 is not a recommended method.

### Data Distribution Test with Detected Values Only

Data Follow Appr. Gamma Distribution at 5% Significance Level

### Nonparametric Statistics

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 331.8 |
| SD | 256.6 |
| SE of Mean | 50.47 |
| 95% KM (t) UCL | 417.8 |
| 95% KM (z) UCL | 414.8 |
| 95% KM (jackknife) UCL | 415.9 |
| 95% KM (bootstrap t) UCL | 537.9 |
| 95% KM (BCA) UCL | 451.8 |
| 95% KM (Percentile Bootstrap) UCL | 425.4 |
| 95% KM (Chebyshev) UCL | 551.8 |
| 97.5% KM (Chebyshev) UCL | 647 |
| 99% KM (Chebyshev) UCL | 834 |

### Potential UCLs to Use

| | |
|---|---|
| 95% KM (t) UCL | 417.8 |

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

## General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 28 | Number of Detected Data | 15 |
| Number of Distinct Detected Data | 15 | Number of Non-Detect Data | 13 |
| | | Percent Non-Detects | 46.43% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 240 | Minimum Detected | 5.481 |
| Maximum Detected | 2170 | Maximum Detected | 7.682 |
| Mean of Detected | 856.7 | Mean of Detected | 6.606 |
| SD of Detected | 483.3 | SD of Detected | 0.579 |
| Minimum Non-Detect | 200 | Minimum Non-Detect | 5.298 |
| Maximum Non-Detect | 200 | Maximum Non-Detect | 5.298 |

## UCL Statistics

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.895 | Shapiro Wilk Test Statistic | 0.964 |
| 5% Shapiro Wilk Critical Value | 0.881 | 5% 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 | |
|---|---|---|---|
| DL/2 Substitution Method | | DL/2 Substitution Method | |
| Mean | 505.4 | Mean | 5.677 |
| SD | 518.5 | SD | 1.098 |
| 95% DL/2 (t) UCL | 672.2 | 95% H-Stat (DL/2) UCL | 921.1 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 278.1 | Mean in Log Scale | 5.894 |
| SD | 773.3 | SD in Log Scale | 0.946 |
| 95% MLE (t) UCL | 527 | Mean in Original Scale | 541.4 |
| 95% MLE (Tiku) UCL | 573.9 | SD in Original Scale | 492.7 |
| | | 95% t UCL | 700 |
| | | 95% Percentile Bootstrap UCL | 699.6 |
| | | 95% BCA Bootstrap UCL | 727.9 |
| | | 95% H UCL | 877 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 2.892 | Data appear Normal at 5% Significance Level |
| Theta Star | 296.3 | |
| nu star | 86.75 | |
| | | |
| A-D Test Statistic | 0.242 | Nonparametric Statistics |
| 5% A-D Critical Value | 0.742 | Kaplan-Meier (KM) Method |
| K-S Test Statistic | 0.742 | Mean 570.4 |
| 5% K-S Critical Value | 0.223 | SD 459.8 |
| Data appear Gamma Distributed at 5% Significance Level | | SE of Mean 89.94 |
| | | 95% KM (t) UCL 723.5 |
| Assuming Gamma Distribution | | 95% KM (z) UCL 718.3 |
| Gamma ROS Statistics using Extrapolated Data | | 95% KM (jackknife) UCL 710 |
| Minimum | 0.000001 | 95% KM (bootstrap t) UCL 763.4 |
| Maximum | 2170 | 95% KM (BCA) UCL 811.4 |
| Mean | 458.9 | 95% KM (Percentile Bootstrap) UCL 776.1 |
| Median | 260 | 95% KM (Chebyshev) UCL 962.4 |

| | | | |
|---|---|---|---|
| SD | 557.2 | 97.5% KM (Chebyshev) UCL | 1132 |
| k star | 0.105 | 99% KM (Chebyshev) UCL | 1465 |
| Theta star | 4360 | | |
| Nu star | 5.894 | **Potential UCLs to Use** | |
| AppChi2 | 1.586 | 95% KM (t) UCL | 723.5 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 1705 | 95% KM (Percentile Bootstrap) UCL | 776.1 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 1862 | | |

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.

Total TPH(EPH[C10-C19] + EPH[C19-C32] + VPH)

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 16 | Number of Distinct Observations | 16 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 220 | Minimum of Log Data | 5.394 |
| Maximum | 2890 | Maximum of Log Data | 7.969 |
| Mean | 1188 | Mean of log Data | 6.874 |
| Geometric Mean | 967.1 | SD of log Data | 0.729 |
| Median | 1230 | | |
| SD | 699.6 | | |
| Std. Error of Mean | 174.9 | | |
| Coefficient of Variation | 0.589 | | |
| Skewness | 0.734 | | |

**Relevant UCL Statistics**

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.947 | Shapiro Wilk Test Statistic | 0.916 |
| Shapiro Wilk Critical Value | 0.887 | Shapiro Wilk Critical Value | 0.887 |
| 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 | 1495 | 95% H-UCL | 1952 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 2280 |
| 95% Adjusted-CLT UCL (Chen-1995) | 1510 | 97.5% Chebyshev (MVUE) UCL | 2731 |
| 95% Modified-t UCL (Johnson-1978) | 1500 | 99% Chebyshev (MVUE) UCL | 3617 |

| Gamma Distribution Test | | Data Distribution |
|---|---|---|
| k star (bias corrected) | 2.141 | Data appear Normal at 5% Significance Level |
| Theta Star | 554.9 | |
| MLE of Mean | 1188 | |
| MLE of Standard Deviation | 811.9 | |
| nu star | 68.52 | |
| Approximate Chi Square Value (.05) | 50.47 | **Nonparametric Statistics** |
| Adjusted Level of Significance | 0.0335 | 95% CLT UCL 1476 |
| Adjusted Chi Square Value | 48.71 | 95% Jackknife UCL 1495 |
| | | 95% Standard Bootstrap UCL 1460 |
| Anderson-Darling Test Statistic | 0.356 | 95% Bootstrap-t UCL 1541 |
| Anderson-Darling 5% Critical Value | 0.747 | 95% Hall's Bootstrap UCL 1606 |

| | |
|---|---|
| Kolmogorov-Smirnov Test Statistic | 0.162 |
| Kolmogorov-Smirnov 5% Critical Value | 0.217 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL (Use when n >= 40) | 1613 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 1671 |

| | |
|---|---|
| 95% Percentile Bootstrap UCL | 1478 |
| 95% BCA Bootstrap UCL | 1501 |
| 95% Chebyshev(Mean, Sd) UCL | 1951 |
| 97.5% Chebyshev(Mean, Sd) UCL | 2280 |
| 99% Chebyshev(Mean, Sd) UCL | 2928 |

Potential UCL to Use

Use 95% Student's-t UCL 1495

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.

From File: PAHs Input.wst

**Summary Statistics for Raw Full Dataset**

| Variable | NumObs | Minimum | Maximum | Mean | Median | Variance | SD | MAD/0.675 | Skewness | Kurtosis | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_Pyrene | 28 | 4.184E-06 | 3.02 | 0.126 | 0.0019 | 0.323 | 0.568 | 0.00278 | 5.26 | 27.77 | 4.508 |

**Percentiles for Raw Full Dataset**

| Variable | NumObs | 5%ile | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | 99%ile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_Pyrene | 28 | 1.794E-05 | 4.224E-05 | 0.0001446 | 0.000237 | 0.0019 | 0.0229 | 0.0516 | 0.0778 | 0.124 | 2.244 |

## General UCL Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| From File | PAHs Input.wst |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**Pyrene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 28 | Number of Detected Data | 7 |
| Number of Distinct Detected Data | 6 | Number of Non-Detect Data | 21 |
| | | Percent Non-Detects | 75.00% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.051 | Minimum Detected | -2.976 |
| Maximum Detected | 3.02 | Maximum Detected | 1.105 |
| Mean of Detected | 0.497 | Mean of Detected | -2.112 |
| SD of Detected | 1.113 | SD of Detected | 1.468 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.05 | Maximum Non-Detect | -2.996 |

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 | 0.477 | Shapiro Wilk Test Statistic | 0.66 |
| 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 | 0.143 | Mean | -3.295 |
| SD | 0.564 | SD | 0.981 |
| 95% DL/2 (t) UCL | 0.325 | 95% H-Stat (DL/2) UCL | 0.0949 |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE yields a negative mean | | Mean in Log Scale | -6.21 |
| | | SD in Log Scale | 3.168 |
| | | Mean in Original Scale | 0.126 |
| | | SD in Original Scale | 0.568 |
| | | 95% t UCL | 0.309 |
| | | 95% Percentile Bootstrap UCL | 0.337 |
| | | 95% BCA Bootstrap UCL | 0.453 |

| | |
|---|---|
| 95% H-UCL | 10.34 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.356 |
| Theta Star | 1.397 |
| nu star | 4.982 |
| | |
| A-D Test Statistic | 1.553 |
| 5% A-D Critical Value | 0.759 |
| K-S Test Statistic | 0.759 |
| 5% K-S Critical Value | 0.329 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 3.02 |
| Mean | 0.124 |
| Median | 0.000001 |
| SD | 0.569 |
| k star | 0.107 |
| Theta star | 1.162 |
| Nu star | 5.987 |
| AppChi2 | 1.633 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 0.455 |
| 95% Adjusted Gamma UCL (Use when n < 40) | 0.497 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.163 |
| SD | 0.55 |
| SE of Mean | 0.112 |
| 95% KM (t) UCL | 0.354 |
| 95% KM (z) UCL | 0.347 |
| 95% KM (jackknife) UCL | 0.342 |
| 95% KM (bootstrap t) UCL | 7.936 |
| 95% KM (BCA) UCL | 0.377 |
| 95% KM (Percentile Bootstrap) UCL | 0.373 |
| 95% KM (Chebyshev) UCL | 0.652 |
| 97.5% KM (Chebyshev) UCL | 0.864 |
| 99% KM (Chebyshev) UCL | 1.28 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (BCA) UCL | 0.377 |

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

From File: Sheet1_a.wst

Summary Statistics for Raw Full Data Sets

| Variable | NumObs | Minimum | Maximum | Mean | Median | Variance | SD | MAD/0.675 | Skewness | Kurtosis | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_LEPHw | 17 | 9.954 | 8740 | 1161 | 251.4 | 4574109 | 2139 | 341.1 | 3.106 | 10.79 | 1.842 |
| LnROS_VPHw | 15 | 2.293 | 3200 | 579 | 88.86 | 918640 | 958.5 | 115.7 | 1.908 | 3.143 | 1.655 |
| LnROS_Benzene | 15 | 3.472E-05 | 2910 | 357.1 | 0.75 | 611341 | 781.9 | 1.111 | 2.839 | 8.822 | 2.19 |
| LnROS_Ethylbenzene | 15 | 0.000758 | 492 | 87.12 | 1.44 | 24998 | 158.1 | 2.113 | 1.709 | 1.941 | 1.815 |
| LnROS_Toluene | 15 | 0.0037 | 2450 | 165.7 | 1.8 | 399342 | 631.9 | 2.615 | 3.873 | 15 | 3.813 |
| LnROS_Xylenes | 15 | 0.00307 | 3390 | 302.9 | 7.83 | 754179 | 868.4 | 11.6 | 3.668 | 13.79 | 2.867 |

Percentiles for Raw Full Data Sets

| Variable | NumObs | 5%ile | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | 99%ile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_LEPHw | 17 | 19.07 | 30.03 | 58.71 | 77.16 | 251.4 | 1560 | 1944 | 2362 | 3940 | 7780 |
| LnROS_VPHw | 15 | 4.729 | 7.803 | 16.6 | 23.05 | 88.86 | 730 | 1186 | 1798 | 2381 | 3036 |
| LnROS_Benzene | 15 | 0.0002676 | 0.000955 | 0.00572 | 0.0136 | 0.75 | 356.9 | 719.6 | 880.6 | 1537 | 2635 |
| LnROS_Ethylbenzene | 15 | 0.00332 | 0.00852 | 0.0338 | 0.0638 | 1.44 | 101.7 | 206.8 | 309 | 382.1 | 470 |
| LnROS_Toluene | 15 | 0.0111 | 0.0229 | 0.0678 | 0.11 | 1.8 | 5.95 | 6.46 | 8.26 | 740.9 | 2108 |
| LnROS_Xylenes | 15 | 0.0125 | 0.0306 | 0.114 | 0.208 | 7.83 | 143.6 | 262 | 436.4 | 1402 | 2992 |

## General UCL Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| From File | Sheet1.wst |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**LEPHw**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 17 | Number of Detected Data | 8 |
| Number of Distinct Detected Data | 8 | Number of Non-Detect Data | 9 |
| | | Percent Non-Detects | 52.94% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 350 | Minimum Detected | 5.858 |
| Maximum Detected | 8740 | Maximum Detected | 9.076 |
| Mean of Detected | 2356 | Mean of Detected | 7.299 |
| SD of Detected | 2714 | SD of Detected | 1.025 |
| Minimum Non-Detect | 250 | Minimum Non-Detect | 5.521 |
| Maximum Non-Detect | 250 | Maximum Non-Detect | 5.521 |

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 | 0.707 | Shapiro Wilk Test Statistic | 0.964 |
| 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 | 1175 | Mean | 5.991 |
| SD | 2131 | SD | 1.441 |
| 95% DL/2 (t) UCL | 2077 | 95% H-Stat (DL/2) UCL | 3819 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE yields a negative mean | | Mean in Log Scale | 5.652 |
| | | SD in Log Scale | 1.894 |
| | | Mean in Original Scale | 1161 |
| | | SD in Original Scale | 2139 |
| | | 95% t UCL | 2067 |
| | | 95% Percentile Bootstrap UCL | 2083 |
| | | 95% BCA Bootstrap UCL | 2607 |

| | |
|---|---|
| 95% H-UCL | 12472 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.842 |
| Theta Star | 2798 |
| nu star | 13.47 |
| | |
| A-D Test Statistic | 0.354 |
| 5% A-D Critical Value | 0.732 |
| K-S Test Statistic | 0.732 |
| 5% K-S Critical Value | 0.3 |

Data appear Gamma Distributed at 5% Significance Level

**Data Distribution Test with Detected Values Only**

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 8740 |
| Mean | 1109 |
| Median | 0.000001 |
| SD | 2166 |
| k star | 0.103 |
| Theta star | 10810 |
| Nu star | 3.488 |
| AppChi2 | 0.53 |
| 95% Gamma Approximate UCL | 7291 |
| 95% Adjusted Gamma UCL | 9019 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 1294 |
| SD | 2009 |
| SE of Mean | 520.8 |
| 95% KM (t) UCL | 2203 |
| 95% KM (z) UCL | 2151 |
| 95% KM (jackknife) UCL | 2116 |
| 95% KM (bootstrap t) UCL | 3356 |
| 95% KM (BCA) UCL | 2571 |
| 95% KM (Percentile Bootstrap) UCL | 2312 |
| 95% KM (Chebyshev) UCL | 3564 |
| 97.5% KM (Chebyshev) UCL | 4547 |
| 99% KM (Chebyshev) UCL | 6476 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 2203 |

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.

**VPHw**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 15 | Number of Detected Data | 6 |
| Number of Distinct Detected Data | 6 | Number of Non-Detect Data | 9 |
| | | Percent Non-Detects | 60.00% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 160 | Minimum Detected | 5.075 |
| Maximum Detected | 3200 | Maximum Detected | 8.071 |
| Mean of Detected | 1383 | Mean of Detected | 6.815 |
| SD of Detected | 1129 | SD of Detected | 1.138 |
| Minimum Non-Detect | 100 | Minimum Non-Detect | 4.605 |
| Maximum Non-Detect | 100 | Maximum Non-Detect | 4.605 |

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

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.947 |
| 5% Shapiro Wilk Critical Value | 0.788 |

Data appear Normal at 5% Significance Level

### Assuming Normal Distribution

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 583.3 |
| SD | 955.3 |
| 95% DL/2 (t) UCL | 1018 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE yields a negative mean**

### Lognormal Distribution Test with Detected Values Only

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.927 |
| 5% Shapiro Wilk Critical Value | 0.788 |

Data appear Lognormal at 5% Significance Level

### Assuming Lognormal Distribution

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 5.073 |
| SD | 1.622 |
| 95% H-Stat (DL/2) UCL | 3139 |
| | |
| Log ROS Method | |
| Mean in Log Scale | 4.619 |
| SD in Log Scale | 2.215 |
| Mean in Original Scale | 579 |
| SD in Original Scale | 958.5 |
| 95% t UCL | 1015 |
| 95% Percentile Bootstrap UCL | 1000 |
| 95% BCA Bootstrap UCL | 1107 |
| 95% H-UCL | 22601 |

### Gamma Distribution Test with Detected Values Only

| | |
|---|---|
| k star (bias corrected) | 0.782 |
| Theta Star | 1770 |
| nu star | 9.38 |
| | |
| A-D Test Statistic | 0.238 |
| 5% A-D Critical Value | 0.71 |
| K-S Test Statistic | 0.71 |
| 5% K-S Critical Value | 0.339 |

Data appear Gamma Distributed at 5% Significance Level

### Assuming Gamma Distribution

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 3200 |
| Mean | 553.3 |
| Median | 0.000001 |
| SD | 973.4 |
| k star | 0.101 |
| Theta star | 5459 |
| Nu star | 3.041 |
| AppChi2 | 0.385 |
| 95% Gamma Approximate UCL | 4375 |
| 95% Adjusted Gamma UCL | 5705 |

### Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

### Nonparametric Statistics

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 649.3 |
| SD | 885.6 |
| SE of Mean | 250.5 |
| 95% KM (t) UCL | 1091 |
| 95% KM (z) UCL | 1061 |
| 95% KM (jackknife) UCL | 1024 |
| 95% KM (bootstrap t) UCL | 1257 |
| 95% KM (BCA) UCL | 1644 |
| 95% KM (Percentile Bootstrap) UCL | 1480 |
| 95% KM (Chebyshev) UCL | 1741 |
| 97.5% KM (Chebyshev) UCL | 2214 |
| 99% KM (Chebyshev) UCL | 3142 |

### Potential UCLs to Use

| | |
|---|---|
| 95% KM (t) UCL | 1091 |
| 95% KM (Percentile Bootstrap) UCL | 1480 |

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.

Benzene

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 15 | Number of Detected Data | 8 |
| Number of Distinct Detected Data | 8 | Number of Non-Detect Data | 7 |
| | | Percent Non-Detects | 46.67% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.75 | Minimum Detected | -0.288 |
| Maximum Detected | 2910 | Maximum Detected | 7.976 |
| Mean of Detected | 669.4 | Mean of Detected | 3.901 |
| SD of Detected | 991.8 | SD of Detected | 3.424 |
| Minimum Non-Detect | 0.5 | Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | 0.5 | Maximum Non-Detect | -0.693 |

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 | 0.725 | Shapiro Wilk Test Statistic | 0.843 |
| 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 | 357.2 | Mean | 1.434 |
| SD | 781.8 | SD | 3.649 |
| 95% DL/2 (t) UCL | 712.7 | 95% H-Stat (DL/2) UCL | 7111686 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE yields a negative mean | | Mean in Log Scale | -0.462 |
| | | SD in Log Scale | 5.734 |
| | | Mean in Original Scale | 357.1 |
| | | SD in Original Scale | 781.9 |
| | | 95% t UCL | 712.6 |
| | | 95% Percentile Bootstrap UCL | 739.6 |
| | | 95% BCA Bootstrap UCL | 887.3 |
| | | 95% H-UCL | 1.233E+15 |

| Gamma Distribution Test with Detected Values Only | |
|---|---|
| k star (bias corrected) | 0.252 |
| Theta Star | 2660 |
| nu star | 4.027 |
| | |
| A-D Test Statistic | 0.625 |
| 5% A-D Critical Value | 0.809 |
| K-S Test Statistic | 0.809 |
| 5% K-S Critical Value | 0.319 |

Data appear Gamma Distributed at 5% Significance Level

| Assuming Gamma Distribution | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 2910 |
| Mean | 357 |
| Median | 0.75 |
| SD | 781.9 |
| k star | 0.109 |
| Theta star | 3262 |
| Nu star | 3.284 |
| AppChi2 | 0.461 |
| 95% Gamma Approximate UCL | 2542 |
| 95% Adjusted Gamma UCL | 3290 |

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only

Data appear Gamma Distributed at 5% Significance Level

| Nonparametric Statistics | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 357.4 |
| SD | 755.2 |
| SE of Mean | 208.5 |
| 95% KM (t) UCL | 724.5 |
| 95% KM (z) UCL | 700.3 |
| 95% KM (jackknife) UCL | 712.7 |
| 95% KM (bootstrap t) UCL | 1195 |
| 95% KM (BCA) UCL | 791.6 |
| 95% KM (Percentile Bootstrap) UCL | 745.4 |
| 95% KM (Chebyshev) UCL | 1266 |
| 97.5% KM (Chebyshev) UCL | 1659 |
| 99% KM (Chebyshev) UCL | 2432 |
| | |
| Potential UCLs to Use | |
| 95% KM (BCA) UCL | 791.6 |

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

Ethylbenzene

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 15 | Number of Detected Data | 8 |
| Number of Distinct Detected Data | 8 | Number of Non-Detect Data | 7 |
| | | Percent Non-Detects | 46.67% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 1.44 | Minimum Detected | 0.365 |
| Maximum Detected | 492 | Maximum Detected | 6.198 |
| Mean of Detected | 163.3 | Mean of Detected | 3.397 |
| SD of Detected | 189.2 | SD of Detected | 2.578 |
| Minimum Non-Detect | 0.5 | Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | 0.5 | Maximum Non-Detect | -0.693 |

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

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.841 |
| 5% Shapiro Wilk Critical Value | 0.818 |

Data appear Normal at 5% Significance Level

### Assuming Normal Distribution

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 87.19 |
| SD | 158.1 |
| 95% DL/2 (t) UCL | 159.1 |
| | |
| Maximum Likelihood Estimate(MLE) Method | N/A |

MLE yields a negative mean

### Lognormal Distribution Test with Detected Values Only

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.824 |
| 5% Shapiro Wilk Critical Value | 0.818 |

Data appear Lognormal at 5% Significance Level

### Assuming Lognormal Distribution

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 1.165 |
| SD | 3.07 |
| 95% H-Stat (DL/2) UCL | 87749 |
| | |
| Log ROS Method | |
| Mean in Log Scale | 0.139 |
| SD in Log Scale | 4.288 |
| Mean in Original Scale | 87.12 |
| SD in Original Scale | 158.1 |
| 95% t UCL | 159 |
| 95% Percentile Bootstrap UCL | 157.3 |
| 95% BCA Bootstrap UCL | 167 |
| 95% H-UCL | 445400000 |

### Gamma Distribution Test with Detected Values Only

| | |
|---|---|
| k star (bias corrected) | 0.327 |
| Theta Star | 499.9 |
| nu star | 5.225 |
| | |
| A-D Test Statistic | 0.651 |
| 5% A-D Critical Value | 0.782 |
| K-S Test Statistic | 0.782 |
| 5% K-S Critical Value | 0.313 |

Data appear Gamma Distributed at 5% Significance Level

### Assuming Gamma Distribution

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 492 |
| Mean | 87.07 |
| Median | 1.44 |
| SD | 158.1 |
| k star | 0.117 |
| Theta star | 746 |
| Nu star | 3.502 |
| AppChi2 | 0.535 |
| 95% Gamma Approximate UCL | 569.5 |
| 95% Adjusted Gamma UCL | 731.5 |

Note: DL/2 is not a recommended method.

### Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

### Nonparametric Statistics

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 87.75 |
| SD | 152.4 |
| SE of Mean | 42.06 |
| 95% KM (t) UCL | 161.8 |
| 95% KM (z) UCL | 156.9 |
| 95% KM (jackknife) UCL | 159.5 |
| 95% KM (bootstrap t) UCL | 198.9 |
| 95% KM (BCA) UCL | 169.5 |
| 95% KM (Percentile Bootstrap) UCL | 159 |
| 95% KM (Chebyshev) UCL | 271.1 |
| 97.5% KM (Chebyshev) UCL | 350.4 |
| 99% KM (Chebyshev) UCL | 506.3 |

### Potential UCLs to Use

| | |
|---|---|
| 95% KM (t) UCL | 161.8 |
| 95% KM (Percentile Bootstrap) UCL | 159 |

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.

**Toluene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 15 | Number of Detected Data | 8 |
| Number of Distinct Detected Data | 8 | Number of Non-Detect Data | 7 |
| | | Percent Non-Detects | 46.67% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 1.8 | Minimum Detected | 0.588 |
| Maximum Detected | 2450 | Maximum Detected | 7.804 |
| Mean of Detected | 310.6 | Mean of Detected | 2.223 |
| SD of Detected | 864.5 | SD of Detected | 2.338 |
| Minimum Non-Detect | 1 | Minimum Non-Detect | 0 |
| Maximum Non-Detect | 10 | Maximum Non-Detect | 2.303 |

| | | |
|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | Number treated as Non-Detect | 14 |
| For all methods (except KM, DL/2, and ROS Methods), | Number treated as Detected | 1 |
| Observations < Largest ND are treated as NDs | Single DL Non-Detect Percentage | 93.33% |

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 | 0.421 | Shapiro Wilk Test Statistic | 0.659 |
| 5% Shapiro Wilk Critical Value | 0.818 | 5% Shapiro Wilk Critical Value | 0.818 |
| 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 | 166.2 | Mean | 1.016 |
| SD | 631.8 | SD | 2.2 |
| 95% DL/2 (t) UCL | 453.5 | 95% H-Stat (DL/2) UCL | 573.3 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE method failed to converge properly | | Mean in Log Scale | -0.113 |
| | | SD in Log Scale | 3.278 |
| | | Mean in Original Scale | 165.7 |
| | | SD in Original Scale | 631.9 |
| | | 95% t UCL | 453.1 |
| | | 95% Percentile Bootstrap UCL | 492 |

| | |
|---|---|
| 95% BCA Bootstrap UCL | 655.3 |
| 95% H-UCL | 98988 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.213 |
| Theta Star | 1456 |
| nu star | 3.414 |
| | |
| A-D Test Statistic | 1.945 |
| 5% A-D Critical Value | 0.833 |
| K-S Test Statistic | 0.833 |
| 5% K-S Critical Value | 0.323 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 2450 |
| Mean | 165.6 |
| Median | 1.8 |
| SD | 632 |
| k star | 0.109 |
| Theta star | 1523 |
| Nu star | 3.263 |
| AppChi2 | 0.454 |
| 95% Gamma Approximate UCL | 1190 |
| 95% Adjusted Gamma UCL | 1541 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

Kaplan-Meier (KM) Method

| | |
|---|---|
| Mean | 166.6 |
| SD | 610.3 |
| SE of Mean | 168.5 |
| 95% KM (t) UCL | 463.3 |
| 95% KM (z) UCL | 443.7 |
| 95% KM (jackknife) UCL | 453.8 |
| 95% KM (bootstrap t) UCL | 51309 |
| 95% KM (BCA) UCL | 494.6 |
| 95% KM (Percentile Bootstrap) UCL | 492.8 |
| 95% KM (Chebyshev) UCL | 900.9 |
| 97.5% KM (Chebyshev) UCL | 1219 |
| 99% KM (Chebyshev) UCL | 1843 |

**Potential UCLs to Use**

| | |
|---|---|
| 99% KM (Chebyshev) UCL | 1843 |

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.

**Xylenes**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 15 | Number of Detected Data | 10 |
| Number of Distinct Detected Data | 10 | Number of Non-Detect Data | 5 |
| | | Percent Non-Detects | 33.33% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.9 | Minimum Detected | -0.105 |
| Maximum Detected | 3390 | Maximum Detected | 8.129 |
| Mean of Detected | 454.4 | Mean of Detected | 3.685 |
| SD of Detected | 1047 | SD of Detected | 2.691 |
| Minimum Non-Detect | 0.71 | Minimum Non-Detect | -0.342 |
| Maximum Non-Detect | 0.71 | Maximum Non-Detect | -0.342 |

**UCL Statistics**

**Normal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.495 |
| 5% Shapiro Wilk Critical Value | 0.842 |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.953 |
| 5% Shapiro Wilk Critical Value | 0.842 |

Data appear Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 303 |
| SD | 868.4 |
| 95% DL/2 (t) UCL | 697.9 |
| | |
| Maximum Likelihood Estimate(MLE) Method | |
| Mean | 15.22 |
| SD | 1089 |
| 95% MLE (t) UCL | 510.5 |
| 95% MLE (Tiku) UCL | 543.3 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 2.111 |
| SD | 3.156 |
| 95% H-Stat (DL/2) UCL | 398561 |
| | |
| Log ROS Method | |
| Mean in Log Scale | 1.38 |
| SD in Log Scale | 4.116 |
| Mean in Original Scale | 302.9 |
| SD in Original Scale | 868.4 |
| 95% t UCL | 697.9 |
| 95% Percentile Bootstrap UCL | 718.2 |
| 95% BCA Bootstrap UCL | 985.2 |
| 95% H UCL | 330000000 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.267 |
| Theta Star | 1705 |
| nu star | 5.331 |
| | |
| A-D Test Statistic | 0.539 |
| 5% A-D Critical Value | 0.819 |
| K-S Test Statistic | 0.819 |
| 5% K-S Critical Value | 0.289 |

Data appear Gamma Distributed at 5% Significance Level

**Data Distribution Test with Detected Values Only**

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 3390 |
| Mean | 302.9 |
| Median | 7.83 |
| SD | 868.4 |
| k star | 0.127 |
| Theta star | 2389 |
| Nu star | 3.803 |
| AppChi2 | 0.646 |
| 95% Gamma Approximate UCL | 1785 |
| 95% Adjusted Gamma UCL | 2266 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 303.2 |
| SD | 838.9 |
| SE of Mean | 228.3 |
| 95% KM (t) UCL | 705.3 |
| 95% KM (z) UCL | 678.8 |
| 95% KM (jackknife) UCL | 698.1 |
| 95% KM (bootstrap t) UCL | 2801 |
| 95% KM (BCA) UCL | 755.6 |
| 95% KM (Percentile Bootstrap) UCL | 735.7 |
| 95% KM (Chebyshev) UCL | 1298 |
| 97.5% KM (Chebyshev) UCL | 1729 |
| 99% KM (Chebyshev) UCL | 2575 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (BCA) UCL | 755.6 |

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

General Statistics on Uncensored Full Data

Date/Time of Computation 10/16/2013 10:27:08 AM

**User Selected Options**

From File PAHs input.xls

Full Precision OFF

**From File: PAHs input.xls**

**General Statistics for Uncensored Data Sets**

| Variable | NumObs | # Missing | Minimum | Maximum | Mean | SD | SEM | MAD/0.675 | Skewness | Kurtosis | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_Acenaphthene | 17 | 0 | 0.00182 | 0.461 | 0.0827 | 0.143 | 0.0348 | 0.0292 | 2.365 | 4.543 | 1.734 |
| LnROS_Acenaphthylene | 17 | 0 | 1.000E-10 | 0.071 | 0.00418 | 0.0172 | 0.00418 | 0 | 4.123 | 17 | 4.123 |
| LnROS_Acridine | 17 | 0 | 1.000E-10 | 0.055 | 0.00324 | 0.0133 | 0.00324 | 0 | 4.123 | 17 | 4.123 |
| LnROS_Anthracene | 17 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.332E-26 | 3.231E-27 | 0 | -1.099 | -2.286 | N/A |
| ROS_Benz(a)anthracene | 17 | 0 | 1.000E-10 | 0.127 | 0.00747 | 0.0308 | 0.00747 | 0 | 4.123 | 17 | 4.123 |
| LnROS_Benzo(a)pyrene | 17 | 0 | 1.000E-10 | 0.038 | 0.00224 | 0.00922 | 0.00224 | 0 | 4.123 | 17 | 4.123 |
| S_Benzo(b)fluoranthene | 17 | 0 | 1.000E-10 | 0.059 | 0.00347 | 0.0143 | 0.00347 | 0 | 4.123 | 17 | 4.123 |
| OS_Benzo(g,h,i)perylene | 17 | 0 | 1.000E-10 | 0.067 | 0.00394 | 0.0162 | 0.00394 | 0 | 4.123 | 17 | 4.123 |
| S_Benzo(k)fluoranthene | 17 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.332E-26 | 3.231E-27 | 0 | -1.099 | -2.286 | N/A |
| LnROS_Chrysene | 17 | 0 | 1.000E-10 | 0.141 | 0.00829 | 0.0342 | 0.00829 | 0 | 4.123 | 17 | 4.123 |
| _Dibenz(a,h)anthracene | 17 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.332E-26 | 3.231E-27 | 0 | -1.099 | -2.286 | N/A |
| LnROS_Fluoranthene | 17 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.332E-26 | 3.231E-27 | 0 | -1.099 | -2.286 | N/A |
| LnROS_Fluorene | 17 | 0 | 8.6545E-4 | 1.64 | 0.192 | 0.404 | 0.098 | 0.0377 | 3.236 | 11.43 | 2.1 |
| _Indeno(1,2,3-c,d)pyrene | 17 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.332E-26 | 3.231E-27 | 0 | -1.099 | -2.286 | N/A |
| LnROS_Naphthalene | 17 | 0 | 0.00306 | 56.5 | 12.45 | 22.15 | 5.372 | 0.344 | 1.394 | 0.019 | 1.78 |
| LnROS_Phenanthrene | 17 | 0 | 8.8261E-4 | 1.74 | 0.16 | 0.415 | 0.101 | 0.0283 | 3.872 | 15.48 | 2.593 |
| LnROS_Pyrene | 17 | 0 | 4.9202E-5 | 0.791 | 0.0687 | 0.192 | 0.0467 | 0.00483 | 3.732 | 14.45 | 2.803 |
| LnROS_Quinoline | 17 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.332E-26 | 3.231E-27 | 0 | -1.099 | -2.286 | N/A |
| LnROS_Total PAHs | 14 | 3 | 0.014 | 63.6 | 16.11 | 25.36 | 6.776 | 0.632 | 1.132 | -0.684 | 1.574 |

**Percentiles for Uncensored Data Sets**

| Variable | NumObs | # Missing | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | 99%ile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_Acenaphthene | 17 | 0 | 0.00481 | 0.00881 | 0.0113 | 0.0266 | 0.0622 | 0.0811 | 0.256 | 0.448 | 0.458 |
| LnROS_Acenaphthylene | 17 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 0.0142 | 0.0596 |
| LnROS_Acridine | 17 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 0.011 | 0.0462 |
| LnROS_Anthracene | 17 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 |
| ROS_Benz(a)anthracene | 17 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 0.0254 | 0.107 |
| LnROS_Benzo(a)pyrene | 17 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 0.0076 | 0.0319 |
| S_Benzo(b)fluoranthene | 17 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 0.0118 | 0.0496 |
| OS_Benzo(g,h,i)perylene | 17 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 0.0134 | 0.0563 |
| S_Benzo(k)fluoranthene | 17 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 |
| LnROS_Chrysene | 17 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 0.0282 | 0.118 |
| _Dibenz(a,h)anthracene | 17 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 |
| LnROS_Fluoranthene | 17 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 |
| LnROS_Fluorene | 17 | 0 | 0.0031 | 0.00675 | 0.00929 | 0.0275 | 0.13 | 0.282 | 0.449 | 0.722 | 1.456 |
| _Indeno(1,2,3-c,d)pyrene | 17 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 |
| LnROS_Naphthalene | 17 | 0 | 0.0102 | 0.0102 | 0.0102 | 0.242 | 6.36 | 36.95 | 50.86 | 53.86 | 55.97 |
| LnROS_Phenanthrene | 17 | 0 | 0.00284 | 0.00581 | 0.00778 | 0.0225 | 0.108 | 0.153 | 0.239 | 0.554 | 1.503 |
| LnROS_Pyrene | 17 | 0 | 2.3820E-4 | 6.1485E-4 | 9.0474E-4 | 0.0034 | 0.0192 | 0.051 | 0.117 | 0.316 | 0.696 |
| LnROS_Quinoline | 17 | 0 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 | 1.000E-10 |
| LnROS_Total PAHs | 14 | 3 | 0.014 | 0.0541 | 0.0959 | 0.44 | 36.05 | 47.6 | 55.13 | 59.44 | 62.77 |

## General UCL Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| From File | PAHs inputs.wst |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**Naphthalene**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 17 | Number of Detected Data | 9 |
| Number of Distinct Detected Data | 9 | Number of Non-Detect Data | 8 |
| | | Percent Non-Detects | 47.06% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.242 | Minimum Detected | -1.419 |
| Maximum Detected | 56.5 | Maximum Detected | 4.034 |
| Mean of Detected | 23.5 | Mean of Detected | 1.509 |
| SD of Detected | 26.25 | SD of Detected | 2.47 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.38 | Maximum Non-Detect | -0.968 |

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 | 9 |
| Number treated as Detected | 8 |
| Single DL Non-Detect Percentage | 52.94% |

**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 | 0.745 |
| 5% Shapiro Wilk Critical Value | 0.829 |

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

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 12.48 |
| SD | 22.13 |
| 95% DL/2 (t) UCL | 21.85 |
| Maximum Likelihood Estimate(MLE) Method | N/A |

**MLE yields a negative mean**

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.78 |
| 5% Shapiro Wilk Critical Value | 0.829 |

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

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -0.481 |
| SD | 2.816 |
| 95% H-Stat (DL/2) UCL | 2130 |
| Log ROS Method | |
| Mean in Log Scale | -1.346 |
| SD in Log Scale | 3.599 |
| Mean in Original Scale | 12.45 |
| SD in Original Scale | 22.15 |
| 95% t UCL | 21.83 |
| 95% Percentile Bootstrap UCL | 21.24 |
| 95% BCA Bootstrap UCL | 21.99 |
| 95% H-UCL | 139924 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.34 |
| Theta Star | 69.05 |
| nu star | 6.126 |
| A-D Test Statistic | 0.985 |
| 5% A-D Critical Value | 0.789 |
| K-S Test Statistic | 0.789 |
| 5% K-S Critical Value | 0.298 |

**Data follow Appr. Gamma Distribution at 5% Significance Level**

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 56.5 |
| Mean | 12.44 |
| Median | 0.242 |
| SD | 22.15 |
| k star | 0.121 |
| Theta star | 103.1 |
| Nu star | 4.102 |
| AppChi2 | 0.763 |
| 95% Gamma Approximate UCL | 66.93 |
| 95% Adjusted Gamma UCL | 81.18 |

**Note: DL/2 is not a recommended method.**

**Data Distribution Test with Detected Values Only**

**Data Follow Appr. Gamma Distribution at 5% Significance Level**

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 12.55 |
| SD | 21.43 |
| SE of Mean | 5.512 |
| 95% KM (t) UCL | 22.18 |
| 95% KM (z) UCL | 21.62 |
| 95% KM (jackknife) UCL | 21.85 |
| 95% KM (bootstrap t) UCL | 26.52 |
| 95% KM (BCA) UCL | 21.12 |
| 95% KM (Percentile Bootstrap) UCL | 21.53 |
| 95% KM (Chebyshev) UCL | 36.58 |
| 97.5% KM (Chebyshev) UCL | 46.98 |
| 99% KM (Chebyshev) UCL | 67.4 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (BCA) UCL | 21.12 |

**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.**

From File: Sheet1.wst

Summary Statistics for Raw Full Data Sets

| Variable | NumObs | Minimum | Maximum | Mean | Median | Variance | SD | MAD/0.675 | Skewness | Kurtosis | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_Aluminum | 14 | 0.341 | 296 | 28.97 | 7 | 5983 | 77.35 | 6.175 | 3.661 | 13.55 | 2.67 |
| LnROS_Antimony | 14 | 0.294 | 0.76 | 0.487 | 0.463 | 0.0186 | 0.136 | 0.135 | 0.543 | -0.485 | 0.28 |
| LnROS_Barium | 14 | 14.9 | 415 | 122.5 | 84.3 | 11786 | 108.6 | 80.43 | 1.69 | 3.206 | 0.887 |
| LnROS_Boron | 14 | 70.75 | 2180 | 878.6 | 450 | 584320 | 764.4 | 481.8 | 0.661 | -1.323 | 0.87 |
| LnROS_Cadmium | 14 | 0.0104 | 1.53 | 0.423 | 0.116 | 0.276 | 0.525 | 0.149 | 1.179 | 0.00152 | 1.24 |
| LnROS_Cobalt | 14 | 0.054 | 48.4 | 8.94 | 4.31 | 157.7 | 12.56 | 5.701 | 2.678 | 8.214 | 1.405 |
| LnROS_Copper | 14 | 0.166 | 11 | 1.725 | 0.945 | 7.481 | 2.735 | 0.586 | 3.441 | 12.38 | 1.586 |
| LnROS_Manganese | 14 | 5.35 | 18500 | 2824 | 1385 | 22194804 | 4711 | 1648 | 3.228 | 11.22 | 1.668 |
| LnROS_Molybdenum | 14 | 0.483 | 36 | 6.835 | 3.95 | 82.97 | 9.109 | 4.379 | 2.841 | 9.137 | 1.333 |
| LnROS_Nickel | 14 | 0.64 | 63.6 | 15.52 | 6.37 | 379.6 | 19.48 | 8.162 | 1.628 | 1.966 | 1.255 |
| LnROS_Thallium | 14 | 0.0109 | 0.498 | 0.161 | 0.0935 | 0.0265 | 0.163 | 0.106 | 0.964 | -0.478 | 1.01 |
| LnROS_Uranium | 14 | 0.068 | 8.01 | 2.642 | 1.184 | 8.811 | 2.968 | 1.652 | 0.726 | -1.168 | 1.124 |
| LnROS_Zinc | 13 | 0 | 411 | 42.4 | 7.3 | 12359 | 111.2 | 4.893 | 3.558 | 12.75 | 2.622 |

Percentiles for Raw Full Data Sets

| Variable | NumObs | 5%ile | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | 99%ile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LnROS_Aluminum | 14 | 0.56 | 0.798 | 1.374 | 2.477 | 7 | 9.475 | 16.26 | 28.32 | 122.7 | 261.3 |
| LnROS_Antimony | 14 | 0.318 | 0.34 | 0.374 | 0.39 | 0.463 | 0.59 | 0.622 | 0.647 | 0.689 | 0.746 |
| LnROS_Barium | 14 | 16.85 | 25.19 | 47.18 | 55.88 | 84.3 | 166 | 172.2 | 233.2 | 311.7 | 394.3 |
| LnROS_Boron | 14 | 135.3 | 179 | 224 | 280 | 450 | 1578 | 1656 | 1964 | 2102 | 2164 |
| LnROS_Cadmium | 14 | 0.0171 | 0.0245 | 0.0363 | 0.0471 | 0.116 | 0.791 | 0.913 | 1.199 | 1.387 | 1.501 |
| LnROS_Cobalt | 14 | 0.315 | 0.461 | 1.354 | 2.088 | 4.31 | 11.53 | 13.4 | 15.57 | 27.08 | 44.14 |
| LnROS_Copper | 14 | 0.216 | 0.339 | 0.566 | 0.585 | 0.945 | 1.643 | 1.76 | 2.077 | 5.28 | 9.856 |
| LnROS_Manganese | 14 | 120.8 | 237.3 | 387.4 | 413.8 | 1385 | 2953 | 3300 | 4044 | 9185 | 16637 |
| LnROS_Molybdenum | 14 | 0.679 | 0.877 | 1.292 | 1.618 | 3.95 | 7.3 | 8.56 | 11.21 | 20.14 | 32.83 |
| LnROS_Nickel | 14 | 0.933 | 1.196 | 1.616 | 1.815 | 6.37 | 22.25 | 25.98 | 42.51 | 54.05 | 61.69 |
| LnROS_Thallium | 14 | 0.0156 | 0.0204 | 0.0307 | 0.0365 | 0.0935 | 0.303 | 0.344 | 0.372 | 0.421 | 0.483 |
| LnROS_Uranium | 14 | 0.0693 | 0.0712 | 0.132 | 0.175 | 1.184 | 5.008 | 5.664 | 6.802 | 7.315 | 7.871 |
| LnROS_Zinc | 13 | 2.04 | 3.94 | 6.26 | 6.5 | 7.3 | 26.7 | 27 | 29.04 | 182.1 | 365.2 |

## General UCL Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| From File | Sheet1.wst |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**Aluminum**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 14 | Number of Detected Data | 10 |
| Number of Distinct Detected Data | 10 | Number of Non-Detect Data | 4 |
| | | Percent Non-Detects | 28.57% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 5.2 | Minimum Detected | 1.649 |
| Maximum Detected | 296 | Maximum Detected | 5.69 |
| Mean of Detected | 40.19 | Mean of Detected | 2.602 |
| SD of Detected | 90.29 | SD of Detected | 1.238 |
| Minimum Non-Detect | 5 | Minimum Non-Detect | 1.609 |
| Maximum Non-Detect | 5 | Maximum Non-Detect | 1.609 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.438 | Shapiro Wilk Test Statistic | 0.744 |
| 5% Shapiro Wilk Critical Value | 0.842 | 5% Shapiro Wilk Critical Value | 0.842 |
| 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 | 29.42 | Mean | 2.121 |
| SD | 77.18 | SD | 1.298 |
| 95% DL/2 (t) UCL | 65.95 | 95% H-Stat (DL/2) UCL | 63.87 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 9.711 | Mean in Log Scale | 1.792 |
| SD | 91.71 | SD in Log Scale | 1.711 |
| 95% MLE (t) UCL | 53.12 | Mean in Original Scale | 28.97 |
| 95% MLE (Tiku) UCL | 54.39 | SD in Original Scale | 77.35 |
| | | 95% t UCL | 65.58 |
| | | 95% Percentile Bootstrap UCL | 69.51 |
| | | 95% BCA Bootstrap UCL | 89.93 |
| | | 95% H UCL | 181.8 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 0.466 | Data do not follow a Discernable Distribution (0.05) |
| Theta Star | 86.24 | |
| nu star | 9.32 | |

| | |
|---|---|
| A-D Test Statistic | 1.757 |
| 5% A-D Critical Value | 0.771 |
| K-S Test Statistic | 0.771 |
| 5% K-S Critical Value | 0.279 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| Gamma ROS Statistics using Extrapolated Data | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 296 |
| Mean | 28.71 |
| Median | 7 |
| SD | 77.46 |
| k star | 0.159 |
| Theta star | 180.1 |
| Nu star | 4.462 |
| AppChi2 | 0.912 |
| 95% Gamma Approximate UCL | 140.4 |
| 95% Adjusted Gamma UCL | 177.2 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

| Kaplan-Meier (KM) Method | |
|---|---|
| Mean | 30.19 |
| SD | 74.1 |
| SE of Mean | 20.88 |
| 95% KM (t) UCL | 67.16 |
| 95% KM (z) UCL | 64.53 |
| 95% KM (jackknife) UCL | 66.54 |
| 95% KM (bootstrap t) UCL | 352.3 |
| 95% KM (BCA) UCL | 71.56 |
| 95% KM (Percentile Bootstrap) UCL | 70.42 |
| 95% KM (Chebyshev) UCL | 121.2 |
| 97.5% KM (Chebyshev) UCL | 160.6 |
| 99% KM (Chebyshev) UCL | 237.9 |

**Potential UCLs to Use**

| | |
|---|---|
| 97.5% KM (Chebyshev) UCL | 160.6 |

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

**Antimony**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 14 | Number of Detected Data | 5 |
| Number of Distinct Detected Data | 5 | Number of Non-Detect Data | 9 |
| | | Percent Non-Detects | 64.29% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.53 | Minimum Detected | -0.635 |
| Maximum Detected | 0.76 | Maximum Detected | -0.274 |
| Mean of Detected | 0.638 | Mean of Detected | -0.456 |
| SD of Detected | 0.0829 | SD of Detected | 0.13 |
| Minimum Non-Detect | 0.5 | Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | 0.5 | Maximum Non-Detect | -0.693 |

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 | 0.961 |
| 5% Shapiro Wilk Critical Value | 0.762 |

Data appear Normal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.389 |
| SD | 0.198 |
| 95% DL/2 (t) UCL | 0.482 |
| | |
| Maximum Likelihood Estimate(MLE) Method | |
| Mean | 0.442 |
| SD | 0.181 |
| 95% MLE (t) UCL | 0.527 |
| 95% MLE (Tiku) UCL | 0.571 |

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.967 |
| 5% Shapiro Wilk Critical Value | 0.762 |

Data appear Lognormal at 5% Significance Level

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | -1.054 |
| SD | 0.468 |
| 95% H-Stat (DL/2) UCL | 0.505 |
| | |
| Log ROS Method | |
| Mean in Log Scale | -0.755 |
| SD in Log Scale | 0.278 |
| Mean in Original Scale | 0.487 |
| SD in Original Scale | 0.136 |
| 95% t UCL | 0.551 |
| 95% Percentile Bootstrap UCL | 0.546 |
| 95% BCA Bootstrap UCL | 0.554 |
| 95% H UCL | 0.564 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 29.96 |
| Theta Star | 0.0213 |
| nu star | 299.6 |
| | |
| A-D Test Statistic | 0.262 |
| 5% A-D Critical Value | 0.678 |
| K-S Test Statistic | 0.678 |
| 5% K-S Critical Value | 0.357 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 0.76 |
| Mean | 0.317 |
| Median | 0.299 |
| SD | 0.283 |
| k star | 0.211 |
| Theta star | 1.503 |
| Nu star | 5.91 |
| AppChi2 | 1.594 |
| 95% Gamma Approximate UCL | 1.176 |
| 95% Adjusted Gamma UCL | 1.424 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 0.569 |
| SD | 0.0681 |
| SE of Mean | 0.0204 |
| 95% KM (t) UCL | 0.605 |
| 95% KM (z) UCL | 0.602 |
| 95% KM (jackknife) UCL | 0.619 |
| 95% KM (bootstrap t) UCL | 0.602 |
| 95% KM (BCA) UCL | 0.659 |
| 95% KM (Percentile Bootstrap) UCL | 0.657 |
| 95% KM (Chebyshev) UCL | 0.657 |
| 97.5% KM (Chebyshev) UCL | 0.696 |
| 99% KM (Chebyshev) UCL | 0.771 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.605 |
| 95% KM (Percentile Bootstrap) UCL | 0.657 |

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.

Barium

## General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Observations | 14 | Number of Distinct Observations | 14 |

### Raw Statistics

| | |
|---|---|
| Minimum | 14.9 |
| Maximum | 415 |
| Mean | 122.5 |
| Median | 84.3 |
| SD | 108.6 |
| Std. Error of Mean | 29.01 |
| Coefficient of Variation | 0.887 |
| Skewness | 1.69 |

### Log-transformed Statistics

| | |
|---|---|
| Minimum of Log Data | 2.701 |
| Maximum of Log Data | 6.028 |
| Mean of log Data | 4.443 |
| SD of log Data | 0.939 |

## Relevant UCL Statistics

### Normal Distribution Test

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.832 |
| Shapiro Wilk Critical Value | 0.874 |

Data not Normal at 5% Significance Level

### Lognormal Distribution Test

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.964 |
| Shapiro Wilk Critical Value | 0.874 |

Data appear Lognormal at 5% Significance Level

### Assuming Normal Distribution

| | |
|---|---|
| 95% Student's-t UCL | 173.8 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 184.2 |
| 95% Modified-t UCL (Johnson-1978) | 176 |

### Assuming Lognormal Distribution

| | |
|---|---|
| 95% H-UCL | 266.5 |
| 95% Chebyshev (MVUE) UCL | 276.3 |
| 97.5% Chebyshev (MVUE) UCL | 341 |
| 99% Chebyshev (MVUE) UCL | 468.2 |

### Gamma Distribution Test

| | |
|---|---|
| k star (bias corrected) | 1.24 |
| Theta Star | 98.77 |
| MLE of Mean | 122.5 |
| MLE of Standard Deviation | 110 |
| nu star | 34.72 |
| Approximate Chi Square Value (.05) | 22.24 |
| Adjusted Level of Significance | 0.0312 |
| Adjusted Chi Square Value | 20.92 |
| Anderson-Darling Test Statistic | 0.238 |
| Anderson-Darling 5% Critical Value | 0.75 |
| Kolmogorov-Smirnov Test Statistic | 0.151 |
| Kolmogorov-Smirnov 5% Critical Value | 0.233 |

Data appear Gamma Distributed at 5% Significance Level

### Data Distribution

Data appear Gamma Distributed at 5% Significance Level

### Nonparametric Statistics

| | |
|---|---|
| 95% CLT UCL | 170.2 |
| 95% Jackknife UCL | 173.8 |
| 95% Standard Bootstrap UCL | 167.5 |
| 95% Bootstrap-t UCL | 204.7 |
| 95% Hall's Bootstrap UCL | 366.4 |
| 95% Percentile Bootstrap UCL | 173.6 |
| 95% BCA Bootstrap UCL | 183.7 |
| 95% Chebyshev(Mean, Sd) UCL | 248.9 |
| 97.5% Chebyshev(Mean, Sd) UCL | 303.7 |
| 99% Chebyshev(Mean, Sd) UCL | 411.2 |

### Assuming Gamma Distribution

| | |
|---|---|
| 95% Approximate Gamma UCL | 191.2 |
| 95% Adjusted Gamma UCL | 203.2 |

**Potential UCL to Use**

Use 95% Approximate Gamma UCL 191.2

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.

Boron

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 14 | Number of Detected Data | 13 |
| Number of Distinct Detected Data | 12 | Number of Non-Detect Data | 1 |
| | | Percent Non-Detects | 7.14% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 170 | Minimum Detected | 5.136 |
| Maximum Detected | 2180 | Maximum Detected | 7.687 |
| Mean of Detected | 940.8 | Mean of Detected | 6.486 |
| SD of Detected | 757.9 | SD of Detected | 0.925 |
| Minimum Non-Detect | 10 | Minimum Non-Detect | 2.303 |
| Maximum Non-Detect | 10 | Maximum Non-Detect | 2.303 |

UCL Statistics

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.839 | Shapiro Wilk Test Statistic | 0.899 |
| 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 | | Assuming Lognormal Distribution | |
|---|---|---|---|
| DL/2 Substitution Method | | DL/2 Substitution Method | |
| Mean | 873.9 | Mean | 6.138 |
| SD | 769.9 | SD | 1.577 |
| 95% DL/2 (t) UCL | 1238 | 95% H-Stat (DL/2) UCL | 8614 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 845.5 | Mean in Log Scale | 6.327 |
| SD | 786.7 | SD in Log Scale | 1.069 |
| 95% MLE (t) UCL | 1218 | Mean in Original Scale | 878.6 |
| 95% MLE (Tiku) UCL | 1209 | SD in Original Scale | 764.4 |
| | | 95% t UCL | 1240 |
| | | 95% Percentile Bootstrap UCL | 1185 |
| | | 95% BCA Bootstrap UCL | 1240 |
| | | 95% H UCL | 2348 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 1.23 | Data appear Gamma Distributed at 5% Significance Level |
| Theta Star | 765.1 | |
| nu star | 31.97 | |
| | | |
| A-D Test Statistic | 0.666 | Nonparametric Statistics |
| 5% A-D Critical Value | 0.75 | Kaplan-Meier (KM) Method |
| K-S Test Statistic | 0.75 | Mean 885.7 |
| 5% K-S Critical Value | 0.241 | SD 729.2 |
| Data appear Gamma Distributed at 5% Significance Level | | SE of Mean 202.9 |

| | |
|---|---|
| 95% KM (t) UCL | 1245 |
| 95% KM (z) UCL | 1219 |
| 95% KM (jackknife) UCL | 1243 |
| 95% KM (bootstrap t) UCL | 1308 |
| 95% KM (BCA) UCL | 1213 |
| 95% KM (Percentile Bootstrap) UCL | 1211 |
| 95% KM (Chebyshev) UCL | 1770 |
| 97.5% KM (Chebyshev) UCL | 2153 |
| 99% KM (Chebyshev) UCL | 2904 |

**Assuming Gamma Distribution**

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 2180 |
| Mean | 873.6 |
| Median | 450 |
| SD | 770.4 |
| k star | 0.348 |
| Theta star | 2513 |
| Nu star | 9.733 |
| AppChi2 | 3.775 |
| 95% Gamma Approximate UCL | 2252 |
| 95% Adjusted Gamma UCL | 2578 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (Chebyshev) UCL | 1770 |

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.

**Cadmium**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 14 | Number of Detected Data | 10 |
| Number of Distinct Detected Data | 9 | Number of Non-Detect Data | 4 |
| | | Percent Non-Detects | 28.57% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.074 | Minimum Detected | -2.604 |
| Maximum Detected | 1.53 | Maximum Detected | 0.425 |
| Mean of Detected | 0.583 | Mean of Detected | -1.086 |
| SD of Detected | 0.547 | SD of Detected | 1.19 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.1 | Maximum Non-Detect | -2.303 |

| | | | |
|---|---|---|---|
| Note: Data have multiple DLs - Use of KM Method is recommended | | Number treated as Non-Detect | 6 |
| For all methods (except KM, DL/2, and ROS Methods), | | Number treated as Detected | 8 |
| Observations < Largest ND are treated as NDs | | Single DL Non-Detect Percentage | 42.86% |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.855 | Shapiro Wilk Test Statistic | 0.883 |
| 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 | 0.425 | Mean | -1.78 |
| SD | 0.524 | SD | 1.518 |
| 95% DL/2 (t) UCL | 0.673 | 95% H-Stat (DL/2) UCL | 2.564 |

| Maximum Likelihood Estimate(MLE) Method | |
|---|---|
| Mean | 0.207 |
| SD | 0.75 |
| 95% MLE (t) UCL | 0.562 |
| 95% MLE (Tiku) UCL | 0.616 |

| Log ROS Method | |
|---|---|
| Mean in Log Scale | -1.855 |
| SD in Log Scale | 1.628 |
| Mean in Original Scale | 0.423 |
| SD in Original Scale | 0.525 |
| 95% t UCL | 0.672 |
| 95% Percentile Bootstrap UCL | 0.654 |
| 95% BCA Bootstrap UCL | 0.7 |
| 95% H UCL | 3.485 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.803 |
| Theta Star | 0.725 |
| nu star | 16.06 |
| | |
| A-D Test Statistic | 0.524 |
| 5% A-D Critical Value | 0.747 |
| K-S Test Statistic | 0.747 |
| 5% K-S Critical Value | 0.273 |

Data appear Gamma Distributed at 5% Significance Level

**Data Distribution Test with Detected Values Only**

Data appear Normal at 5% Significance Level

**Assuming Gamma Distribution**

| Gamma ROS Statistics using Extrapolated Data | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 1.53 |
| Mean | 0.416 |
| Median | 0.116 |
| SD | 0.531 |
| k star | 0.199 |
| Theta star | 2.092 |
| Nu star | 5.568 |
| AppChi2 | 1.423 |
| 95% Gamma Approximate UCL | 1.628 |
| 95% Adjusted Gamma UCL | 1.987 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

| Kaplan-Meier (KM) Method | |
|---|---|
| Mean | 0.437 |
| SD | 0.495 |
| SE of Mean | 0.14 |
| 95% KM (t) UCL | 0.684 |
| 95% KM (z) UCL | 0.667 |
| 95% KM (jackknife) UCL | 0.679 |
| 95% KM (bootstrap t) UCL | 0.761 |
| 95% KM (BCA) UCL | 0.679 |
| 95% KM (Percentile Bootstrap) UCL | 0.658 |
| 95% KM (Chebyshev) UCL | 1.046 |
| 97.5% KM (Chebyshev) UCL | 1.309 |
| 99% KM (Chebyshev) UCL | 1.826 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.684 |
| 95% KM (Percentile Bootstrap) UCL | 0.658 |

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.

**Cobalt**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 14 | Number of Distinct Observations | 14 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 0.054 | Minimum of Log Data | -2.919 |
| Maximum | 48.4 | Maximum of Log Data | 3.879 |
| Mean | 8.94 | Mean of log Data | 1.231 |

| | | | |
|---|---|---|---|
| Median | 4.31 | SD of log Data | 1.764 |
| SD | 12.56 | | |
| Std. Error of Mean | 3.357 | | |
| Coefficient of Variation | 1.405 | | |
| Skewness | 2.678 | | |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.671 |
| Shapiro Wilk Critical Value | 0.874 |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.935 |
| Shapiro Wilk Critical Value | 0.874 |

Data appear Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 14.88 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 17.03 |
| 95% Modified-t UCL (Johnson-1978) | 15.29 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 126.6 |
| 95% Chebyshev (MVUE) UCL | 43.06 |
| 97.5% Chebyshev (MVUE) UCL | 56.1 |
| 99% Chebyshev (MVUE) UCL | 81.71 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 0.549 |
| Theta Star | 16.29 |
| MLE of Mean | 8.94 |
| MLE of Standard Deviation | 12.07 |
| nu star | 15.37 |
| Approximate Chi Square Value (.05) | 7.518 |
| Adjusted Level of Significance | 0.0312 |
| Adjusted Chi Square Value | 6.801 |
| Anderson-Darling Test Statistic | 0.198 |
| Anderson-Darling 5% Critical Value | 0.781 |
| Kolmogorov-Smirnov Test Statistic | 0.114 |
| Kolmogorov-Smirnov 5% Critical Value | 0.239 |

Data appear Gamma Distributed at 5% Significance Level

**Data Distribution**

Data appear Gamma Distributed at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 14.46 |
| 95% Jackknife UCL | 14.88 |
| 95% Standard Bootstrap UCL | 14.3 |
| 95% Bootstrap-t UCL | 21.87 |
| 95% Hall's Bootstrap UCL | 35.15 |
| 95% Percentile Bootstrap UCL | 14.72 |
| 95% BCA Bootstrap UCL | 18.26 |
| 95% Chebyshev(Mean, Sd) UCL | 23.57 |
| 97.5% Chebyshev(Mean, Sd) UCL | 29.9 |
| 99% Chebyshev(Mean, Sd) UCL | 42.34 |

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL | 18.28 |
| 95% Adjusted Gamma UCL | 20.2 |

**Potential UCL to Use**

Use 95% Approximate Gamma UCL 18.28

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 Data | 14 | Number of Detected Data | 12 |
| Number of Distinct Detected Data | 11 | Number of Non-Detect Data | 2 |
| | | Percent Non-Detects | 14.29% |

| Raw Statistics | |
|---|---|
| Minimum Detected | 0.56 |
| Maximum Detected | 11 |
| Mean of Detected | 1.978 |
| SD of Detected | 2.89 |
| Minimum Non-Detect | 0.5 |
| Maximum Non-Detect | 0.5 |

| Log-transformed Statistics | |
|---|---|
| Minimum Detected | -0.58 |
| Maximum Detected | 2.398 |
| Mean of Detected | 0.239 |
| SD of Detected | 0.819 |
| Minimum Non-Detect | -0.693 |
| Maximum Non-Detect | -0.693 |

## UCL Statistics

| Normal Distribution Test with Detected Values Only | |
|---|---|
| Shapiro Wilk Test Statistic | 0.492 |
| 5% Shapiro Wilk Critical Value | 0.859 |

Data not Normal at 5% Significance Level

| Lognormal Distribution Test with Detected Values Only | |
|---|---|
| Shapiro Wilk Test Statistic | 0.839 |
| 5% Shapiro Wilk Critical Value | 0.859 |

Data not Lognormal at 5% Significance Level

| Assuming Normal Distribution | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 1.731 |
| SD | 2.731 |
| 95% DL/2 (t) UCL | 3.024 |
| | |
| Maximum Likelihood Estimate(MLE) Method | |
| Mean | 1.483 |
| SD | 2.896 |
| 95% MLE (t) UCL | 2.854 |
| 95% MLE (Tiku) UCL | 2.784 |

| Assuming Lognormal Distribution | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 0.00694 |
| SD | 0.957 |
| 95% H-Stat (DL/2) UCL | 3.281 |
| | |
| Log ROS Method | |
| Mean in Log Scale | -0.0243 |
| SD in Log Scale | 1.011 |
| Mean in Original Scale | 1.725 |
| SD in Original Scale | 2.735 |
| 95% t UCL | 3.02 |
| 95% Percentile Bootstrap UCL | 3.096 |
| 95% BCA Bootstrap UCL | 3.934 |
| 95% H UCL | 3.578 |

| Gamma Distribution Test with Detected Values Only | |
|---|---|
| k star (bias corrected) | 1.007 |
| Theta Star | 1.964 |
| nu star | 24.18 |
| | |
| A-D Test Statistic | 1.277 |
| 5% A-D Critical Value | 0.751 |
| K-S Test Statistic | 0.751 |
| 5% K-S Critical Value | 0.251 |

Data not Gamma Distributed at 5% Significance Level

| Assuming Gamma Distribution | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 11 |
| Mean | 1.696 |
| Median | 0.945 |
| SD | 2.754 |
| k star | 0.283 |

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

| Nonparametric Statistics | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 1.776 |
| SD | 2.609 |
| SE of Mean | 0.728 |
| 95% KM (t) UCL | 3.066 |
| 95% KM (z) UCL | 2.974 |
| 95% KM (jackknife) UCL | 3.056 |
| 95% KM (bootstrap t) UCL | 7.247 |
| 95% KM (BCA) UCL | 3.308 |
| 95% KM (Percentile Bootstrap) UCL | 3.184 |
| 95% KM (Chebyshev) UCL | 4.95 |
| 97.5% KM (Chebyshev) UCL | 6.324 |
| 99% KM (Chebyshev) UCL | 9.022 |

| | |
|---|---|
| Theta star | 5.982 |
| Nu star | 7.938 |
| AppChi2 | 2.699 |
| 95% Gamma Approximate UCL | 4.987 |
| 95% Adjusted Gamma UCL | 5.825 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (Chebyshev) UCL | 4.95 |

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.

**Manganese**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 14 | Number of Distinct Observations | 14 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 5.35 |
| Maximum | 18500 |
| Mean | 2824 |
| Median | 1385 |
| SD | 4711 |
| Std. Error of Mean | 1259 |
| Coefficient of Variation | 1.668 |
| Skewness | 3.228 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | 1.677 |
| Maximum of Log Data | 9.826 |
| Mean of log Data | 6.881 |
| SD of log Data | 1.922 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.558 |
| Shapiro Wilk Critical Value | 0.874 |

Data not Normal at 5% Significance Level

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.885 |
| Shapiro Wilk Critical Value | 0.874 |

Data appear Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 5054 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 6056 |
| 95% Modified-t UCL (Johnson-1978) | 5235 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 68529 |
| 95% Chebyshev (MVUE) UCL | 16343 |
| 97.5% Chebyshev (MVUE) UCL | 21414 |
| 99% Chebyshev (MVUE) UCL | 31374 |

**Gamma Distribution Test**

| | |
|---|---|
| k star (bias corrected) | 0.506 |
| Theta Star | 5587 |
| MLE of Mean | 2824 |
| MLE of Standard Deviation | 3972 |
| nu star | 14.16 |
| Approximate Chi Square Value (.05) | 6.678 |
| Adjusted Level of Significance | 0.0312 |
| Adjusted Chi Square Value | 6.008 |
| Anderson-Darling Test Statistic | 0.361 |
| Anderson-Darling 5% Critical Value | 0.786 |

**Data Distribution**

Data appear Gamma Distributed at 5% Significance Level

**Nonparametric Statistics**

| | |
|---|---|
| 95% CLT UCL | 4895 |
| 95% Jackknife UCL | 5054 |
| 95% Standard Bootstrap UCL | 4783 |
| 95% Bootstrap-t UCL | 8912 |
| 95% Hall's Bootstrap UCL | 12602 |

| | |
|---|---|
| Kolmogorov-Smirnov Test Statistic | 0.156 |
| Kolmogorov-Smirnov 5% Critical Value | 0.24 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| 95% Approximate Gamma UCL | 5987 |
| 95% Adjusted Gamma UCL | 6654 |

| | |
|---|---|
| 95% Percentile Bootstrap UCL | 5063 |
| 95% BCA Bootstrap UCL | 6153 |
| 95% Chebyshev(Mean, Sd) UCL | 8313 |
| 97.5% Chebyshev(Mean, Sd) UCL | 10687 |
| 99% Chebyshev(Mean, Sd) UCL | 15352 |

**Potential UCL to Use**

Use 95% Approximate Gamma UCL 5987

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.

**Molybdenum**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 14 | Number of Detected Data | 10 |
| Number of Distinct Detected Data | 9 | Number of Non-Detect Data | 4 |
| | | Percent Non-Detects | 28.57% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 2.2 | Minimum Detected | 0.788 |
| Maximum Detected | 36 | Maximum Detected | 3.584 |
| Mean of Detected | 9.19 | Mean of Detected | 1.879 |
| SD of Detected | 9.91 | SD of Detected | 0.807 |
| Minimum Non-Detect | 2 | Minimum Non-Detect | 0.693 |
| Maximum Non-Detect | 2 | Maximum Non-Detect | 0.693 |

**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 | 0.944 |
| 5% Shapiro Wilk Critical Value | 0.842 | 5% Shapiro Wilk Critical Value | 0.842 |
| 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 | 6.85 | Mean | 1.342 |
| SD | 9.096 | SD | 1.108 |
| 95% DL/2 (t) UCL | 11.16 | 95% H-Stat (DL/2) UCL | 17.62 |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 4.929 | Mean in Log Scale | 1.304 |
| SD | 10.91 | SD in Log Scale | 1.179 |
| 95% MLE (t) UCL | 10.09 | Mean in Original Scale | 6.835 |
| 95% MLE (Tiku) UCL | 10.27 | SD in Original Scale | 9.109 |
| | | 95% t UCL | 11.15 |
| | | 95% Percentile Bootstrap UCL | 11.18 |
| | | 95% BCA Bootstrap UCL | 12.81 |

| | |
|---|---|
| 95% H UCL | 20.34 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 1.201 |
| Theta Star | 7.649 |
| nu star | 24.03 |
| | |
| A-D Test Statistic | 0.539 |
| 5% A-D Critical Value | 0.738 |
| K-S Test Statistic | 0.738 |
| 5% K-S Critical Value | 0.271 |

Data appear Gamma Distributed at 5% Significance Level

**Data Distribution Test with Detected Values Only**

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 36 |
| Mean | 6.564 |
| Median | 3.95 |
| SD | 9.303 |
| k star | 0.18 |
| Theta star | 36.48 |
| Nu star | 5.038 |
| AppChi2 | 1.17 |
| 95% Gamma Approximate UCL | 28.27 |
| 95% Adjusted Gamma UCL | 35.02 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

Kaplan-Meier (KM) Method

| | |
|---|---|
| Mean | 7.193 |
| SD | 8.55 |
| SE of Mean | 2.409 |
| 95% KM (t) UCL | 11.46 |
| 95% KM (z) UCL | 11.15 |
| 95% KM (jackknife) UCL | 11.23 |
| 95% KM (bootstrap t) UCL | 17.11 |
| 95% KM (BCA) UCL | 12 |
| 95% KM (Percentile Bootstrap) UCL | 11.68 |
| 95% KM (Chebyshev) UCL | 17.69 |
| 97.5% KM (Chebyshev) UCL | 22.24 |
| 99% KM (Chebyshev) UCL | 31.16 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (Percentile Bootstrap) UCL | 11.68 |

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

**Nickel**

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 14 | Number of Detected Data | 13 |
| Number of Distinct Detected Data | 13 | Number of Non-Detect Data | 1 |
| | | Percent Non-Detects | 7.14% |

**Raw Statistics**

| | |
|---|---|
| Minimum Detected | 0.64 |
| Maximum Detected | 63.6 |
| Mean of Detected | 16.6 |
| SD of Detected | 19.84 |
| Minimum Non-Detect | 3 |
| Maximum Non-Detect | 3 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum Detected | -0.446 |
| Maximum Detected | 4.153 |
| Mean of Detected | 2.008 |
| SD of Detected | 1.463 |
| Minimum Non-Detect | 1.099 |
| Maximum Non-Detect | 1.099 |

**UCL Statistics**

**Normal Distribution Test with Detected Values Only**

**Lognormal Distribution Test with Detected Values Only**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.791 |
| 5% Shapiro Wilk Critical Value | 0.866 |

Data not Normal at 5% Significance Level

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.962 |
| 5% Shapiro Wilk Critical Value | 0.866 |

Data appear Lognormal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 15.53 |
| SD | 19.48 |
| 95% DL/2 (t) UCL | 24.75 |
| | |
| Maximum Likelihood Estimate(MLE) Method | |
| Mean | 9.584 |
| SD | 25.62 |
| 95% MLE (t) UCL | 21.71 |
| 95% MLE (Tiku) UCL | 22.8 |

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 1.893 |
| SD | 1.469 |
| 95% H-Stat (DL/2) UCL | 85.83 |
| | |
| Log ROS Method | |
| Mean in Log Scale | 1.891 |
| SD in Log Scale | 1.472 |
| Mean in Original Scale | 15.52 |
| SD in Original Scale | 19.48 |
| 95% t UCL | 24.74 |
| 95% Percentile Bootstrap UCL | 24.36 |
| 95% BCA Bootstrap UCL | 26.11 |
| 95% H UCL | 86.43 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.626 |
| Theta Star | 26.53 |
| nu star | 16.27 |
| | |
| A-D Test Statistic | 0.255 |
| 5% A-D Critical Value | 0.771 |
| K-S Test Statistic | 0.771 |
| 5% K-S Critical Value | 0.246 |

Data appear Gamma Distributed at 5% Significance Level

**Data Distribution Test with Detected Values Only**

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 63.6 |
| Mean | 15.42 |
| Median | 6.37 |
| SD | 19.57 |
| k star | 0.331 |
| Theta star | 46.63 |
| Nu star | 9.258 |
| AppChi2 | 3.484 |
| 95% Gamma Approximate UCL | 40.97 |
| 95% Adjusted Gamma UCL | 47.12 |

Note: DL/2 is not a recommended method.

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 15.52 |
| SD | 18.78 |
| SE of Mean | 5.224 |
| 95% KM (t) UCL | 24.77 |
| 95% KM (z) UCL | 24.11 |
| 95% KM (jackknife) UCL | 24.74 |
| 95% KM (bootstrap t) UCL | 29.31 |
| 95% KM (BCA) UCL | 24.84 |
| 95% KM (Percentile Bootstrap) UCL | 24.24 |
| 95% KM (Chebyshev) UCL | 38.29 |
| 97.5% KM (Chebyshev) UCL | 48.14 |
| 99% KM (Chebyshev) UCL | 67.5 |
| | |
| Potential UCLs to Use | |
| 95% KM (Chebyshev) UCL | 38.29 |

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.

Thallium

## General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Data | 14 | Number of Detected Data | 9 |
| Number of Distinct Detected Data | 9 | Number of Non-Detect Data | 5 |
| | | Percent Non-Detects | 35.71% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.051 | Minimum Detected | -2.976 |
| Maximum Detected | 0.498 | Maximum Detected | -0.697 |
| Mean of Detected | 0.236 | Mean of Detected | -1.695 |
| SD of Detected | 0.159 | SD of Detected | 0.801 |
| Minimum Non-Detect | 0.05 | Minimum Non-Detect | -2.996 |
| Maximum Non-Detect | 0.05 | Maximum Non-Detect | -2.996 |

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 | 0.909 | Shapiro Wilk Test Statistic | 0.929 |
| 5% Shapiro Wilk Critical Value | 0.829 | 5% Shapiro Wilk Critical Value | 0.829 |
| 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 | 0.161 | Mean | -2.407 |
| SD | 0.163 | SD | 1.174 |
| 95% DL/2 (t) UCL | 0.238 | 95% H-Stat (DL/2) UCL | 0.491 |
| Maximum Likelihood Estimate(MLE) Method | | Log ROS Method | |
| Mean | 0.118 | Mean in Log Scale | -2.425 |
| SD | 0.211 | SD in Log Scale | 1.233 |
| 95% MLE (t) UCL | 0.218 | Mean in Original Scale | 0.161 |
| 95% MLE (Tiku) UCL | 0.227 | SD in Original Scale | 0.163 |
| | | 95% t UCL | 0.238 |
| | | 95% Percentile Bootstrap UCL | 0.235 |
| | | 95% BCA Bootstrap UCL | 0.243 |
| | | 95% H UCL | 0.564 |

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only |
|---|---|---|
| k star (bias corrected) | 1.498 | Data appear Normal at 5% Significance Level |
| Theta Star | 0.158 | |
| nu star | 26.96 | |
| A-D Test Statistic | 0.369 | Nonparametric Statistics |

| | |
|---|---|
| 5% A-D Critical Value | 0.729 |
| K-S Test Statistic | 0.729 |
| 5% K-S Critical Value | 0.282 |

Data appear Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

Gamma ROS Statistics using Extrapolated Data

| | |
|---|---|
| Minimum | 0.000001 |
| Maximum | 0.498 |
| Mean | 0.152 |
| Median | 0.0935 |
| SD | 0.172 |
| k star | 0.19 |
| Theta star | 0.802 |
| Nu star | 5.307 |
| AppChi2 | 1.297 |
| 95% Gamma Approximate UCL | 0.622 |
| 95% Adjusted Gamma UCL | 0.764 |

Note: DL/2 is not a recommended method.

Kaplan-Meier (KM) Method

| | |
|---|---|
| Mean | 0.17 |
| SD | 0.15 |
| SE of Mean | 0.0424 |
| 95% KM (t) UCL | 0.245 |
| 95% KM (z) UCL | 0.24 |
| 95% KM (jackknife) UCL | 0.24 |
| 95% KM (bootstrap t) UCL | 0.256 |
| 95% KM (BCA) UCL | 0.257 |
| 95% KM (Percentile Bootstrap) UCL | 0.246 |
| 95% KM (Chebyshev) UCL | 0.355 |
| 97.5% KM (Chebyshev) UCL | 0.435 |
| 99% KM (Chebyshev) UCL | 0.592 |

**Potential UCLs to Use**

| | |
|---|---|
| 95% KM (t) UCL | 0.245 |
| 95% KM (Percentile Bootstrap) UCL | 0.246 |

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.

**Uranium**

**General Statistics**

| | |
|---|---|
| Number of Valid Observations | 14 |
| Number of Distinct Observations | 14 |

**Raw Statistics**

| | |
|---|---|
| Minimum | 0.068 |
| Maximum | 8.01 |
| Mean | 2.642 |
| Median | 1.184 |
| SD | 2.968 |
| Std. Error of Mean | 0.793 |
| Coefficient of Variation | 1.124 |
| Skewness | 0.726 |

**Log-transformed Statistics**

| | |
|---|---|
| Minimum of Log Data | -2.688 |
| Maximum of Log Data | 2.081 |
| Mean of log Data | -0.175 |
| SD of log Data | 1.875 |

**Relevant UCL Statistics**

**Normal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.814 |
| Shapiro Wilk Critical Value | 0.874 |

Data not Normal at 5% Significance Level

**Assuming Normal Distribution**

| | |
|---|---|
| 95% Student's-t UCL | 4.047 |

**95% UCLs (Adjusted for Skewness)**

| | |
|---|---|
| 95% Adjusted-CLT UCL (Chen-1995) | 4.111 |
| 95% Modified-t UCL (Johnson-1978) | 4.072 |

**Lognormal Distribution Test**

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.87 |
| Shapiro Wilk Critical Value | 0.874 |

Data not Lognormal at 5% Significance Level

**Assuming Lognormal Distribution**

| | |
|---|---|
| 95% H-UCL | 48.68 |
| 95% Chebyshev (MVUE) UCL | 12.94 |
| 97.5% Chebyshev (MVUE) UCL | 16.93 |
| 99% Chebyshev (MVUE) UCL | 24.76 |

| Gamma Distribution Test | |
|---|---|
| k star (bias corrected) | 0.477 |
| Theta Star | 5.537 |
| MLE of Mean | 2.642 |
| MLE of Standard Deviation | 3.824 |
| nu star | 13.36 |
| Approximate Chi Square Value (.05) | 6.135 |
| Adjusted Level of Significance | 0.0312 |
| Adjusted Chi Square Value | 5.498 |
| Anderson-Darling Test Statistic | 0.705 |
| Anderson-Darling 5% Critical Value | 0.789 |
| Kolmogorov-Smirnov Test Statistic | 0.184 |
| Kolmogorov-Smirnov 5% Critical Value | 0.241 |

Data appear Gamma Distributed at 5% Significance Level

| Assuming Gamma Distribution | |
|---|---|
| 95% Approximate Gamma UCL | 5.752 |
| 95% Adjusted Gamma UCL | 6.419 |

**Data Distribution**

Data appear Gamma Distributed at 5% Significance Level

| Nonparametric Statistics | |
|---|---|
| 95% CLT UCL | 3.947 |
| 95% Jackknife UCL | 4.047 |
| 95% Standard Bootstrap UCL | 3.886 |
| 95% Bootstrap-t UCL | 4.247 |
| 95% Hall's Bootstrap UCL | 3.823 |
| 95% Percentile Bootstrap UCL | 3.903 |
| 95% BCA Bootstrap UCL | 4.221 |
| 95% Chebyshev(Mean, Sd) UCL | 6.1 |
| 97.5% Chebyshev(Mean, Sd) UCL | 7.596 |
| 99% Chebyshev(Mean, Sd) UCL | 10.53 |

| Potential UCL to Use | |
|---|---|
| Use 95% Approximate Gamma UCL | 5.752 |

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.

Zinc

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Data | 13 | Number of Detected Data | 12 |
| Number of Distinct Detected Data | 12 | Number of Non-Detect Data | 1 |
| Number of Missing Values | 1 | Percent Non-Detects | 7.69% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 3.4 | Minimum Detected | 1.224 |
| Maximum Detected | 411 | Maximum Detected | 6.019 |
| Mean of Detected | 45.93 | Mean of Detected | 2.61 |
| SD of Detected | 115.3 | SD of Detected | 1.271 |
| Minimum Non-Detect | 3 | Minimum Non-Detect | 1.099 |
| Maximum Non-Detect | 3 | Maximum Non-Detect | 1.099 |

**UCL Statistics**

| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.391 | Shapiro Wilk Test Statistic | 0.788 |
| 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**

**Assuming Lognormal Distribution**

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 42.52 |
| SD | 111.1 |
| 95% DL/2 (t) UCL | 97.45 |

| | |
|---|---|
| Maximum Likelihood Estimate(MLE) Method | |
| Mean | 36.6 |
| SD | 112.2 |
| 95% MLE (t) UCL | 92.08 |
| 95% MLE (Tiku) UCL | 87.2 |

| | |
|---|---|
| DL/2 Substitution Method | |
| Mean | 2.44 |
| SD | 1.362 |
| 95% H-Stat (DL/2) UCL | 115.5 |

| | |
|---|---|
| Log ROS Method | |
| Mean in Log Scale | 2.394 |
| SD in Log Scale | 1.444 |
| Mean in Original Scale | 42.46 |
| SD in Original Scale | 111.1 |
| 95% t UCL | 97.4 |
| 95% Percentile Bootstrap UCL | 102.4 |
| 95% BCA Bootstrap UCL | 135.2 |
| 95% H UCL | 143.9 |

**Gamma Distribution Test with Detected Values Only**

| | |
|---|---|
| k star (bias corrected) | 0.445 |
| Theta Star | 103.3 |
| nu star | 10.67 |
| | |
| A-D Test Statistic | 2.02 |
| 5% A-D Critical Value | 0.783 |
| K-S Test Statistic | 0.783 |
| 5% K-S Critical Value | 0.258 |

Data not Gamma Distributed at 5% Significance Level

**Assuming Gamma Distribution**

| | |
|---|---|
| Gamma ROS Statistics using Extrapolated Data | |
| Minimum | 0.000001 |
| Maximum | 411 |
| Mean | 42.4 |
| Median | 7.3 |
| SD | 111.2 |
| k star | 0.274 |
| Theta star | 155 |
| Nu star | 7.113 |
| AppChi2 | 2.233 |
| 95% Gamma Approximate UCL | 135.1 |
| 95% Adjusted Gamma UCL | 161.8 |

Note: DL/2 is not a recommended method.

**Data Distribution Test with Detected Values Only**

Data do not follow a Discernable Distribution (0.05)

**Nonparametric Statistics**

| | |
|---|---|
| Kaplan-Meier (KM) Method | |
| Mean | 42.66 |
| SD | 106.7 |
| SE of Mean | 30.91 |
| 95% KM (t) UCL | 97.76 |
| 95% KM (z) UCL | 93.51 |
| 95% KM (jackknife) UCL | 97.4 |
| 95% KM (bootstrap t) UCL | 513.6 |
| 95% KM (BCA) UCL | 106.6 |
| 95% KM (Percentile Bootstrap) UCL | 102.4 |
| 95% KM (Chebyshev) UCL | 177.4 |
| 97.5% KM (Chebyshev) UCL | 235.7 |
| 99% KM (Chebyshev) UCL | 350.2 |

**Potential UCLs to Use**

| | |
|---|---|
| 97.5% KM (Chebyshev) UCL | 235.7 |

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

From File: INPUT_a.wst

## Summary Statistics for Raw Full Data Sets

| Variable | NumObs | Minimum | Maximum | Mean | Median | Variance | SD | MAD/0.675 | Skewness | Kurtosis | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ROS_EPHw(C10-<C19)1 | 88 | 0.291 | 4550 | 216.2 | 33.57 | 373951 | 611.5 | 45.03 | 5.261 | 31.81 | 2.829 |
| ROS_EPHw(C19-C32)1 | 88 | 0.248 | 2010 | 107 | 20.76 | 76807 | 277.1 | 27.34 | 4.969 | 28.51 | 2.591 |
| LnROS_LEPH | 88 | 0.276 | 4550 | 214.7 | 32.73 | 373534 | 611.2 | 43.96 | 5.274 | 31.94 | 2.846 |
| LnROS_HEPH | 88 | 0.248 | 2010 | 107 | 20.76 | 76807 | 277.1 | 27.34 | 4.969 | 28.51 | 2.591 |
| LnROS_VPH | 88 | 0.662 | 840 | 66.47 | 22.68 | 16497 | 128.4 | 26.79 | 4.038 | 18.95 | 1.932 |
| LnROS_VH | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Benzene | 88 | 1.22E-05 | 0.305 | 0.0156 | 0.00195 | 0.00214 | 0.0462 | 0.00268 | 5.113 | 28.26 | 2.96 |
| LnROS_Ethylbenzene | 88 | 4.92E-10 | 0.524 | 0.0128 | 1.47E-05 | 0.00532 | 0.0729 | 2.177E-05 | 6.481 | 41.68 | 5.68 |
| LnROS_Styrene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Toluene | 88 | 8.708E-07 | 0.745 | 0.0209 | 0.0007232 | 0.00758 | 0.0871 | 0.00105 | 7.109 | 56.65 | 4.172 |
| LnROS_o-xylene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_m,p-xylene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Xylenes | 88 | 2.355E-06 | 3.88 | 0.13 | 0.00256 | 0.298 | 0.546 | 0.00373 | 5.888 | 36.06 | 4.199 |
| LnROS_MTBE | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Dimethylamine | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

## Percentiles for Raw Full Data Sets

| Variable | NumObs | 5%ile | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | 99%ile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ROS_EPHw(C10-<C19)1 | 88 | 1.326 | 2.589 | 6.127 | 8.56 | 33.57 | 131.6 | 183.9 | 435 | 850.9 | 2671 |
| ROS_EPHw(C19-C32)1 | 88 | 1.019 | 1.903 | 4.249 | 5.804 | 20.76 | 74.19 | 101.4 | 226.3 | 422.9 | 1236 |
| LnROS_LEPH | 88 | 1.27 | 2.489 | 5.919 | 8.285 | 32.73 | 129.3 | 181 | 430.1 | 844.4 | 2671 |
| LnROS_HEPH | 88 | 1.019 | 1.903 | 4.249 | 5.804 | 20.76 | 74.19 | 101.4 | 226.3 | 422.9 | 1236 |
| LnROS_VPH | 88 | 2.044 | 3.366 | 6.393 | 8.2 | 22.68 | 62.68 | 80.4 | 152.6 | 251.3 | 648.6 |
| LnROS_VH | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Benzene | 88 | 0.0000617 | 0.0001261 | 0.0003166 | 0.0004527 | 0.00195 | 0.00838 | 0.012 | 0.03 | 0.0808 | 0.279 |
| LnROS_Ethylbenzene | 88 | 1.337E-08 | 5.673E-08 | 3.67E-07 | 7.578E-07 | 1.47E-05 | 0.000285 | 0.0005897 | 0.00383 | 0.0166 | 0.454 |
| LnROS_Styrene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Toluene | 88 | 7.475E-06 | 1.925E-05 | 6.513E-05 | 0.0001046 | 0.0007232 | 0.00499 | 0.00802 | 0.0271 | 0.0771 | 0.32 |
| LnROS_o-xylene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_m,p-xylene | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Xylenes | 88 | 1.864E-05 | 4.782E-05 | 0.0001793 | 0.000328 | 0.00256 | 0.0201 | 0.033 | 0.163 | 0.4 | 3.245 |
| LnROS_MTBE | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| LnROS_Dimethylamine | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 9 | EPHw(C10-<C19)1 | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 11 | | | | | | General Statistics | | | | | | |
| 12 | | | | | | Number of Valid Data | 86 | | | Number of Detected Data | | 4 |
| 13 | | | | | | Number of Distinct Detected Data | 4 | | | Number of Non-Detect Data | | 82 |
| 14 | | | | | | | | | | Percent Non-Detects | | 95.35% |
| 15 | | | | | | | | | | | | |
| 16 | | | | Raw Statistics | | | | | | Log-transformed Statistics | | |
| 17 | | | | | | Minimum Detected | 1220 | | | Minimum Detected | | 7.107 |
| 18 | | | | | | Maximum Detected | 4550 | | | Maximum Detected | | 8.423 |
| 19 | | | | | | Mean of Detected | 2623 | | | Mean of Detected | | 7.766 |
| 20 | | | | | | SD of Detected | 1393 | | | SD of Detected | | 0.537 |
| 21 | | | | | | Minimum Non-Detect | 200 | | | Minimum Non-Detect | | 5.298 |
| 22 | | | | | | Maximum Non-Detect | 200 | | | Maximum Non-Detect | | 5.298 |
| 23 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | |
| 25 | | | | | | Warning: There are only 4 Distinct Detected Values in this data | | | | | | |
| 26 | | | | | | Note: It should be noted that even though bootstrap may be performed on this data set | | | | | | |
| 27 | | | | | | the resulting calculations may not be reliable enough to draw conclusions | | | | | | |
| 28 | | | | | | | | | | | | |
| 29 | | | | | | It is recommended to have 10-15 or more distinct observations for accurate and meaningful results. | | | | | | |
| 30 | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | |
| 32 | | | | | | UCL Statistics | | | | | | |
| 33 | | | | Normal Distribution Test with Detected Values Only | | | | | | Lognormal Distribution Test with Detected Values Only | | |
| 34 | | | | | | Shapiro Wilk Test Statistic | 0.907 | | | Shapiro Wilk Test Statistic | | 0.953 |
| 35 | | | | | | 5% Shapiro Wilk Critical Value | 0.748 | | | 5% Shapiro Wilk Critical Value | | 0.748 |
| 36 | | | | | | Data appear Normal at 5% Significance Level | | | | Data appear Lognormal at 5% Significance Level | | |
| 37 | | | | | | | | | | | | |
| 38 | | | | | | Assuming Normal Distribution | | | | Assuming Lognormal Distribution | | |
| 39 | | | | | | DL/2 Substitution Method | | | | DL/2 Substitution Method | | |
| 40 | | | | | | Mean | 217.3 | | | Mean | | 4.752 |
| 41 | | | | | | SD | 595 | | | SD | | 0.677 |
| 42 | | | | | | 95% DL/2 (t) UCL | 324 | | | 95% H-Stat (DL/2) UCL | | 168.5 |
| 43 | | | | | | | | | | | | |
| 44 | | | | | | Maximum Likelihood Estimate(MLE) Method | N/A | | | Log ROS Method | | |
| 45 | | | | | | MLE yields a negative mean | | | | Mean in Log Scale | | 3.556 |
| 46 | | | | | | | | | | SD in Log Scale | | 2.011 |
| 47 | | | | | | | | | | Mean in Original Scale | | 220.5 |
| 48 | | | | | | | | | | SD in Original Scale | | 617.9 |
| 49 | | | | | | | | | | 95% t UCL | | 331.3 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 50 | | | | | | | | | 95% Percentile Bootstrap UCL | | | 336.5 |
| 51 | | | | | | | | | 95% BCA Bootstrap UCL | | | 378.6 |
| 52 | | | | | | | | | 95% H-UCL | | | 553.3 |
| 53 | | | | | | | | | | | | |
| 54 | | | Gamma Distribution Test with Detected Values Only | | | | | | Data Distribution Test with Detected Values Only | | | |
| 55 | | | | | k star (bias corrected) | 1.382 | | | Data appear Normal at 5% Significance Level | | | |
| 56 | | | | | Theta Star | 1897 | | | | | | |
| 57 | | | | | nu star | 11.06 | | | | | | |
| 58 | | | | | | | | | | | | |
| 59 | | | | | A-D Test Statistic | 0.319 | | | Nonparametric Statistics | | | |
| 60 | | | | | 5% A-D Critical Value | 0.659 | | | Kaplan-Meier (KM) Method | | | |
| 61 | | | | | K-S Test Statistic | 0.659 | | | Mean | | | 1285 |
| 62 | | | | | 5% K-S Critical Value | 0.396 | | | SD | | | 393.6 |
| 63 | | | Data appear Gamma Distributed at 5% Significance Level | | | | | | SE of Mean | | | 49.01 |
| 64 | | | | | | | | | 95% KM (t) UCL | | | 1367 |
| 65 | | | Assuming Gamma Distribution | | | | | | 95% KM (z) UCL | | | 1366 |
| 66 | | | | | Gamma ROS Statistics using Extrapolated Data | | | | 95% KM (jackknife) UCL | | | 1990 |
| 67 | | | | | Minimum | 0.000001 | | | 95% KM (bootstrap t) UCL | | | 1374 |
| 68 | | | | | Maximum | 4550 | | | 95% KM (BCA) UCL | | | 2490 |
| 69 | | | | | Mean | 122 | | | 95% KM (Percentile Bootstrap) UCL | | | 2440 |
| 70 | | | | | Median | 0.000001 | | | 95% KM (Chebyshev) UCL | | | 1499 |
| 71 | | | | | SD | 614.1 | | | 97.5% KM (Chebyshev) UCL | | | 1591 |
| 72 | | | | | k star | 0.0557 | | | 99% KM (Chebyshev) UCL | | | 1773 |
| 73 | | | | | Theta star | 2189 | | | | | | |
| 74 | | | | | Nu star | 9.584 | | | Potential UCLs to Use | | | |
| 75 | | | | | AppChi2 | 3.684 | | | 95% KM (t) UCL | | | 1367 |
| 76 | | | | | 95% Gamma Approximate UCL | 317.4 | | | 95% KM (Percentile Bootstrap) UCL | | | 2440 |
| 77 | | | | | 95% Adjusted Gamma UCL | N/A | | | | | | |
| 78 | Note: DL/2 is not a recommended method. | | | | | | | | | | | |
| 79 | | | | | | | | | | | | |
| 80 | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | |
| 81 | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | |
| 82 | | | For additional insight, the user may want to consult a statistician. | | | | | | | | | |
| 83 | | | | | | | | | | | | |
| 84 | | | | | | | | | | | | |
| 85 | LEPH | | | | | | | | | | | |
| 86 | | | | | | | | | | | | |
| 87 | | | | | | General Statistics | | | | | | |
| 88 | | | | | Number of Valid Data | 86 | | | Number of Detected Data | | | 4 |
| 89 | | | | | Number of Distinct Detected Data | 4 | | | Number of Non-Detect Data | | | 82 |
| 90 | | | | | | | | | Percent Non-Detects | | | 95.35% |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 91 | | | | | | | | | | | | |
| 92 | | | Raw Statistics | | | | Log-transformed Statistics | | | | | |
| 93 | | | Minimum Detected | | | 1210 | Minimum Detected | | | | | 7.098 |
| 94 | | | Maximum Detected | | | 4550 | Maximum Detected | | | | | 8.423 |
| 95 | | | Mean of Detected | | | 2620 | Mean of Detected | | | | | 7.763 |
| 96 | | | SD of Detected | | | 1396 | SD of Detected | | | | | 0.541 |
| 97 | | | Minimum Non-Detect | | | 200 | Minimum Non-Detect | | | | | 5.298 |
| 98 | | | Maximum Non-Detect | | | 200 | Maximum Non-Detect | | | | | 5.298 |
| 99 | | | | | | | | | | | | |
| 100 | | | | | | | | | | | | |
| 101 | | | Warning: There are only 4 Distinct Detected Values in this data | | | | | | | | | |
| 102 | | | Note: It should be noted that even though bootstrap may be performed on this data set | | | | | | | | | |
| 103 | | | the resulting calculations may not be reliable enough to draw conclusions | | | | | | | | | |
| 104 | | | | | | | | | | | | |
| 105 | | | It is recommended to have 10-15 or more distinct observations for accurate and meaningful results. | | | | | | | | | |
| 106 | | | | | | | | | | | | |
| 107 | | | | | | | | | | | | |
| 108 | | | UCL Statistics | | | | | | | | | |
| 109 | | | Normal Distribution Test with Detected Values Only | | | | Lognormal Distribution Test with Detected Values Only | | | | | |
| 110 | | | Shapiro Wilk Test Statistic | | | 0.908 | Shapiro Wilk Test Statistic | | | | | 0.953 |
| 111 | | | 5% Shapiro Wilk Critical Value | | | 0.748 | 5% Shapiro Wilk Critical Value | | | | | 0.748 |
| 112 | | | Data appear Normal at 5% Significance Level | | | | Data appear Lognormal at 5% Significance Level | | | | | |
| 113 | | | | | | | | | | | | |
| 114 | | | Assuming Normal Distribution | | | | Assuming Lognormal Distribution | | | | | |
| 115 | | | DL/2 Substitution Method | | | | DL/2 Substitution Method | | | | | |
| 116 | | | Mean | | | 217.2 | Mean | | | | | 4.752 |
| 117 | | | SD | | | 594.8 | SD | | | | | 0.677 |
| 118 | | | 95% DL/2 (t) UCL | | | 323.9 | 95% H-Stat (DL/2) UCL | | | | | 168.4 |
| 119 | | | | | | | | | | | | |
| 120 | | | Maximum Likelihood Estimate(MLE) Method | | | N/A | Log ROS Method | | | | | |
| 121 | | | MLE yields a negative mean | | | | Mean in Log Scale | | | | | 3.531 |
| 122 | | | | | | | SD in Log Scale | | | | | 2.021 |
| 123 | | | | | | | Mean in Original Scale | | | | | 219 |
| 124 | | | | | | | SD in Original Scale | | | | | 617.6 |
| 125 | | | | | | | 95% t UCL | | | | | 329.7 |
| 126 | | | | | | | 95% Percentile Bootstrap UCL | | | | | 341.4 |
| 127 | | | | | | | 95% BCA Bootstrap UCL | | | | | 389.8 |
| 128 | | | | | | | 95% H-UCL | | | | | 555.6 |
| 129 | | | | | | | | | | | | |
| 130 | | | Gamma Distribution Test with Detected Values Only | | | | Data Distribution Test with Detected Values Only | | | | | |
| 131 | | | k star (bias corrected) | | | 1.37 | Data appear Normal at 5% Significance Level | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 132 | | | | | Theta Star | 1912 | | | | | | |
| 133 | | | | | nu star | 10.96 | | | | | | |
| 134 | | | | | | | | | | | | |
| 135 | | | | | A-D Test Statistic | 0.318 | | | Nonparametric Statistics | | | |
| 136 | | | | | 5% A-D Critical Value | 0.659 | | | | Kaplan-Meier (KM) Method | | |
| 137 | | | | | K-S Test Statistic | 0.659 | | | | Mean | | 1276 |
| 138 | | | | | 5% K-S Critical Value | 0.396 | | | | SD | | 395.2 |
| 139 | | | Data appear Gamma Distributed at 5% Significance Level | | | | | | | SE of Mean | | 49.21 |
| 140 | | | | | | | | | | 95% KM (t) UCL | | 1357 |
| 141 | | | Assuming Gamma Distribution | | | | | | | 95% KM (z) UCL | | 1357 |
| 142 | | | | Gamma ROS Statistics using Extrapolated Data | | | | | | 95% KM (jackknife) UCL | | 1986 |
| 143 | | | | | Minimum | 0.000001 | | | | 95% KM (bootstrap t) UCL | | 1364 |
| 144 | | | | | Maximum | 4550 | | | | 95% KM (BCA) UCL | | 2440 |
| 145 | | | | | Mean | 121.9 | | | | 95% KM (Percentile Bootstrap) UCL | | 2440 |
| 146 | | | | | Median | 0.000001 | | | | 95% KM (Chebyshev) UCL | | 1490 |
| 147 | | | | | SD | 613.9 | | | | 97.5% KM (Chebyshev) UCL | | 1583 |
| 148 | | | | | k star | 0.0557 | | | | 99% KM (Chebyshev) UCL | | 1765 |
| 149 | | | | | Theta star | 2187 | | | | | | |
| 150 | | | | | Nu star | 9.585 | | | Potential UCLs to Use | | | |
| 151 | | | | | AppChi2 | 3.684 | | | | 95% KM (t) UCL | | 1357 |
| 152 | | | | | 95% Gamma Approximate UCL | 317.1 | | | | 95% KM (Percentile Bootstrap) UCL | | 2440 |
| 153 | | | | | 95% Adjusted Gamma UCL | N/A | | | | | | |
| 154 | Note: DL/2 is not a recommended method. | | | | | | | | | | | |
| 155 | | | | | | | | | | | | |
| 156 | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | |
| 157 | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | |
| 158 | | | For additional insight, the user may want to consult a statistician. | | | | | | | | | |
| 159 | | | | | | | | | | | | |
| 160 | | | | | | | | | | | | |
| 161 | VPH | | | | | | | | | | | |
| 162 | | | | | | | | | | | | |
| 163 | | | | | General Statistics | | | | | | | |
| 164 | | | | | Number of Valid Data | 86 | | | | Number of Detected Data | | 4 |
| 165 | | | | | Number of Distinct Detected Data | 4 | | | | Number of Non-Detect Data | | 82 |
| 166 | | | | | | | | | | Percent Non-Detects | | 95.35% |
| 167 | | | | | | | | | | | | |
| 168 | | | | Raw Statistics | | | | | Log-transformed Statistics | | | |
| 169 | | | | | Minimum Detected | 340 | | | | Minimum Detected | | 5.829 |
| 170 | | | | | Maximum Detected | 840 | | | | Maximum Detected | | 6.733 |
| 171 | | | | | Mean of Detected | 567.5 | | | | Mean of Detected | | 6.286 |
| 172 | | | | | SD of Detected | 214.7 | | | | SD of Detected | | 0.386 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 173 | | | | | Minimum Non-Detect | 100 | | | | Minimum Non-Detect | | 4.605 |
| 174 | | | | | Maximum Non-Detect | 100 | | | | Maximum Non-Detect | | 4.605 |
| 175 | | | | | | | | | | | | |
| 176 | | | | | | | | | | | | |
| 177 | | | | | Warning: There are only 4 Distinct Detected Values in this data | | | | | | | |
| 178 | | | | | Note: It should be noted that even though bootstrap may be performed on this data set | | | | | | | |
| 179 | | | | | the resulting calculations may not be reliable enough to draw conclusions | | | | | | | |
| 180 | | | | | | | | | | | | |
| 181 | | | | | It is recommended to have 10-15 or more distinct observations for accurate and meaningful results. | | | | | | | |
| 182 | | | | | | | | | | | | |
| 183 | | | | | | | | | | | | |
| 184 | | | | | UCL Statistics | | | | | | | |
| 185 | | | | | Normal Distribution Test with Detected Values Only | | | | | Lognormal Distribution Test with Detected Values Only | | |
| 186 | | | | | Shapiro Wilk Test Statistic | 0.983 | | | | Shapiro Wilk Test Statistic | | 0.997 |
| 187 | | | | | 5% Shapiro Wilk Critical Value | 0.748 | | | | 5% Shapiro Wilk Critical Value | | 0.748 |
| 188 | | | | | Data appear Normal at 5% Significance Level | | | | | Data appear Lognormal at 5% Significance Level | | |
| 189 | | | | | | | | | | | | |
| 190 | | | | | Assuming Normal Distribution | | | | | Assuming Lognormal Distribution | | |
| 191 | | | | | DL/2 Substitution Method | | | | | DL/2 Substitution Method | | |
| 192 | | | | | Mean | 74.07 | | | | Mean | | 4.022 |
| 193 | | | | | SD | 116.8 | | | | SD | | 0.508 |
| 194 | | | | | 95% DL/2 (t) UCL | 95.02 | | | | 95% H-Stat (DL/2) UCL | | 70.35 |
| 195 | | | | | | | | | | | | |
| 196 | | | | | Maximum Likelihood Estimate(MLE) Method | N/A | | | | Log ROS Method | | |
| 197 | | | | | MLE yields a negative mean | | | | | Mean in Log Scale | | 3.153 |
| 198 | | | | | | | | | | SD in Log Scale | | 1.496 |
| 199 | | | | | | | | | | Mean in Original Scale | | 67.62 |
| 200 | | | | | | | | | | SD in Original Scale | | 129.7 |
| 201 | | | | | | | | | | 95% t UCL | | 90.87 |
| 202 | | | | | | | | | | 95% Percentile Bootstrap UCL | | 91.42 |
| 203 | | | | | | | | | | 95% BCA Bootstrap UCL | | 99.54 |
| 204 | | | | | | | | | | 95% H-UCL | | 112.3 |
| 205 | | | | | | | | | | | | |
| 206 | | | | | Gamma Distribution Test with Detected Values Only | | | | | Data Distribution Test with Detected Values Only | | |
| 207 | | | | | k star (bias corrected) | 2.479 | | | | Data appear Normal at 5% Significance Level | | |
| 208 | | | | | Theta Star | 229 | | | | | | |
| 209 | | | | | nu star | 19.83 | | | | | | |
| 210 | | | | | | | | | | | | |
| 211 | | | | | A-D Test Statistic | 0.196 | | | | Nonparametric Statistics | | |
| 212 | | | | | 5% A-D Critical Value | 0.657 | | | | Kaplan-Meier (KM) Method | | |
| 213 | | | | | K-S Test Statistic | 0.657 | | | | Mean | | 350.6 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 214 | | | | | 5% K-S Critical Value | 0.395 | | | | | SD | 62.48 |
| 215 | | | | Data appear Gamma Distributed at 5% Significance Level | | | | | | | SE of Mean | 7.779 |
| 216 | | | | | | | | | | | 95% KM (t) UCL | 363.5 |
| 217 | | | | Assuming Gamma Distribution | | | | | | | 95% KM (z) UCL | 363.4 |
| 218 | | | | | Gamma ROS Statistics using Extrapolated Data | | | | | | 95% KM (jackknife) UCL | 433.3 |
| 219 | | | | | Minimum | 0.000001 | | | | | 95% KM (bootstrap t) UCL | 361.6 |
| 220 | | | | | Maximum | 840 | | | | | 95% KM (BCA) UCL | 625.1 |
| 221 | | | | | Mean | 26.4 | | | | | 95% KM (Percentile Bootstrap) UCL | 622.6 |
| 222 | | | | | Median | 0.000001 | | | | | 95% KM (Chebyshev) UCL | 384.5 |
| 223 | | | | | SD | 126.8 | | | | | 97.5% KM (Chebyshev) UCL | 399.2 |
| 224 | | | | | k star | 0.0597 | | | | | 99% KM (Chebyshev) UCL | 428 |
| 225 | | | | | Theta star | 442.2 | | | | | | |
| 226 | | | | | Nu star | 10.27 | | | | Potential UCLs to Use | | |
| 227 | | | | | AppChi2 | 4.109 | | | | | 95% KM (t) UCL | 363.5 |
| 228 | | | | | 95% Gamma Approximate UCL | 65.95 | | | | | 95% KM (Percentile Bootstrap) UCL | 622.6 |
| 229 | | | | | 95% Adjusted Gamma UCL | N/A | | | | | | |
| 230 | Note: DL/2 is not a recommended method. | | | | | | | | | | | |
| 231 | | | | | | | | | | | | |
| 232 | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | |
| 233 | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | |
| 234 | | | | For additional insight, the user may want to consult a statistician. | | | | | | | | |
| 235 | | | | | | | | | | | | |
| 236 | | | | | | | | | | | | |
| 237 | VH | | | | | | | | | | | |
| 238 | | | | | | | | | | | | |
| 239 | | | | | | General Statistics | | | | | | |
| 240 | | | | | Number of Valid Data | 9 | | | | | Number of Detected Data | 0 |
| 241 | | | | | Number of Distinct Detected Data | 0 | | | | | Number of Non-Detect Data | 9 |
| 242 | | | | | | | | | | | Percent Non-Detects | 100.00% |
| 243 | | | | | | | | | | | | |
| 244 | | | | Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs! | | | | | | | | |
| 245 | | | | Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit! | | | | | | | | |
| 246 | | | | The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV). | | | | | | | | |
| 247 | | | | | | | | | | | | |
| 248 | | | | The data set for variable VH was not processed! | | | | | | | | |
| 249 | | | | | | | | | | | | |
| 250 | | | | | | | | | | | | |
| 251 | | | | | | | | | | | | |
| 252 | Benzene | | | | | | | | | | | |
| 253 | | | | | | | | | | | | |
| 254 | | | | | | General Statistics | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 255 | | | | | Number of Valid Data | 86 | | | Number of Detected Data | | | 7 |
| 256 | | | | | Number of Distinct Detected Data | 7 | | | Number of Non-Detect Data | | | 79 |
| 257 | | | | | | | | | Percent Non-Detects | | | 91.86% |
| 258 | | | | | | | | | | | | |
| 259 | | | | | Raw Statistics | | | | Log-transformed Statistics | | | |
| 260 | | | | | Minimum Detected | 0.045 | | | Minimum Detected | | | -3.101 |
| 261 | | | | | Maximum Detected | 0.305 | | | Maximum Detected | | | -1.187 |
| 262 | | | | | Mean of Detected | 0.138 | | | Mean of Detected | | | -2.202 |
| 263 | | | | | SD of Detected | 0.105 | | | SD of Detected | | | 0.704 |
| 264 | | | | | Minimum Non-Detect | 0.04 | | | Minimum Non-Detect | | | -3.219 |
| 265 | | | | | Maximum Non-Detect | 0.04 | | | Maximum Non-Detect | | | -3.219 |
| 266 | | | | | | | | | | | | |
| 267 | | | | | | | | | | | | |
| 268 | | | | | Warning: There are only 7 Detected Values in this data | | | | | | | |
| 269 | | | | | Note: It should be noted that even though bootstrap may be performed on this data set | | | | | | | |
| 270 | | | | | the resulting calculations may not be reliable enough to draw conclusions | | | | | | | |
| 271 | | | | | | | | | | | | |
| 272 | | | | | It is recommended to have 10-15 or more distinct observations for accurate and meaningful results. | | | | | | | |
| 273 | | | | | | | | | | | | |
| 274 | | | | | | | | | | | | |
| 275 | | | | | UCL Statistics | | | | | | | |
| 276 | | | | | Normal Distribution Test with Detected Values Only | | | | Lognormal Distribution Test with Detected Values Only | | | |
| 277 | | | | | Shapiro Wilk Test Statistic | 0.76 | | | Shapiro Wilk Test Statistic | | | 0.873 |
| 278 | | | | | 5% Shapiro Wilk Critical Value | 0.803 | | | 5% Shapiro Wilk Critical Value | | | 0.803 |
| 279 | | | | | Data not Normal at 5% Significance Level | | | | Data appear Lognormal at 5% Significance Level | | | |
| 280 | | | | | | | | | | | | |
| 281 | | | | | Assuming Normal Distribution | | | | Assuming Lognormal Distribution | | | |
| 282 | | | | | DL/2 Substitution Method | | | | DL/2 Substitution Method | | | |
| 283 | | | | | Mean | 0.0296 | | | Mean | | | -3.773 |
| 284 | | | | | SD | 0.0429 | | | SD | | | 0.506 |
| 285 | | | | | 95% DL/2 (t) UCL | 0.0373 | | | 95% H-Stat (DL/2) UCL | | | 0.0289 |
| 286 | | | | | | | | | | | | |
| 287 | | | | | Maximum Likelihood Estimate(MLE) Method | N/A | | | Log ROS Method | | | |
| 288 | | | | | MLE yields a negative mean | | | | Mean in Log Scale | | | -6.192 |
| 289 | | | | | | | | | SD in Log Scale | | | 2.148 |
| 290 | | | | | | | | | Mean in Original Scale | | | 0.0159 |
| 291 | | | | | | | | | SD in Original Scale | | | 0.0467 |
| 292 | | | | | | | | | 95% t UCL | | | 0.0243 |
| 293 | | | | | | | | | 95% Percentile Bootstrap UCL | | | 0.0249 |
| 294 | | | | | | | | | 95% BCA Bootstrap UCL | | | 0.0277 |
| 295 | | | | | | | | | 95% H-UCL | | | 0.0471 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 296 | | | | | | | | | | | | |
| 297 | | | Gamma Distribution Test with Detected Values Only | | | | Data Distribution Test with Detected Values Only | | | | | |
| 298 | | | k star (bias corrected) | | | 1.456 | Data Follow Appr. Gamma Distribution at 5% Significance Level | | | | | |
| 299 | | | Theta Star | | | 0.0951 | | | | | | |
| 300 | | | nu star | | | 20.38 | | | | | | |
| 301 | | | | | | | | | | | | |
| 302 | | | A-D Test Statistic | | | 0.699 | Nonparametric Statistics | | | | | |
| 303 | | | 5% A-D Critical Value | | | 0.714 | Kaplan-Meier (KM) Method | | | | | |
| 304 | | | K-S Test Statistic | | | 0.714 | Mean | | | | | 0.0526 |
| 305 | | | 5% K-S Critical Value | | | 0.315 | SD | | | | | 0.0377 |
| 306 | | | Data follow Appr. Gamma Distribution at 5% Significance Level | | | | SE of Mean | | | | | 0.0044 |
| 307 | | | | | | | 95% KM (t) UCL | | | | | 0.0599 |
| 308 | | | Assuming Gamma Distribution | | | | 95% KM (z) UCL | | | | | 0.0598 |
| 309 | | | Gamma ROS Statistics using Extrapolated Data | | | | 95% KM (jackknife) UCL | | | | | 0.0703 |
| 310 | | | Minimum | | | 0.000001 | 95% KM (bootstrap t) UCL | | | | | 0.0735 |
| 311 | | | Maximum | | | 0.305 | 95% KM (BCA) UCL | | | | | 0.0978 |
| 312 | | | Mean | | | 0.0113 | 95% KM (Percentile Bootstrap) UCL | | | | | 0.0928 |
| 313 | | | Median | | | 0.000001 | 95% KM (Chebyshev) UCL | | | | | 0.0718 |
| 314 | | | SD | | | 0.0472 | 97.5% KM (Chebyshev) UCL | | | | | 0.0801 |
| 315 | | | k star | | | 0.102 | 99% KM (Chebyshev) UCL | | | | | 0.0963 |
| 316 | | | Theta star | | | 0.111 | | | | | | |
| 317 | | | Nu star | | | 17.47 | Potential UCLs to Use | | | | | |
| 318 | | | AppChi2 | | | 9.008 | 95% KM (t) UCL | | | | | 0.0599 |
| 319 | | | 95% Gamma Approximate UCL | | | 0.0219 | | | | | | |
| 320 | | | 95% Adjusted Gamma UCL | | | 0.0221 | | | | | | |
| 321 | Note: DL/2 is not a recommended method. | | | | | | | | | | | |
| 322 | | | | | | | | | | | | |
| 323 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 324 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 325 | For additional insight, the user may want to consult a statistician. | | | | | | | | | | | |
| 326 | | | | | | | | | | | | |
| 327 | | | | | | | | | | | | |
| 328 | Ethylbenzene | | | | | | | | | | | |
| 329 | | | | | | | | | | | | |
| 330 | | | | General Statistics | | | | | | | | |
| 331 | | | Number of Valid Data | | | 86 | Number of Detected Data | | | | | 3 |
| 332 | | | Number of Distinct Detected Data | | | 3 | Number of Non-Detect Data | | | | | 83 |
| 333 | | | | | | | Percent Non-Detects | | | | | 96.51% |
| 334 | | | | | | | | | | | | |
| 335 | | | Raw Statistics | | | | Log-transformed Statistics | | | | | |
| 336 | | | Minimum Detected | | | 0.062 | Minimum Detected | | | | | -2.781 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 337 | | | | | | Maximum Detected | 0.524 | | | Maximum Detected | | -0.646 |
| 338 | | | | | | Mean of Detected | 0.343 | | | Mean of Detected | | -1.413 |
| 339 | | | | | | SD of Detected | 0.247 | | | SD of Detected | | 1.187 |
| 340 | | | | | | Minimum Non-Detect | 0.05 | | | Minimum Non-Detect | | -2.996 |
| 341 | | | | | | Maximum Non-Detect | 0.05 | | | Maximum Non-Detect | | -2.996 |
| 342 | | | | | | | | | | | | |
| 343 | | | | | | | | | | | | |
| 344 | | | | | | Warning: There are only 3 Distinct Detected Values in this data set | | | | | | |
| 345 | | | | | | The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods. | | | | | | |
| 346 | | | | | | Those methods will return a 'N/A' value on your output display! | | | | | | |
| 347 | | | | | | | | | | | | |
| 348 | | | | | | It is necessary to have 4 or more Distinct Values for bootstrap methods. | | | | | | |
| 349 | | | | | | However, results obtained using 4 to 9 distinct values may not be reliable. | | | | | | |
| 350 | | | | | | It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates. | | | | | | |
| 351 | | | | | | | | | | | | |
| 352 | | | | | | | | | | | | |
| 353 | | | | | | UCL Statistics | | | | | | |
| 354 | | | | | | Normal Distribution Test with Detected Values Only | | | | Lognormal Distribution Test with Detected Values Only | | |
| 355 | | | | | | Shapiro Wilk Test Statistic | 0.875 | | | Shapiro Wilk Test Statistic | | 0.808 |
| 356 | | | | | | 5% Shapiro Wilk Critical Value | 0.767 | | | 5% Shapiro Wilk Critical Value | | 0.767 |
| 357 | | | | | | Data appear Normal at 5% Significance Level | | | | Data appear Lognormal at 5% Significance Level | | |
| 358 | | | | | | | | | | | | |
| 359 | | | | | | Assuming Normal Distribution | | | | Assuming Lognormal Distribution | | |
| 360 | | | | | | DL/2 Substitution Method | | | | DL/2 Substitution Method | | |
| 361 | | | | | | Mean | 0.0361 | | | Mean | | -3.609 |
| 362 | | | | | | SD | 0.0699 | | | SD | | 0.458 |
| 363 | | | | | | 95% DL/2 (t) UCL | 0.0486 | | | 95% H-Stat (DL/2) UCL | | 0.0329 |
| 364 | | | | | | | | | | | | |
| 365 | | | | | | Maximum Likelihood Estimate(MLE) Method | N/A | | | Log ROS Method | | |
| 366 | | | | | | MLE yields a negative mean | | | | Mean in Log Scale | | -11.04 |
| 367 | | | | | | | | | | SD in Log Scale | | 4.364 |
| 368 | | | | | | | | | | Mean in Original Scale | | 0.0131 |
| 369 | | | | | | | | | | SD in Original Scale | | 0.0738 |
| 370 | | | | | | | | | | 95% t UCL | | 0.0264 |
| 371 | | | | | | | | | | 95% Percentile Bootstrap UCL | | 0.0268 |
| 372 | | | | | | | | | | 95% BCA Bootstrap UCL | | 0.0352 |
| 373 | | | | | | | | | | 95% H-UCL | | 4.968 |
| 374 | | | | | | | | | | | | |
| 375 | | | | | | Gamma Distribution Test with Detected Values Only | | | | Data Distribution Test with Detected Values Only | | |
| 376 | | | | | | k star (bias corrected) | N/A | | | Data appear Normal at 5% Significance Level | | |
| 377 | | | | | | Theta Star | N/A | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 378 | | | | | nu star | N/A | | | | | | |
| 379 | | | | | | | | | | | | |
| 380 | | | | | A-D Test Statistic | N/A | | | Nonparametric Statistics | | | |
| 381 | | | | | 5% A-D Critical Value | N/A | | | Kaplan-Meier (KM) Method | | | |
| 382 | | | | | K-S Test Statistic | N/A | | | Mean | | | 0.0718 |
| 383 | | | | | 5% K-S Critical Value | N/A | | | SD | | | 0.0639 |
| 384 | | | Data not Gamma Distributed at 5% Significance Level | | | | | | SE of Mean | | | 0.00844 |
| 385 | | | | | | | | | 95% KM (t) UCL | | | 0.0858 |
| 386 | | | Assuming Gamma Distribution | | | | | | 95% KM (z) UCL | | | 0.0857 |
| 387 | | | | | Gamma ROS Statistics using Extrapolated Data | | | | 95% KM (jackknife) UCL | | | 0.317 |
| 388 | | | | | Minimum | N/A | | | 95% KM (bootstrap t) UCL | | | 0.0779 |
| 389 | | | | | Maximum | N/A | | | 95% KM (BCA) UCL | | | 0.524 |
| 390 | | | | | Mean | N/A | | | 95% KM (Percentile Bootstrap) UCL | | | 0.524 |
| 391 | | | | | Median | N/A | | | 95% KM (Chebyshev) UCL | | | 0.109 |
| 392 | | | | | SD | N/A | | | 97.5% KM (Chebyshev) UCL | | | 0.125 |
| 393 | | | | | k star | N/A | | | 99% KM (Chebyshev) UCL | | | 0.156 |
| 394 | | | | | Theta star | N/A | | | | | | |
| 395 | | | | | Nu star | N/A | | | Potential UCLs to Use | | | |
| 396 | | | | | AppChi2 | N/A | | | 95% KM (t) UCL | | | 0.0858 |
| 397 | | | | | 95% Gamma Approximate UCL | N/A | | | 95% KM (Percentile Bootstrap) UCL | | | 0.524 |
| 398 | | | | | 95% Adjusted Gamma UCL | N/A | | | | | | |
| 399 | Note: DL/2 is not a recommended method. | | | | | | | | | | | |
| 400 | | | | | | | | | | | | |
| 401 | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | |
| 402 | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | |
| 403 | | | | For additional insight, the user may want to consult a statistician. | | | | | | | | |
| 404 | | | | | | | | | | | | |
| 405 | | | | | | | | | | | | |
| 406 | Styrene | | | | | | | | | | | |
| 407 | | | | | | | | | | | | |
| 408 | | | | | General Statistics | | | | | | | |
| 409 | | | | | Number of Valid Data | 84 | | | Number of Detected Data | | | 0 |
| 410 | | | | | Number of Distinct Detected Data | 0 | | | Number of Non-Detect Data | | | 84 |
| 411 | | | | | | | | | Percent Non-Detects | | | 100.00% |
| 412 | | | | | | | | | | | | |
| 413 | | | | Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs! | | | | | | | | |
| 414 | | | | Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit! | | | | | | | | |
| 415 | | | | The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV). | | | | | | | | |
| 416 | | | | | | | | | | | | |
| 417 | | | | The data set for variable Styrene was not processed! | | | | | | | | |
| 418 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 419 | | | | | | | | | | | | |
| 420 | | | | | | | | | | | | |
| 421 | Toluene | | | | | | | | | | | |
| 422 | | | | | | | | | | | | |
| 423 | | | | | | General Statistics | | | | | | |
| 424 | | | | | | Number of Valid Data | 86 | | | Number of Detected Data | | 8 |
| 425 | | | | | | Number of Distinct Detected Data | 8 | | | Number of Non-Detect Data | | 78 |
| 426 | | | | | | | | | | Percent Non-Detects | | 90.70% |
| 427 | | | | | | | | | | | | |
| 428 | | | | | | Raw Statistics | | | | Log-transformed Statistics | | |
| 429 | | | | | | Minimum Detected | 0.052 | | | Minimum Detected | | -2.957 |
| 430 | | | | | | Maximum Detected | 0.745 | | | Maximum Detected | | -0.294 |
| 431 | | | | | | Mean of Detected | 0.199 | | | Mean of Detected | | -2.053 |
| 432 | | | | | | SD of Detected | 0.233 | | | SD of Detected | | 0.939 |
| 433 | | | | | | Minimum Non-Detect | 0.05 | | | Minimum Non-Detect | | -2.996 |
| 434 | | | | | | Maximum Non-Detect | 0.05 | | | Maximum Non-Detect | | -2.996 |
| 435 | | | | | | | | | | | | |
| 436 | | | | | | | | | | | | |
| 437 | | | | | | Warning: There are only 8 Detected Values in this data | | | | | | |
| 438 | | | | | | Note: It should be noted that even though bootstrap may be performed on this data set | | | | | | |
| 439 | | | | | | the resulting calculations may not be reliable enough to draw conclusions | | | | | | |
| 440 | | | | | | | | | | | | |
| 441 | | | | | | It is recommended to have 10-15 or more distinct observations for accurate and meaningful results. | | | | | | |
| 442 | | | | | | | | | | | | |
| 443 | | | | | | | | | | | | |
| 444 | | | | | | UCL Statistics | | | | | | |
| 445 | | | | | | Normal Distribution Test with Detected Values Only | | | | Lognormal Distribution Test with Detected Values Only | | |
| 446 | | | | | | Shapiro Wilk Test Statistic | 0.682 | | | Shapiro Wilk Test Statistic | | 0.888 |
| 447 | | | | | | 5% Shapiro Wilk Critical Value | 0.818 | | | 5% Shapiro Wilk Critical Value | | 0.818 |
| 448 | | | | | | Data not Normal at 5% Significance Level | | | | Data appear Lognormal at 5% Significance Level | | |
| 449 | | | | | | | | | | | | |
| 450 | | | | | | Assuming Normal Distribution | | | | Assuming Lognormal Distribution | | |
| 451 | | | | | | DL/2 Substitution Method | | | | DL/2 Substitution Method | | |
| 452 | | | | | | Mean | 0.0412 | | | Mean | | -3.537 |
| 453 | | | | | | SD | 0.0838 | | | SD | | 0.549 |
| 454 | | | | | | 95% DL/2 (t) UCL | 0.0562 | | | 95% H-Stat (DL/2) UCL | | 0.0378 |
| 455 | | | | | | | | | | | | |
| 456 | | | | | | Maximum Likelihood Estimate(MLE) Method | N/A | | | Log ROS Method | | |
| 457 | | | | | | MLE yields a negative mean | | | | Mean in Log Scale | | -7.166 |
| 458 | | | | | | | | | | SD in Log Scale | | 2.844 |
| 459 | | | | | | | | | | Mean in Original Scale | | 0.0213 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 460 | | | | | | | | | | SD in Original Scale | | 0.088 |
| 461 | | | | | | | | | | 95% t UCL | | 0.0371 |
| 462 | | | | | | | | | | 95% Percentile Bootstrap UCL | | 0.0384 |
| 463 | | | | | | | | | | 95% BCA Bootstrap UCL | | 0.0519 |
| 464 | | | | | | | | | | 95% H-UCL | | 0.176 |
| 465 | | | | | | | | | | | | |
| 466 | | | Gamma Distribution Test with Detected Values Only | | | | Data Distribution Test with Detected Values Only | | | | | |
| 467 | | | k star (bias corrected) | | | 0.888 | Data appear Gamma Distributed at 5% Significance Level | | | | | |
| 468 | | | Theta Star | | | 0.224 | | | | | | |
| 469 | | | nu star | | | 14.21 | | | | | | |
| 470 | | | | | | | | | | | | |
| 471 | | | A-D Test Statistic | | | 0.573 | Nonparametric Statistics | | | | | |
| 472 | | | 5% A-D Critical Value | | | 0.731 | Kaplan-Meier (KM) Method | | | | | |
| 473 | | | K-S Test Statistic | | | 0.731 | Mean | | | | | 0.0656 |
| 474 | | | 5% K-S Critical Value | | | 0.3 | SD | | | | | 0.0789 |
| 475 | | | Data appear Gamma Distributed at 5% Significance Level | | | | SE of Mean | | | | | 0.00909 |
| 476 | | | | | | | 95% KM (t) UCL | | | | | 0.0808 |
| 477 | | | Assuming Gamma Distribution | | | | 95% KM (z) UCL | | | | | 0.0806 |
| 478 | | | Gamma ROS Statistics using Extrapolated Data | | | | 95% KM (jackknife) UCL | | | | | 0.0791 |
| 479 | | | Minimum | | | 0.000001 | 95% KM (bootstrap t) UCL | | | | | 0.109 |
| 480 | | | Maximum | | | 0.745 | 95% KM (BCA) UCL | | | | | 0.116 |
| 481 | | | Mean | | | 0.0185 | 95% KM (Percentile Bootstrap) UCL | | | | | 0.0947 |
| 482 | | | Median | | | 0.000001 | 95% KM (Chebyshev) UCL | | | | | 0.105 |
| 483 | | | SD | | | 0.0885 | 97.5% KM (Chebyshev) UCL | | | | | 0.122 |
| 484 | | | k star | | | 0.0983 | 99% KM (Chebyshev) UCL | | | | | 0.156 |
| 485 | | | Theta star | | | 0.188 | | | | | | |
| 486 | | | Nu star | | | 16.9 | Potential UCLs to Use | | | | | |
| 487 | | | AppChi2 | | | 8.6 | 95% KM (t) UCL | | | | | 0.0808 |
| 488 | | | 95% Gamma Approximate UCL | | | 0.0363 | | | | | | |
| 489 | | | 95% Adjusted Gamma UCL | | | 0.0367 | | | | | | |
| 490 | Note: DL/2 is not a recommended method. | | | | | | | | | | | |
| 491 | | | | | | | | | | | | |
| 492 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 493 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 494 | For additional insight, the user may want to consult a statistician. | | | | | | | | | | | |
| 495 | | | | | | | | | | | | |
| 496 | | | | | | | | | | | | |
| 497 | Xylenes | | | | | | | | | | | |
| 498 | | | | | | | | | | | | |
| 499 | | | | General Statistics | | | | | | | | |
| 500 | | | Number of Valid Data | | | 86 | Number of Detected Data | | | | | 10 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 501 | | | Number of Distinct Detected Data | | | 9 | | | Number of Non-Detect Data | | | 76 |
| 502 | | | | | | | | | Percent Non-Detects | | | 88.37% |
| 503 | | | | | | | | | | | | |
| 504 | | | Raw Statistics | | | | | | Log-transformed Statistics | | | |
| 505 | | | Minimum Detected | | | 0.16 | | | Minimum Detected | | | -1.833 |
| 506 | | | Maximum Detected | | | 3.88 | | | Maximum Detected | | | 1.356 |
| 507 | | | Mean of Detected | | | 1.064 | | | Mean of Detected | | | -0.555 |
| 508 | | | SD of Detected | | | 1.335 | | | SD of Detected | | | 1.127 |
| 509 | | | Minimum Non-Detect | | | 0.071 | | | Minimum Non-Detect | | | -2.645 |
| 510 | | | Maximum Non-Detect | | | 0.1 | | | Maximum Non-Detect | | | -2.303 |
| 511 | | | | | | | | | | | | |
| 512 | Note: Data have multiple DLs - Use of KM Method is recommended | | | | | | | | Number treated as Non-Detect | | | 76 |
| 513 | For all methods (except KM, DL/2, and ROS Methods), | | | | | | | | Number treated as Detected | | | 10 |
| 514 | Observations < Largest ND are treated as NDs | | | | | | | | Single DL Non-Detect Percentage | | | 88.37% |
| 515 | | | | | | | | | | | | |
| 516 | | | | UCL Statistics | | | | | | | | |
| 517 | | | Normal Distribution Test with Detected Values Only | | | | | | Lognormal Distribution Test with Detected Values Only | | | |
| 518 | | | Shapiro Wilk Test Statistic | | | 0.7 | | | Shapiro Wilk Test Statistic | | | 0.901 |
| 519 | | | 5% Shapiro Wilk Critical Value | | | 0.842 | | | 5% Shapiro Wilk Critical Value | | | 0.842 |
| 520 | | | Data not Normal at 5% Significance Level | | | | | | Data appear Lognormal at 5% Significance Level | | | |
| 521 | | | | | | | | | | | | |
| 522 | | | Assuming Normal Distribution | | | | | | Assuming Lognormal Distribution | | | |
| 523 | | | DL/2 Substitution Method | | | | | | DL/2 Substitution Method | | | |
| 524 | | | Mean | | | 0.164 | | | Mean | | | -2.811 |
| 525 | | | SD | | | 0.545 | | | SD | | | 0.914 |
| 526 | | | 95% DL/2 (t) UCL | | | 0.261 | | | 95% H-Stat (DL/2) UCL | | | 0.113 |
| 527 | | | | | | | | | | | | |
| 528 | | | Maximum Likelihood Estimate(MLE) Method | | | N/A | | | Log ROS Method | | | |
| 529 | | | MLE yields a negative mean | | | | | | Mean in Log Scale | | | -5.91 |
| 530 | | | | | | | | | SD in Log Scale | | | 3.114 |
| 531 | | | | | | | | | Mean in Original Scale | | | 0.133 |
| 532 | | | | | | | | | SD in Original Scale | | | 0.552 |
| 533 | | | | | | | | | 95% t UCL | | | 0.232 |
| 534 | | | | | | | | | 95% Percentile Bootstrap UCL | | | 0.241 |
| 535 | | | | | | | | | 95% BCA Bootstrap UCL | | | 0.307 |
| 536 | | | | | | | | | 95% H-UCL | | | 1.782 |
| 537 | | | | | | | | | | | | |
| 538 | | | Gamma Distribution Test with Detected Values Only | | | | | | Data Distribution Test with Detected Values Only | | | |
| 539 | | | k star (bias corrected) | | | 0.726 | | | Data appear Gamma Distributed at 5% Significance Level | | | |
| 540 | | | Theta Star | | | 1.465 | | | | | | |
| 541 | | | nu star | | | 14.53 | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 542 | | | | | | | | | | | | |
| 543 | | | | | A-D Test Statistic | 0.734 | | | Nonparametric Statistics | | | |
| 544 | | | | | 5% A-D Critical Value | 0.75 | | | | Kaplan-Meier (KM) Method | | |
| 545 | | | | | K-S Test Statistic | 0.75 | | | | Mean | | 0.265 |
| 546 | | | | | 5% K-S Critical Value | 0.274 | | | | SD | | 0.52 |
| 547 | | | Data appear Gamma Distributed at 5% Significance Level | | | | | | | SE of Mean | | 0.0591 |
| 548 | | | | | | | | | | 95% KM (t) UCL | | 0.363 |
| 549 | | | Assuming Gamma Distribution | | | | | | | 95% KM (z) UCL | | 0.362 |
| 550 | | | | Gamma ROS Statistics using Extrapolated Data | | | | | | 95% KM (jackknife) UCL | | 0.352 |
| 551 | | | | | Minimum | 0.000001 | | | | 95% KM (bootstrap t) UCL | | 0.586 |
| 552 | | | | | Maximum | 3.88 | | | | 95% KM (BCA) UCL | | 0.496 |
| 553 | | | | | Mean | 0.124 | | | | 95% KM (Percentile Bootstrap) UCL | | 0.412 |
| 554 | | | | | Median | 0.000001 | | | | 95% KM (Chebyshev) UCL | | 0.523 |
| 555 | | | | | SD | 0.553 | | | | 97.5% KM (Chebyshev) UCL | | 0.634 |
| 556 | | | | | k star | 0.0866 | | | | 99% KM (Chebyshev) UCL | | 0.853 |
| 557 | | | | | Theta star | 1.428 | | | | | | |
| 558 | | | | | Nu star | 14.9 | | | Potential UCLs to Use | | | |
| 559 | | | | | AppChi2 | 7.19 | | | | 95% KM (t) UCL | | 0.363 |
| 560 | | | | | 95% Gamma Approximate UCL | 0.256 | | | | | | |
| 561 | | | | | 95% Adjusted Gamma UCL | 0.26 | | | | | | |
| 562 | Note: DL/2 is not a recommended method. | | | | | | | | | | | |
| 563 | | | | | | | | | | | | |
| 564 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 565 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 566 | For additional insight, the user may want to consult a statistician. | | | | | | | | | | | |
| 567 | | | | | | | | | | | | |
| 568 | | | | | | | | | | | | |
| 569 | MTBE | | | | | | | | | | | |
| 570 | | | | | | | | | | | | |
| 571 | General Statistics | | | | | | | | | | | |
| 572 | | | | | Number of Valid Data | 86 | | | | Number of Detected Data | | 0 |
| 573 | | | | | Number of Distinct Detected Data | 0 | | | | Number of Non-Detect Data | | 86 |
| 574 | | | | | | | | | | Percent Non-Detects | | 100.00% |
| 575 | | | | | | | | | | | | |
| 576 | Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs! | | | | | | | | | | | |
| 577 | Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit! | | | | | | | | | | | |
| 578 | The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV). | | | | | | | | | | | |
| 579 | | | | | | | | | | | | |
| 580 | The data set for variable MTBE was not processed! | | | | | | | | | | | |
| 581 | | | | | | | | | | | | |
| 582 | | | | | | | | | | | | |

From File: INPUT.wst

**Summary Statistics for Raw Full Data Sets**

| Variable | NumObs | Minimum | Maximum | Mean | Median | Variance | SD | MAD/0.675 | Skewness | Kurtosis | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 7 | 12100 | 21900 | 16043 | 14700 | 13296190 | 3646 | 3410 | 0.663 | -0.832 | 0.227 |
| GROS_Nickel | 49 | 1.591 | 11 | 7.304 | 7.74 | 3.686 | 1.92 | 2.135 | -0.74 | 0.989 | 0.263 |
| GROS_Zinc | 49 | 26.1 | 71.9 | 50.56 | 52.2 | 93.59 | 9.674 | 7.858 | -0.375 | -0.118 | 0.191 |

**Percentiles for Raw Full Data Sets**

| Variable | NumObs | 5%ile | 10%ile | 20%ile | 25%ile(Q1) | 50%ile(Q2) | 75%ile(Q3) | 80%ile | 90%ile | 95%ile | 99%ile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 7 | 12250 | 12400 | 12960 | 13500 | 14700 | 18300 | 19080 | 20520 | 21210 | 21762 |
| GROS_Nickel | 49 | 3.973 | 5.32 | 5.9 | 6.2 | 7.74 | 8.4 | 8.896 | 9.6 | 9.964 | 10.57 |
| GROS_Zinc | 49 | 35.18 | 36.68 | 41.66 | 45.4 | 52.2 | 57.1 | 57.62 | 60.34 | 64.26 | 69.45 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 9 | Aluminum | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 11 | | | | | | General Statistics | | | | | | |
| 12 | | | | | | Number of Valid Observations | 7 | | | Number of Distinct Observations | 7 | |
| 13 | | | | | | | | | | | | |
| 14 | | | | | | Raw Statistics | | | | Log-transformed Statistics | | |
| 15 | | | | | | Minimum | 12100 | | | Minimum of Log Data | 9.401 | |
| 16 | | | | | | Maximum | 21900 | | | Maximum of Log Data | 9.994 | |
| 17 | | | | | | Mean | 16043 | | | Mean of log Data | 9.662 | |
| 18 | | | | | | Median | 14700 | | | SD of log Data | 0.221 | |
| 19 | | | | | | SD | 3646 | | | | | |
| 20 | | | | | | Std. Error of Mean | 1378 | | | | | |
| 21 | | | | | | Coefficient of Variation | 0.227 | | | | | |
| 22 | | | | | | Skewness | 0.663 | | | | | |
| 23 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | |
| 25 | | | | | | Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates! | | | | | | |
| 26 | | | | | | | | | | | | |
| 27 | | | | | | It is suggested to collect at least 8 to 10 observations using these statistical methods! | | | | | | |
| 28 | | | | | | If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results. | | | | | | |
| 29 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | |
| 31 | | | | | | Warning: There are only 7 Values in this data | | | | | | |
| 32 | | | | | | Note: It should be noted that even though bootstrap methods may be performed on this data set, | | | | | | |
| 33 | | | | | | the resulting calculations may not be reliable enough to draw conclusions | | | | | | |
| 34 | | | | | | | | | | | | |
| 35 | | | | | | The literature suggests to use bootstrap methods on data sets having more than 10-15 observations. | | | | | | |
| 36 | | | | | | | | | | | | |
| 37 | | | | | | Relevant UCL Statistics | | | | | | |
| 38 | | | | | | Normal Distribution Test | | | | Lognormal Distribution Test | | |
| 39 | | | | | | Shapiro Wilk Test Statistic | 0.926 | | | Shapiro Wilk Test Statistic | 0.943 | |
| 40 | | | | | | Shapiro Wilk Critical Value | 0.803 | | | Shapiro Wilk Critical Value | 0.803 | |
| 41 | | | | | | Data appear Normal at 5% Significance Level | | | | Data appear Lognormal at 5% Significance Level | | |
| 42 | | | | | | | | | | | | |
| 43 | | | | | | Assuming Normal Distribution | | | | Assuming Lognormal Distribution | | |
| 44 | | | | | | 95% Student's-t UCL | 18721 | | | 95% H-UCL | 19336 | |
| 45 | | | | | | 95% UCLs (Adjusted for Skewness) | | | | 95% Chebyshev (MVUE) UCL | 21895 | |
| 46 | | | | | | 95% Adjusted-CLT UCL (Chen-1995) | 18679 | | | 97.5% Chebyshev (MVUE) UCL | 24431 | |
| 47 | | | | | | 95% Modified-t UCL (Johnson-1978) | 18779 | | | 99% Chebyshev (MVUE) UCL | 29411 | |
| 48 | | | | | | | | | | | | |
| 49 | | | | | | Gamma Distribution Test | | | | Data Distribution | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 50 | | | | | k star (bias corrected) | 13.56 | | | Data appear Normal at 5% Significance Level | | | |
| 51 | | | | | Theta Star | 1184 | | | | | | |
| 52 | | | | | MLE of Mean | 16043 | | | | | | |
| 53 | | | | | MLE of Standard Deviation | 4357 | | | | | | |
| 54 | | | | | nu star | 189.8 | | | | | | |
| 55 | | | | | Approximate Chi Square Value (.05) | 158.9 | | | Nonparametric Statistics | | | |
| 56 | | | | | Adjusted Level of Significance | 0.0158 | | | | | 95% CLT UCL | 18310 |
| 57 | | | | | Adjusted Chi Square Value | 150.4 | | | | | 95% Jackknife UCL | 18721 |
| 58 | | | | | | | | | | | 95% Standard Bootstrap UCL | 18212 |
| 59 | | | | | Anderson-Darling Test Statistic | 0.281 | | | | | 95% Bootstrap-t UCL | 20167 |
| 60 | | | | | Anderson-Darling 5% Critical Value | 0.707 | | | | | 95% Hall's Bootstrap UCL | 19368 |
| 61 | | | | | Kolmogorov-Smirnov Test Statistic | 0.208 | | | | | 95% Percentile Bootstrap UCL | 18157 |
| 62 | | | | | Kolmogorov-Smirnov 5% Critical Value | 0.311 | | | | | 95% BCA Bootstrap UCL | 18400 |
| 63 | | | | Data appear Gamma Distributed at 5% Significance Level | | | | | | | 95% Chebyshev(Mean, Sd) UCL | 22050 |
| 64 | | | | | | | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 24650 |
| 65 | | | | Assuming Gamma Distribution | | | | | | | 99% Chebyshev(Mean, Sd) UCL | 29756 |
| 66 | | | | | 95% Approximate Gamma UCL | 19159 | | | | | | |
| 67 | | | | | 95% Adjusted Gamma UCL | 20249 | | | | | | |
| 68 | | | | | | | | | | | | |
| 69 | | | | Potential UCL to Use | | | | | | | Use 95% Student's-t UCL | 18721 |
| 70 | | | | | | | | | | | | |
| 71 | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | |
| 72 | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | |
| 73 | | | | and Singh and Singh (2003). For additional insight, the user may want to consult a statistician. | | | | | | | | |
| 74 | | | | | | | | | | | | |
| 75 | | | | | | | | | | | | |
| 76 | Antimony | | | | | | | | | | | |
| 77 | | | | | | | | | | | | |
| 78 | | | | | General Statistics | | | | | | | |
| 79 | | | | | Number of Valid Data | 7 | | | | | Number of Detected Data | 4 |
| 80 | | | | | Number of Distinct Detected Data | 3 | | | | | Number of Non-Detect Data | 3 |
| 81 | | | | | | | | | | | Percent Non-Detects | 42.86% |
| 82 | | | | | | | | | | | | |
| 83 | | | | | Raw Statistics | | | | Log-transformed Statistics | | | |
| 84 | | | | | Minimum Detected | 0.13 | | | | | Minimum Detected | -2.04 |
| 85 | | | | | Maximum Detected | 0.21 | | | | | Maximum Detected | -1.561 |
| 86 | | | | | Mean of Detected | 0.16 | | | | | Mean of Detected | -1.849 |
| 87 | | | | | SD of Detected | 0.0346 | | | | | SD of Detected | 0.204 |
| 88 | | | | | Minimum Non-Detect | 0.1 | | | | | Minimum Non-Detect | -2.303 |
| 89 | | | | | Maximum Non-Detect | 0.1 | | | | | Maximum Non-Detect | -2.303 |
| 90 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 91 | | | | | | | | | | | | |
| 92 | | | | Warning: There are only 3 Distinct Detected Values in this data set | | | | | | | | |
| 93 | | | | The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods. | | | | | | | | |
| 94 | | | | Those methods will return a 'N/A' value on your output display! | | | | | | | | |
| 95 | | | | | | | | | | | | |
| 96 | | | | It is necessary to have 4 or more Distinct Values for bootstrap methods. | | | | | | | | |
| 97 | | | | However, results obtained using 4 to 9 distinct values may not be reliable. | | | | | | | | |
| 98 | | | | It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates. | | | | | | | | |
| 99 | | | | | | | | | | | | |
| 100 | | | | | | | | | | | | |
| 101 | | | | UCL Statistics | | | | | | | | |
| 102 | | | Normal Distribution Test with Detected Values Only | | | | Lognormal Distribution Test with Detected Values Only | | | | | |
| 103 | | | Shapiro Wilk Test Statistic | | | 0.84 | Shapiro Wilk Test Statistic | | | | | 0.873 |
| 104 | | | 5% Shapiro Wilk Critical Value | | | 0.748 | 5% Shapiro Wilk Critical Value | | | | | 0.748 |
| 105 | | | Data appear Normal at 5% Significance Level | | | | Data appear Lognormal at 5% Significance Level | | | | | |
| 106 | | | | | | | | | | | | |
| 107 | | | Assuming Normal Distribution | | | | Assuming Lognormal Distribution | | | | | |
| 108 | | | DL/2 Substitution Method | | | | DL/2 Substitution Method | | | | | |
| 109 | | | Mean | | | 0.113 | Mean | | | | | -2.34 |
| 110 | | | SD | | | 0.0637 | SD | | | | | 0.63 |
| 111 | | | 95% DL/2 (t) UCL | | | 0.16 | 95% H-Stat (DL/2) UCL | | | | | 0.237 |
| 112 | | | | | | | | | | | | |
| 113 | | | Maximum Likelihood Estimate(MLE) Method | | | | Log ROS Method | | | | | |
| 114 | | | Mean | | | 0.161 | Mean in Log Scale | | | | | -2.101 |
| 115 | | | SD | | | 0.03 | SD in Log Scale | | | | | 0.358 |
| 116 | | | 95% MLE (t) UCL | | | 0.183 | Mean in Original Scale | | | | | 0.129 |
| 117 | | | 95% MLE (Tiku) UCL | | | 0.19 | SD in Original Scale | | | | | 0.0463 |
| 118 | | | | | | | 95% t UCL | | | | | 0.163 |
| 119 | | | | | | | 95% Percentile Bootstrap UCL | | | | | 0.156 |
| 120 | | | | | | | 95% BCA Bootstrap UCL | | | | | 0.163 |
| 121 | | | | | | | 95% H UCL | | | | | 0.182 |
| 122 | | | | | | | | | | | | |
| 123 | | | Gamma Distribution Test with Detected Values Only | | | | Data Distribution Test with Detected Values Only | | | | | |
| 124 | | | k star (bias corrected) | | | 7.926 | Data appear Normal at 5% Significance Level | | | | | |
| 125 | | | Theta Star | | | 0.0202 | | | | | | |
| 126 | | | nu star | | | 63.41 | | | | | | |
| 127 | | | | | | | | | | | | |
| 128 | | | A-D Test Statistic | | | 0.479 | Nonparametric Statistics | | | | | |
| 129 | | | 5% A-D Critical Value | | | 0.657 | Kaplan-Meier (KM) Method | | | | | |
| 130 | | | K-S Test Statistic | | | 0.657 | Mean | | | | | 0.147 |
| 131 | | | 5% K-S Critical Value | | | 0.394 | SD | | | | | 0.0271 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 132 | | | Data appear Gamma Distributed at 5% Significance Level | | | | | | | | SE of Mean | 0.0118 |
| 133 | | | | | | | | | | | 95% KM (t) UCL | 0.17 |
| 134 | | | Assuming Gamma Distribution | | | | | | | | 95% KM (z) UCL | 0.167 |
| 135 | | | Gamma ROS Statistics using Extrapolated Data | | | | | | | | 95% KM (jackknife) UCL | 0.169 |
| 136 | | | | | | Minimum | 0.000001 | | | | 95% KM (bootstrap t) UCL | 0.181 |
| 137 | | | | | | Maximum | 0.21 | | | | 95% KM (BCA) UCL | 0.176 |
| 138 | | | | | | Mean | 0.103 | | | | 95% KM (Percentile Bootstrap) UCL | 0.17 |
| 139 | | | | | | Median | 0.13 | | | | 95% KM (Chebyshev) UCL | 0.199 |
| 140 | | | | | | SD | 0.0771 | | | | 97.5% KM (Chebyshev) UCL | 0.221 |
| 141 | | | | | | k star | 0.316 | | | | 99% KM (Chebyshev) UCL | 0.265 |
| 142 | | | | | | Theta star | 0.326 | | | | | |
| 143 | | | | | | Nu star | 4.429 | | | | Potential UCLs to Use | |
| 144 | | | | | | AppChi2 | 0.898 | | | | 95% KM (t) UCL | 0.17 |
| 145 | | | | | | 95% Gamma Approximate UCL | 0.509 | | | | 95% KM (Percentile Bootstrap) UCL | 0.17 |
| 146 | | | | | | 95% Adjusted Gamma UCL | N/A | | | | | |
| 147 | Note: DL/2 is not a recommended method. | | | | | | | | | | | |
| 148 | | | | | | | | | | | | |
| 149 | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | |
| 150 | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | |
| 151 | | | For additional insight, the user may want to consult a statistician. | | | | | | | | | |
| 152 | | | | | | | | | | | | |
| 153 | | | | | | | | | | | | |
| 154 | Arsenic | | | | | | | | | | | |
| 155 | | | | | | | | | | | | |
| 156 | | | | | | General Statistics | | | | | | |
| 157 | | | | | | Number of Valid Observations | 7 | | | | Number of Distinct Observations | 7 |
| 158 | | | | | | | | | | | | |
| 159 | | | | | | Raw Statistics | | | | | Log-transformed Statistics | |
| 160 | | | | | | Minimum | 0.518 | | | | Minimum of Log Data | -0.658 |
| 161 | | | | | | Maximum | 1.56 | | | | Maximum of Log Data | 0.445 |
| 162 | | | | | | Mean | 1.097 | | | | Mean of log Data | 0.0236 |
| 163 | | | | | | Median | 1.14 | | | | SD of log Data | 0.421 |
| 164 | | | | | | SD | 0.398 | | | | | |
| 165 | | | | | | Std. Error of Mean | 0.15 | | | | | |
| 166 | | | | | | Coefficient of Variation | 0.363 | | | | | |
| 167 | | | | | | Skewness | -0.421 | | | | | |
| 168 | | | | | | | | | | | | |
| 169 | | | | | | | | | | | | |
| 170 | | | Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates! | | | | | | | | | |
| 171 | | | | | | | | | | | | |
| 172 | | | It is suggested to collect at least 8 to 10 observations using these statistical methods! | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 173 | If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results. | | | | | | | | | | | |
| 174 | | | | | | | | | | | | |
| 175 | | | | | | | | | | | | |
| 176 | Warning: There are only 7 Values in this data | | | | | | | | | | | |
| 177 | Note: It should be noted that even though bootstrap methods may be performed on this data set, | | | | | | | | | | | |
| 178 | the resulting calculations may not be reliable enough to draw conclusions | | | | | | | | | | | |
| 179 | | | | | | | | | | | | |
| 180 | The literature suggests to use bootstrap methods on data sets having more than 10-15 observations. | | | | | | | | | | | |
| 181 | | | | | | | | | | | | |
| 182 | Relevant UCL Statistics | | | | | | | | | | | |
| 183 | Normal Distribution Test | | | | | | Lognormal Distribution Test | | | | | |
| 184 | | | Shapiro Wilk Test Statistic | 0.907 | | | | | Shapiro Wilk Test Statistic | | | 0.868 |
| 185 | | | Shapiro Wilk Critical Value | 0.803 | | | | | Shapiro Wilk Critical Value | | | 0.803 |
| 186 | Data appear Normal at 5% Significance Level | | | | | | Data appear Lognormal at 5% Significance Level | | | | | |
| 187 | | | | | | | | | | | | |
| 188 | Assuming Normal Distribution | | | | | | Assuming Lognormal Distribution | | | | | |
| 189 | | | 95% Student's-t UCL | 1.389 | | | | | 95% H-UCL | | | 1.664 |
| 190 | 95% UCLs (Adjusted for Skewness) | | | | | | | | 95% Chebyshev (MVUE) UCL | | | 1.872 |
| 191 | | | 95% Adjusted-CLT UCL (Chen-1995) | 1.318 | | | | | 97.5% Chebyshev (MVUE) UCL | | | 2.204 |
| 192 | | | 95% Modified-t UCL (Johnson-1978) | 1.385 | | | | | 99% Chebyshev (MVUE) UCL | | | 2.857 |
| 193 | | | | | | | | | | | | |
| 194 | Gamma Distribution Test | | | | | | Data Distribution | | | | | |
| 195 | | | k star (bias corrected) | 4.357 | | | Data appear Normal at 5% Significance Level | | | | | |
| 196 | | | Theta Star | 0.252 | | | | | | | | |
| 197 | | | MLE of Mean | 1.097 | | | | | | | | |
| 198 | | | MLE of Standard Deviation | 0.525 | | | | | | | | |
| 199 | | | nu star | 61 | | | | | | | | |
| 200 | | | Approximate Chi Square Value (.05) | 44.03 | | | Nonparametric Statistics | | | | | |
| 201 | | | Adjusted Level of Significance | 0.0158 | | | | | 95% CLT UCL | | | 1.344 |
| 202 | | | Adjusted Chi Square Value | 39.72 | | | | | 95% Jackknife UCL | | | 1.389 |
| 203 | | | | | | | | | 95% Standard Bootstrap UCL | | | 1.323 |
| 204 | | | Anderson-Darling Test Statistic | 0.476 | | | | | 95% Bootstrap-t UCL | | | 1.347 |
| 205 | | | Anderson-Darling 5% Critical Value | 0.709 | | | | | 95% Hall's Bootstrap UCL | | | 1.339 |
| 206 | | | Kolmogorov-Smirnov Test Statistic | 0.276 | | | | | 95% Percentile Bootstrap UCL | | | 1.321 |
| 207 | | | Kolmogorov-Smirnov 5% Critical Value | 0.312 | | | | | 95% BCA Bootstrap UCL | | | 1.31 |
| 208 | Data appear Gamma Distributed at 5% Significance Level | | | | | | | | 95% Chebyshev(Mean, Sd) UCL | | | 1.752 |
| 209 | | | | | | | | | 97.5% Chebyshev(Mean, Sd) UCL | | | 2.036 |
| 210 | Assuming Gamma Distribution | | | | | | | | 99% Chebyshev(Mean, Sd) UCL | | | 2.593 |
| 211 | | | 95% Approximate Gamma UCL | 1.519 | | | | | | | | |
| 212 | | | 95% Adjusted Gamma UCL | 1.684 | | | | | | | | |
| 213 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 214 | | | Potential UCL to Use | | | | | | | Use 95% Student's-t UCL | | 1.389 |
| 215 | | | | | | | | | | | | |
| 216 | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | |
| 217 | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | |
| 218 | | | and Singh and Singh (2003). For additional insight, the user may want to consult a statistician. | | | | | | | | | |
| 219 | | | | | | | | | | | | |
| 220 | | | Note: For highly negative-skewed data, confidence limits | | | | | | | | | |
| 221 | | | (e.g., Chen, Johnson, Lognormal, and Gamma) may not be | | | | | | | | | |
| 222 | | | reliable. Chen's and Johnson's methods provide | | | | | | | | | |
| 223 | | | adjustments for positvely skewed data sets. | | | | | | | | | |
| 224 | | | | | | | | | | | | |
| 225 | | | | | | | | | | | | |
| 226 | Barium | | | | | | | | | | | |
| 227 | | | | | | | | | | | | |
| 228 | | | | General Statistics | | | | | | | | |
| 229 | | | Number of Valid Observations | 7 | | | | | Number of Distinct Observations | | | 7 |
| 230 | | | | | | | | | | | | |
| 231 | | | Raw Statistics | | | | Log-transformed Statistics | | | | | |
| 232 | | | Minimum | 38 | | | Minimum of Log Data | | | | | 3.638 |
| 233 | | | Maximum | 121 | | | Maximum of Log Data | | | | | 4.796 |
| 234 | | | Mean | 65.71 | | | Mean of log Data | | | | | 4.084 |
| 235 | | | Median | 44.2 | | | SD of log Data | | | | | 0.478 |
| 236 | | | SD | 32.99 | | | | | | | | |
| 237 | | | Std. Error of Mean | 12.47 | | | | | | | | |
| 238 | | | Coefficient of Variation | 0.502 | | | | | | | | |
| 239 | | | Skewness | 0.881 | | | | | | | | |
| 240 | | | | | | | | | | | | |
| 241 | | | | | | | | | | | | |
| 242 | | | Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates! | | | | | | | | | |
| 243 | | | | | | | | | | | | |
| 244 | | | It is suggested to collect at least 8 to 10 observations using these statistical methods! | | | | | | | | | |
| 245 | | | If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results. | | | | | | | | | |
| 246 | | | | | | | | | | | | |
| 247 | | | | | | | | | | | | |
| 248 | | | Warning: There are only 7 Values in this data | | | | | | | | | |
| 249 | | | Note: It should be noted that even though bootstrap methods may be performed on this data set, | | | | | | | | | |
| 250 | | | the resulting calculations may not be reliable enough to draw conclusions | | | | | | | | | |
| 251 | | | | | | | | | | | | |
| 252 | | | The literature suggests to use bootstrap methods on data sets having more than 10-15 observations. | | | | | | | | | |
| 253 | | | | | | | | | | | | |
| 254 | | | | Relevant UCL Statistics | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 255 | | | Normal Distribution Test | | | | Lognormal Distribution Test | | | | | |
| 256 | | | Shapiro Wilk Test Statistic | | | 0.833 | Shapiro Wilk Test Statistic | | | | | 0.846 |
| 257 | | | Shapiro Wilk Critical Value | | | 0.803 | Shapiro Wilk Critical Value | | | | | 0.803 |
| 258 | | | Data appear Normal at 5% Significance Level | | | | Data appear Lognormal at 5% Significance Level | | | | | |
| 259 | | | | | | | | | | | | |
| 260 | | | Assuming Normal Distribution | | | | Assuming Lognormal Distribution | | | | | |
| 261 | | | 95% Student's-t UCL | | | 89.94 | 95% H-UCL | | | | | 106.6 |
| 262 | | | 95% UCLs (Adjusted for Skewness) | | | | 95% Chebyshev (MVUE) UCL | | | | | 117.1 |
| 263 | | | 95% Adjusted-CLT UCL (Chen-1995) | | | 90.66 | 97.5% Chebyshev (MVUE) UCL | | | | | 139.5 |
| 264 | | | 95% Modified-t UCL (Johnson-1978) | | | 90.63 | 99% Chebyshev (MVUE) UCL | | | | | 183.4 |
| 265 | | | | | | | | | | | | |
| 266 | | | Gamma Distribution Test | | | | Data Distribution | | | | | |
| 267 | | | k star (bias corrected) | | | 3.001 | Data appear Normal at 5% Significance Level | | | | | |
| 268 | | | Theta Star | | | 21.9 | | | | | | |
| 269 | | | MLE of Mean | | | 65.71 | | | | | | |
| 270 | | | MLE of Standard Deviation | | | 37.93 | | | | | | |
| 271 | | | nu star | | | 42.02 | | | | | | |
| 272 | | | Approximate Chi Square Value (.05) | | | 28.16 | Nonparametric Statistics | | | | | |
| 273 | | | Adjusted Level of Significance | | | 0.0158 | 95% CLT UCL | | | | | 86.22 |
| 274 | | | Adjusted Chi Square Value | | | 24.78 | 95% Jackknife UCL | | | | | 89.94 |
| 275 | | | | | | | 95% Standard Bootstrap UCL | | | | | 84.55 |
| 276 | | | Anderson-Darling Test Statistic | | | 0.616 | 95% Bootstrap-t UCL | | | | | 107.6 |
| 277 | | | Anderson-Darling 5% Critical Value | | | 0.71 | 95% Hall's Bootstrap UCL | | | | | 81.04 |
| 278 | | | Kolmogorov-Smirnov Test Statistic | | | 0.325 | 95% Percentile Bootstrap UCL | | | | | 84.87 |
| 279 | | | Kolmogorov-Smirnov 5% Critical Value | | | 0.313 | 95% BCA Bootstrap UCL | | | | | 87.79 |
| 280 | | | Data follow Appr. Gamma Distribution at 5% Significance Level | | | | 95% Chebyshev(Mean, Sd) UCL | | | | | 120.1 |
| 281 | | | | | | | 97.5% Chebyshev(Mean, Sd) UCL | | | | | 143.6 |
| 282 | | | Assuming Gamma Distribution | | | | 99% Chebyshev(Mean, Sd) UCL | | | | | 189.8 |
| 283 | | | 95% Approximate Gamma UCL | | | 98.06 | | | | | | |
| 284 | | | 95% Adjusted Gamma UCL | | | 111.4 | | | | | | |
| 285 | | | | | | | | | | | | |
| 286 | | | Potential UCL to Use | | | | Use 95% Student's-t UCL | | | | | 89.94 |
| 287 | | | | | | | | | | | | |
| 288 | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | |
| 289 | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | |
| 290 | | | and Singh and Singh (2003). For additional insight, the user may want to consult a statistician. | | | | | | | | | |
| 291 | | | | | | | | | | | | |
| 292 | | | | | | | | | | | | |
| 293 | Beryllium | | | | | | | | | | | |
| 294 | | | | | | | | | | | | |
| 295 | | | General Statistics | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 296 | | | Number of Valid Observations | | | 7 | | | Number of Distinct Observations | | | 6 |
| 297 | | | | | | | | | | | | |
| 298 | | | Raw Statistics | | | | | | Log-transformed Statistics | | | |
| 299 | | | Minimum | | | 0.27 | | | Minimum of Log Data | | | -1.309 |
| 300 | | | Maximum | | | 0.5 | | | Maximum of Log Data | | | -0.693 |
| 301 | | | Mean | | | 0.347 | | | Mean of log Data | | | -1.08 |
| 302 | | | Median | | | 0.33 | | | SD of log Data | | | 0.223 |
| 303 | | | SD | | | 0.0826 | | | | | | |
| 304 | | | Std. Error of Mean | | | 0.0312 | | | | | | |
| 305 | | | Coefficient of Variation | | | 0.238 | | | | | | |
| 306 | | | Skewness | | | 1.178 | | | | | | |
| 307 | | | | | | | | | | | | |
| 308 | | | | | | | | | | | | |
| 309 | | | Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates! | | | | | | | | | |
| 310 | | | | | | | | | | | | |
| 311 | | | It is suggested to collect at least 8 to 10 observations using these statistical methods! | | | | | | | | | |
| 312 | | | If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results. | | | | | | | | | |
| 313 | | | | | | | | | | | | |
| 314 | | | | | | | | | | | | |
| 315 | | | Warning: There are only 7 Values in this data | | | | | | | | | |
| 316 | | | Note: It should be noted that even though bootstrap methods may be performed on this data set, | | | | | | | | | |
| 317 | | | the resulting calculations may not be reliable enough to draw conclusions | | | | | | | | | |
| 318 | | | | | | | | | | | | |
| 319 | | | The literature suggests to use bootstrap methods on data sets having more than 10-15 observations. | | | | | | | | | |
| 320 | | | | | | | | | | | | |
| 321 | | | Relevant UCL Statistics | | | | | | | | | |
| 322 | | | Normal Distribution Test | | | | | | Lognormal Distribution Test | | | |
| 323 | | | Shapiro Wilk Test Statistic | | | 0.882 | | | Shapiro Wilk Test Statistic | | | 0.916 |
| 324 | | | Shapiro Wilk Critical Value | | | 0.803 | | | Shapiro Wilk Critical Value | | | 0.803 |
| 325 | | | Data appear Normal at 5% Significance Level | | | | | | Data appear Lognormal at 5% Significance Level | | | |
| 326 | | | | | | | | | | | | |
| 327 | | | Assuming Normal Distribution | | | | | | Assuming Lognormal Distribution | | | |
| 328 | | | 95% Student's-t UCL | | | 0.408 | | | 95% H-UCL | | | 0.419 |
| 329 | | | 95% UCLs (Adjusted for Skewness) | | | | | | 95% Chebyshev (MVUE) UCL | | | 0.475 |
| 330 | | | 95% Adjusted-CLT UCL (Chen-1995) | | | 0.413 | | | 97.5% Chebyshev (MVUE) UCL | | | 0.53 |
| 331 | | | 95% Modified-t UCL (Johnson-1978) | | | 0.41 | | | 99% Chebyshev (MVUE) UCL | | | 0.639 |
| 332 | | | | | | | | | | | | |
| 333 | | | Gamma Distribution Test | | | | | | Data Distribution | | | |
| 334 | | | k star (bias corrected) | | | 13.02 | | | Data appear Normal at 5% Significance Level | | | |
| 335 | | | Theta Star | | | 0.0267 | | | | | | |
| 336 | | | MLE of Mean | | | 0.347 | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 337 | | | | | | MLE of Standard Deviation | 0.0962 | | | | | |
| 338 | | | | | | nu star | 182.2 | | | | | |
| 339 | | | | | | Approximate Chi Square Value (.05) | 152 | | | Nonparametric Statistics | | |
| 340 | | | | | | Adjusted Level of Significance | 0.0158 | | | | 95% CLT UCL | 0.398 |
| 341 | | | | | | Adjusted Chi Square Value | 143.6 | | | | 95% Jackknife UCL | 0.408 |
| 342 | | | | | | | | | | | 95% Standard Bootstrap UCL | 0.395 |
| 343 | | | | | | Anderson-Darling Test Statistic | 0.361 | | | | 95% Bootstrap-t UCL | 0.466 |
| 344 | | | | | | Anderson-Darling 5% Critical Value | 0.707 | | | | 95% Hall's Bootstrap UCL | 0.739 |
| 345 | | | | | | Kolmogorov-Smirnov Test Statistic | 0.226 | | | | 95% Percentile Bootstrap UCL | 0.396 |
| 346 | | | | | | Kolmogorov-Smirnov 5% Critical Value | 0.311 | | | | 95% BCA Bootstrap UCL | 0.403 |
| 347 | | | Data appear Gamma Distributed at 5% Significance Level | | | | | | | | 95% Chebyshev(Mean, Sd) UCL | 0.483 |
| 348 | | | | | | | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 0.542 |
| 349 | | | Assuming Gamma Distribution | | | | | | | | 99% Chebyshev(Mean, Sd) UCL | 0.658 |
| 350 | | | | | | 95% Approximate Gamma UCL | 0.416 | | | | | |
| 351 | | | | | | 95% Adjusted Gamma UCL | 0.44 | | | | | |
| 352 | | | | | | | | | | | | |
| 353 | | | Potential UCL to Use | | | | | | | | Use 95% Student's-t UCL | 0.408 |
| 354 | | | | | | | | | | | | |
| 355 | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | |
| 356 | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | |
| 357 | | | and Singh and Singh (2003). For additional insight, the user may want to consult a statistician. | | | | | | | | | |
| 358 | | | | | | | | | | | | |
| 359 | | | | | | | | | | | | |
| 360 | Bismuth | | | | | | | | | | | |
| 361 | | | | | | | | | | | | |
| 362 | | | | | | General Statistics | | | | | | |
| 363 | | | | | | Number of Valid Data | 7 | | | | Number of Detected Data | 0 |
| 364 | | | | | | Number of Distinct Detected Data | 0 | | | | Number of Non-Detect Data | 7 |
| 365 | | | | | | | | | | | Percent Non-Detects | 100.00% |
| 366 | | | | | | | | | | | | |
| 367 | | | Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs! | | | | | | | | | |
| 368 | | | Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit! | | | | | | | | | |
| 369 | | | The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV). | | | | | | | | | |
| 370 | | | | | | | | | | | | |
| 371 | | | The data set for variable Bismuth was not processed! | | | | | | | | | |
| 372 | | | | | | | | | | | | |
| 373 | | | | | | | | | | | | |
| 374 | | | | | | | | | | | | |
| 375 | Cadmium | | | | | | | | | | | |
| 376 | | | | | | | | | | | | |
| 377 | | | | | | General Statistics | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 378 | | | | | | Number of Valid Data | 7 | | | Number of Detected Data | | 2 |
| 379 | | | | | | Number of Distinct Detected Data | 2 | | | Number of Non-Detect Data | | 5 |
| 380 | | | | | | | | | | Percent Non-Detects | | 71.43% |
| 381 | | | | | | | | | | | | |
| 382 | | | | | | Raw Statistics | | | | Log-transformed Statistics | | |
| 383 | | | | | | Minimum Detected | 0.11 | | | Minimum Detected | | -2.207 |
| 384 | | | | | | Maximum Detected | 0.22 | | | Maximum Detected | | -1.514 |
| 385 | | | | | | Mean of Detected | 0.165 | | | Mean of Detected | | -1.861 |
| 386 | | | | | | SD of Detected | 0.0778 | | | SD of Detected | | 0.49 |
| 387 | | | | | | Minimum Non-Detect | 0.1 | | | Minimum Non-Detect | | -2.303 |
| 388 | | | | | | Maximum Non-Detect | 0.1 | | | Maximum Non-Detect | | -2.303 |
| 389 | | | | | | | | | | | | |
| 390 | | | | | | | | | | | | |
| 391 | | | | | | Warning: Data set has only 2 Distinct Detected Values. | | | | | | |
| 392 | | | | | | This may not be adequate enough to compute meaningful and reliable test statistics and estimates. | | | | | | |
| 393 | | | | | | The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV). | | | | | | |
| 394 | | | | | | | | | | | | |
| 395 | | | | | | Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations. | | | | | | |
| 396 | | | | | | | | | | | | |
| 397 | | | | | | The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods. | | | | | | |
| 398 | | | | | | Those methods will return a 'N/A' value on your output display! | | | | | | |
| 399 | | | | | | | | | | | | |
| 400 | | | | | | It is necessary to have 4 or more Distinct Values for bootstrap methods. | | | | | | |
| 401 | | | | | | However, results obtained using 4 to 9 distinct values may not be reliable. | | | | | | |
| 402 | | | | | | It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates. | | | | | | |
| 403 | | | | | | | | | | | | |
| 404 | | | | | | | | | | | | |
| 405 | | | | | | UCL Statistics | | | | | | |
| 406 | | | | | | Normal Distribution Test with Detected Values Only | | | | Lognormal Distribution Test with Detected Values Only | | |
| 407 | | | | | | Shapiro Wilk Test Statistic | N/A | | | Shapiro Wilk Test Statistic | | N/A |
| 408 | | | | | | 5% Shapiro Wilk Critical Value | N/A | | | 5% Shapiro Wilk Critical Value | | N/A |
| 409 | | | | | | Data not Normal at 5% Significance Level | | | | Data not Lognormal at 5% Significance Level | | |
| 410 | | | | | | | | | | | | |
| 411 | | | | | | Assuming Normal Distribution | | | | Assuming Lognormal Distribution | | |
| 412 | | | | | | DL/2 Substitution Method | | | | DL/2 Substitution Method | | |
| 413 | | | | | | Mean | 0.0829 | | | Mean | | -2.671 |
| 414 | | | | | | SD | 0.0645 | | | SD | | 0.589 |
| 415 | | | | | | 95% DL/2 (t) UCL | 0.13 | | | 95% H-Stat (DL/2) UCL | | 0.155 |
| 416 | | | | | | | | | | | | |
| 417 | | | | | | Maximum Likelihood Estimate(MLE) Method | N/A | | | Log ROS Method | | |
| 418 | | | | | | MLE method failed to converge properly | | | | Mean in Log Scale | | N/A |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 419 | | | | | | | | | | SD in Log Scale | | N/A |
| 420 | | | | | | | | | | Mean in Original Scale | | N/A |
| 421 | | | | | | | | | | SD in Original Scale | | N/A |
| 422 | | | | | | | | | | 95% t UCL | | N/A |
| 423 | | | | | | | | | | 95% Percentile Bootstrap UCL | | N/A |
| 424 | | | | | | | | | | 95% BCA Bootstrap UCL | | N/A |
| 425 | | | | | | | | | | 95% H-UCL | | N/A |
| 426 | | | | | | | | | | | | |
| 427 | | | Gamma Distribution Test with Detected Values Only | | | | | | | Data Distribution Test with Detected Values Only | | |
| 428 | | | | k star (bias corrected) | | N/A | | | | Data do not follow a Discernable Distribution (0.05) | | |
| 429 | | | | Theta Star | | N/A | | | | | | |
| 430 | | | | nu star | | N/A | | | | | | |
| 431 | | | | | | | | | | | | |
| 432 | | | | A-D Test Statistic | | N/A | | | | Nonparametric Statistics | | |
| 433 | | | | 5% A-D Critical Value | | N/A | | | | Kaplan-Meier (KM) Method | | |
| 434 | | | | K-S Test Statistic | | N/A | | | | Mean | | 0.126 |
| 435 | | | | 5% K-S Critical Value | | N/A | | | | SD | | 0.0385 |
| 436 | | | Data not Gamma Distributed at 5% Significance Level | | | | | | | SE of Mean | | 0.0206 |
| 437 | | | | | | | | | | 95% KM (t) UCL | | 0.166 |
| 438 | | | Assuming Gamma Distribution | | | | | | | 95% KM (z) UCL | | 0.16 |
| 439 | | | | Gamma ROS Statistics using Extrapolated Data | | | | | | 95% KM (jackknife) UCL | | N/A |
| 440 | | | | Minimum | | N/A | | | | 95% KM (bootstrap t) UCL | | N/A |
| 441 | | | | Maximum | | N/A | | | | 95% KM (BCA) UCL | | N/A |
| 442 | | | | Mean | | N/A | | | | 95% KM (Percentile Bootstrap) UCL | | N/A |
| 443 | | | | Median | | N/A | | | | 95% KM (Chebyshev) UCL | | 0.215 |
| 444 | | | | SD | | N/A | | | | 97.5% KM (Chebyshev) UCL | | 0.254 |
| 445 | | | | k star | | N/A | | | | 99% KM (Chebyshev) UCL | | 0.33 |
| 446 | | | | Theta star | | N/A | | | | | | |
| 447 | | | | Nu star | | N/A | | | | Potential UCLs to Use | | |
| 448 | | | | AppChi2 | | N/A | | | | 95% KM (t) UCL | | 0.166 |
| 449 | | | | 95% Gamma Approximate UCL | | N/A | | | | 95% KM (% Bootstrap) UCL | | N/A |
| 450 | | | | 95% Adjusted Gamma UCL | | N/A | | | | | | |
| 451 | Note: DL/2 is not a recommended method. | | | | | | | | | | | |
| 452 | | | | | | | | | | | | |
| 453 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 454 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 455 | For additional insight, the user may want to consult a statistician. | | | | | | | | | | | |
| 456 | | | | | | | | | | | | |
| 457 | | | | | | | | | | | | |
| 458 | Chromium | | | | | | | | | | | |
| 459 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 460 | | | | | | General Statistics | | | | | | |
| 461 | | | | | | Number of Valid Observations | 7 | | | Number of Distinct Observations | | 7 |
| 462 | | | | | | | | | | | | |
| 463 | | | | | | Raw Statistics | | | | Log-transformed Statistics | | |
| 464 | | | | | | Minimum | 9.82 | | | Minimum of Log Data | | 2.284 |
| 465 | | | | | | Maximum | 19.1 | | | Maximum of Log Data | | 2.95 |
| 466 | | | | | | Mean | 14.27 | | | Mean of log Data | | 2.631 |
| 467 | | | | | | Median | 12.9 | | | SD of log Data | | 0.252 |
| 468 | | | | | | SD | 3.573 | | | | | |
| 469 | | | | | | Std. Error of Mean | 1.35 | | | | | |
| 470 | | | | | | Coefficient of Variation | 0.25 | | | | | |
| 471 | | | | | | Skewness | 0.257 | | | | | |
| 472 | | | | | | | | | | | | |
| 473 | | | | | | | | | | | | |
| 474 | | | | | | Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates! | | | | | | |
| 475 | | | | | | | | | | | | |
| 476 | | | | | | It is suggested to collect at least 8 to 10 observations using these statistical methods! | | | | | | |
| 477 | | | | | | If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results. | | | | | | |
| 478 | | | | | | | | | | | | |
| 479 | | | | | | | | | | | | |
| 480 | | | | | | Warning: There are only 7 Values in this data | | | | | | |
| 481 | | | | | | Note: It should be noted that even though bootstrap methods may be performed on this data set, | | | | | | |
| 482 | | | | | | the resulting calculations may not be reliable enough to draw conclusions | | | | | | |
| 483 | | | | | | | | | | | | |
| 484 | | | | | | The literature suggests to use bootstrap methods on data sets having more than 10-15 observations. | | | | | | |
| 485 | | | | | | | | | | | | |
| 486 | | | | | | Relevant UCL Statistics | | | | | | |
| 487 | | | | | | Normal Distribution Test | | | | Lognormal Distribution Test | | |
| 488 | | | | | | Shapiro Wilk Test Statistic | 0.922 | | | Shapiro Wilk Test Statistic | | 0.934 |
| 489 | | | | | | Shapiro Wilk Critical Value | 0.803 | | | Shapiro Wilk Critical Value | | 0.803 |
| 490 | | | | | | Data appear Normal at 5% Significance Level | | | | Data appear Lognormal at 5% Significance Level | | |
| 491 | | | | | | | | | | | | |
| 492 | | | | | | Assuming Normal Distribution | | | | Assuming Lognormal Distribution | | |
| 493 | | | | | | 95% Student's-t UCL | 16.9 | | | 95% H-UCL | | 17.79 |
| 494 | | | | | | 95% UCLs (Adjusted for Skewness) | | | | 95% Chebyshev (MVUE) UCL | | 20.21 |
| 495 | | | | | | 95% Adjusted-CLT UCL (Chen-1995) | 16.64 | | | 97.5% Chebyshev (MVUE) UCL | | 22.78 |
| 496 | | | | | | 95% Modified-t UCL (Johnson-1978) | 16.92 | | | 99% Chebyshev (MVUE) UCL | | 27.83 |
| 497 | | | | | | | | | | | | |
| 498 | | | | | | Gamma Distribution Test | | | | Data Distribution | | |
| 499 | | | | | | k star (bias corrected) | 10.73 | | | Data appear Normal at 5% Significance Level | | |
| 500 | | | | | | Theta Star | 1.33 | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 501 | | | | | MLE of Mean | 14.27 | | | | | | |
| 502 | | | | | MLE of Standard Deviation | 4.358 | | | | | | |
| 503 | | | | | nu star | 150.2 | | | | | | |
| 504 | | | | | Approximate Chi Square Value (.05) | 122.9 | | | Nonparametric Statistics | | | |
| 505 | | | | | Adjusted Level of Significance | 0.0158 | | | | | 95% CLT UCL | 16.5 |
| 506 | | | | | Adjusted Chi Square Value | 115.4 | | | | | 95% Jackknife UCL | 16.9 |
| 507 | | | | | | | | | | | 95% Standard Bootstrap UCL | 16.27 |
| 508 | | | | | Anderson-Darling Test Statistic | 0.33 | | | | | 95% Bootstrap-t UCL | 17.26 |
| 509 | | | | | Anderson-Darling 5% Critical Value | 0.707 | | | | | 95% Hall's Bootstrap UCL | 16.04 |
| 510 | | | | | Kolmogorov-Smirnov Test Statistic | 0.209 | | | | | 95% Percentile Bootstrap UCL | 16.34 |
| 511 | | | | | Kolmogorov-Smirnov 5% Critical Value | 0.312 | | | | | 95% BCA Bootstrap UCL | 16.4 |
| 512 | | | Data appear Gamma Distributed at 5% Significance Level | | | | | | | | 95% Chebyshev(Mean, Sd) UCL | 20.16 |
| 513 | | | | | | | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 22.71 |
| 514 | | | Assuming Gamma Distribution | | | | | | | | 99% Chebyshev(Mean, Sd) UCL | 27.71 |
| 515 | | | | | 95% Approximate Gamma UCL | 17.45 | | | | | | |
| 516 | | | | | 95% Adjusted Gamma UCL | 18.58 | | | | | | |
| 517 | | | | | | | | | | | | |
| 518 | | | Potential UCL to Use | | | | | | | | Use 95% Student's-t UCL | 16.9 |
| 519 | | | | | | | | | | | | |
| 520 | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | |
| 521 | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | |
| 522 | | | and Singh and Singh (2003). For additional insight, the user may want to consult a statistician. | | | | | | | | | |
| 523 | | | | | | | | | | | | |
| 524 | | | | | | | | | | | | |
| 525 | Cobalt | | | | | | | | | | | |
| 526 | | | | | | | | | | | | |
| 527 | | | | | General Statistics | | | | | | | |
| 528 | | | | | Number of Valid Observations | 7 | | | | | Number of Distinct Observations | 7 |
| 529 | | | | | | | | | | | | |
| 530 | | | | | Raw Statistics | | | | Log-transformed Statistics | | | |
| 531 | | | | | Minimum | 5.33 | | | | | Minimum of Log Data | 1.673 |
| 532 | | | | | Maximum | 12.2 | | | | | Maximum of Log Data | 2.501 |
| 533 | | | | | Mean | 8.42 | | | | | Mean of log Data | 2.085 |
| 534 | | | | | Median | 8.22 | | | | | SD of log Data | 0.326 |
| 535 | | | | | SD | 2.754 | | | | | | |
| 536 | | | | | Std. Error of Mean | 1.041 | | | | | | |
| 537 | | | | | Coefficient of Variation | 0.327 | | | | | | |
| 538 | | | | | Skewness | 0.459 | | | | | | |
| 539 | | | | | | | | | | | | |
| 540 | | | | | | | | | | | | |
| 541 | | | Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates! | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 542 | | | | | | | | | | | | |
| 543 | It is suggested to collect at least 8 to 10 observations using these statistical methods! | | | | | | | | | | | |
| 544 | If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results. | | | | | | | | | | | |
| 545 | | | | | | | | | | | | |
| 546 | | | | | | | | | | | | |
| 547 | Warning: There are only 7 Values in this data | | | | | | | | | | | |
| 548 | Note: It should be noted that even though bootstrap methods may be performed on this data set, | | | | | | | | | | | |
| 549 | the resulting calculations may not be reliable enough to draw conclusions | | | | | | | | | | | |
| 550 | | | | | | | | | | | | |
| 551 | The literature suggests to use bootstrap methods on data sets having more than 10-15 observations. | | | | | | | | | | | |
| 552 | | | | | | | | | | | | |
| 553 | Relevant UCL Statistics | | | | | | | | | | | |
| 554 | Normal Distribution Test | | | | | | Lognormal Distribution Test | | | | | |
| 555 | | | Shapiro Wilk Test Statistic | 0.899 | | | | | Shapiro Wilk Test Statistic | 0.922 | | |
| 556 | | | Shapiro Wilk Critical Value | 0.803 | | | | | Shapiro Wilk Critical Value | 0.803 | | |
| 557 | Data appear Normal at 5% Significance Level | | | | | | Data appear Lognormal at 5% Significance Level | | | | | |
| 558 | | | | | | | | | | | | |
| 559 | Assuming Normal Distribution | | | | | | Assuming Lognormal Distribution | | | | | |
| 560 | | | 95% Student's-t UCL | 10.44 | | | | | 95% H-UCL | 11.45 | | |
| 561 | 95% UCLs (Adjusted for Skewness) | | | | | | | | 95% Chebyshev (MVUE) UCL | 12.96 | | |
| 562 | | | 95% Adjusted-CLT UCL (Chen-1995) | 10.32 | | | | | 97.5% Chebyshev (MVUE) UCL | 14.92 | | |
| 563 | | | 95% Modified-t UCL (Johnson-1978) | 10.47 | | | | | 99% Chebyshev (MVUE) UCL | 18.78 | | |
| 564 | | | | | | | | | | | | |
| 565 | Gamma Distribution Test | | | | | | Data Distribution | | | | | |
| 566 | | | k star (bias corrected) | 6.439 | | | Data appear Normal at 5% Significance Level | | | | | |
| 567 | | | Theta Star | 1.308 | | | | | | | | |
| 568 | | | MLE of Mean | 8.42 | | | | | | | | |
| 569 | | | MLE of Standard Deviation | 3.318 | | | | | | | | |
| 570 | | | nu star | 90.15 | | | | | | | | |
| 571 | | | Approximate Chi Square Value (.05) | 69.26 | | | Nonparametric Statistics | | | | | |
| 572 | | | Adjusted Level of Significance | 0.0158 | | | | | 95% CLT UCL | 10.13 | | |
| 573 | | | Adjusted Chi Square Value | 63.75 | | | | | 95% Jackknife UCL | 10.44 | | |
| 574 | | | | | | | | | 95% Standard Bootstrap UCL | 9.979 | | |
| 575 | | | Anderson-Darling Test Statistic | 0.34 | | | | | 95% Bootstrap-t UCL | 11.14 | | |
| 576 | | | Anderson-Darling 5% Critical Value | 0.708 | | | | | 95% Hall's Bootstrap UCL | 10.69 | | |
| 577 | | | Kolmogorov-Smirnov Test Statistic | 0.21 | | | | | 95% Percentile Bootstrap UCL | 9.97 | | |
| 578 | | | Kolmogorov-Smirnov 5% Critical Value | 0.312 | | | | | 95% BCA Bootstrap UCL | 10.12 | | |
| 579 | Data appear Gamma Distributed at 5% Significance Level | | | | | | | | 95% Chebyshev(Mean, Sd) UCL | 12.96 | | |
| 580 | | | | | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 14.92 | | |
| 581 | Assuming Gamma Distribution | | | | | | | | 99% Chebyshev(Mean, Sd) UCL | 18.78 | | |
| 582 | | | 95% Approximate Gamma UCL | 10.96 | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 583 | | | 95% Adjusted Gamma UCL | | | 11.91 | | | | | | |
| 584 | | | | | | | | | | | | |
| 585 | | | Potential UCL to Use | | | | | | | | Use 95% Student's-t UCL | 10.44 |
| 586 | | | | | | | | | | | | |
| 587 | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | |
| 588 | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | |
| 589 | | | and Singh and Singh (2003). For additional insight, the user may want to consult a statistician. | | | | | | | | | |
| 590 | | | | | | | | | | | | |
| 591 | | | | | | | | | | | | |
| 592 | Copper | | | | | | | | | | | |
| 593 | | | | | | | | | | | | |
| 594 | | | | General Statistics | | | | | | | | |
| 595 | | | Number of Valid Observations | | | 53 | | | Number of Distinct Observations | | | 48 |
| 596 | | | | | | | | | | | | |
| 597 | | | Raw Statistics | | | | Log-transformed Statistics | | | | | |
| 598 | | | Minimum | | | 7.8 | | | Minimum of Log Data | | | 2.054 |
| 599 | | | Maximum | | | 49.1 | | | Maximum of Log Data | | | 3.894 |
| 600 | | | Mean | | | 22.99 | | | Mean of log Data | | | 3.011 |
| 601 | | | Median | | | 23.2 | | | SD of log Data | | | 0.523 |
| 602 | | | SD | | | 10.85 | | | | | | |
| 603 | | | Std. Error of Mean | | | 1.49 | | | | | | |
| 604 | | | Coefficient of Variation | | | 0.472 | | | | | | |
| 605 | | | Skewness | | | 0.369 | | | | | | |
| 606 | | | | | | | | | | | | |
| 607 | | | | Relevant UCL Statistics | | | | | | | | |
| 608 | | | Normal Distribution Test | | | | Lognormal Distribution Test | | | | | |
| 609 | | | Lilliefors Test Statistic | | | 0.105 | | | Lilliefors Test Statistic | | | 0.13 |
| 610 | | | Lilliefors Critical Value | | | 0.122 | | | Lilliefors Critical Value | | | 0.122 |
| 611 | | | Data appear Normal at 5% Significance Level | | | | Data not Lognormal at 5% Significance Level | | | | | |
| 612 | | | | | | | | | | | | |
| 613 | | | Assuming Normal Distribution | | | | Assuming Lognormal Distribution | | | | | |
| 614 | | | 95% Student's-t UCL | | | 25.49 | | | 95% H-UCL | | | 26.73 |
| 615 | | | 95% UCLs (Adjusted for Skewness) | | | | | | 95% Chebyshev (MVUE) UCL | | | 30.91 |
| 616 | | | 95% Adjusted-CLT UCL (Chen-1995) | | | 25.53 | | | 97.5% Chebyshev (MVUE) UCL | | | 34.24 |
| 617 | | | 95% Modified-t UCL (Johnson-1978) | | | 25.5 | | | 99% Chebyshev (MVUE) UCL | | | 40.76 |
| 618 | | | | | | | | | | | | |
| 619 | | | Gamma Distribution Test | | | | Data Distribution | | | | | |
| 620 | | | k star (bias corrected) | | | 3.974 | Data appear Normal at 5% Significance Level | | | | | |
| 621 | | | Theta Star | | | 5.786 | | | | | | |
| 622 | | | MLE of Mean | | | 22.99 | | | | | | |
| 623 | | | MLE of Standard Deviation | | | 11.53 | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 624 | | | | | nu star | 421.3 | | | | | | |
| 625 | | | | | Approximate Chi Square Value (.05) | 374.7 | | | Nonparametric Statistics | | | |
| 626 | | | | | Adjusted Level of Significance | 0.0455 | | | | | 95% CLT UCL | 25.45 |
| 627 | | | | | Adjusted Chi Square Value | 373.5 | | | | | 95% Jackknife UCL | 25.49 |
| 628 | | | | | | | | | | | 95% Standard Bootstrap UCL | 25.44 |
| 629 | | | | | Anderson-Darling Test Statistic | 0.857 | | | | | 95% Bootstrap-t UCL | 25.56 |
| 630 | | | | | Anderson-Darling 5% Critical Value | 0.754 | | | | | 95% Hall's Bootstrap UCL | 25.69 |
| 631 | | | | | Kolmogorov-Smirnov Test Statistic | 0.106 | | | | | 95% Percentile Bootstrap UCL | 25.5 |
| 632 | | | | | Kolmogorov-Smirnov 5% Critical Value | 0.123 | | | | | 95% BCA Bootstrap UCL | 25.52 |
| 633 | | | | Data follow Appr. Gamma Distribution at 5% Significance Level | | | | | | | 95% Chebyshev(Mean, Sd) UCL | 29.49 |
| 634 | | | | | | | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 32.3 |
| 635 | | | | Assuming Gamma Distribution | | | | | | | 99% Chebyshev(Mean, Sd) UCL | 37.82 |
| 636 | | | | | 95% Approximate Gamma UCL | 25.85 | | | | | | |
| 637 | | | | | 95% Adjusted Gamma UCL | 25.94 | | | | | | |
| 638 | | | | | | | | | | | | |
| 639 | | | | Potential UCL to Use | | | | | | | Use 95% Student's-t UCL | 25.49 |
| 640 | | | | | | | | | | | | |
| 641 | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | |
| 642 | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | |
| 643 | | | | and Singh and Singh (2003). For additional insight, the user may want to consult a statistician. | | | | | | | | |
| 644 | | | | | | | | | | | | |
| 645 | | | | | | | | | | | | |
| 646 | Iron | | | | | | | | | | | |
| 647 | | | | | | | | | | | | |
| 648 | | | | | General Statistics | | | | | | | |
| 649 | | | | | Number of Valid Observations | 7 | | | | | Number of Distinct Observations | 6 |
| 650 | | | | | | | | | | | | |
| 651 | | | | Raw Statistics | | | | | Log-transformed Statistics | | | |
| 652 | | | | | Minimum | 16300 | | | | | Minimum of Log Data | 9.699 |
| 653 | | | | | Maximum | 29800 | | | | | Maximum of Log Data | 10.3 |
| 654 | | | | | Mean | 23357 | | | | | Mean of log Data | 10.04 |
| 655 | | | | | Median | 21500 | | | | | SD of log Data | 0.218 |
| 656 | | | | | SD | 4957 | | | | | | |
| 657 | | | | | Std. Error of Mean | 1874 | | | | | | |
| 658 | | | | | Coefficient of Variation | 0.212 | | | | | | |
| 659 | | | | | Skewness | 0.0223 | | | | | | |
| 660 | | | | | | | | | | | | |
| 661 | | | | | | | | | | | | |
| 662 | | | | Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates! | | | | | | | | |
| 663 | | | | | | | | | | | | |
| 664 | | | | It is suggested to collect at least 8 to 10 observations using these statistical methods! | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 665 | | | If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results. | | | | | | | | | |
| 666 | | | | | | | | | | | | |
| 667 | | | | | | | | | | | | |
| 668 | | | Warning: There are only 7 Values in this data | | | | | | | | | |
| 669 | | | Note: It should be noted that even though bootstrap methods may be performed on this data set, | | | | | | | | | |
| 670 | | | the resulting calculations may not be reliable enough to draw conclusions | | | | | | | | | |
| 671 | | | | | | | | | | | | |
| 672 | | | The literature suggests to use bootstrap methods on data sets having more than 10-15 observations. | | | | | | | | | |
| 673 | | | | | | | | | | | | |
| 674 | | | Relevant UCL Statistics | | | | | | | | | |
| 675 | | | Normal Distribution Test | | | | Lognormal Distribution Test | | | | | |
| 676 | | | Shapiro Wilk Test Statistic | | | 0.942 | Shapiro Wilk Test Statistic | | | | | 0.943 |
| 677 | | | Shapiro Wilk Critical Value | | | 0.803 | Shapiro Wilk Critical Value | | | | | 0.803 |
| 678 | | | Data appear Normal at 5% Significance Level | | | | Data appear Lognormal at 5% Significance Level | | | | | |
| 679 | | | | | | | | | | | | |
| 680 | | | Assuming Normal Distribution | | | | Assuming Lognormal Distribution | | | | | |
| 681 | | | 95% Student's-t UCL | | | 26998 | 95% H-UCL | | | | | 28060 |
| 682 | | | 95% UCLs (Adjusted for Skewness) | | | | 95% Chebyshev (MVUE) UCL | | | | | 31751 |
| 683 | | | 95% Adjusted-CLT UCL (Chen-1995) | | | 26456 | 97.5% Chebyshev (MVUE) UCL | | | | | 35380 |
| 684 | | | 95% Modified-t UCL (Johnson-1978) | | | 27001 | 99% Chebyshev (MVUE) UCL | | | | | 42508 |
| 685 | | | | | | | | | | | | |
| 686 | | | Gamma Distribution Test | | | | Data Distribution | | | | | |
| 687 | | | k star (bias corrected) | | | 14.52 | Data appear Normal at 5% Significance Level | | | | | |
| 688 | | | Theta Star | | | 1608 | | | | | | |
| 689 | | | MLE of Mean | | | 23357 | | | | | | |
| 690 | | | MLE of Standard Deviation | | | 6129 | | | | | | |
| 691 | | | nu star | | | 203.3 | | | | | | |
| 692 | | | Approximate Chi Square Value (.05) | | | 171.3 | Nonparametric Statistics | | | | | |
| 693 | | | Adjusted Level of Significance | | | 0.0158 | 95% CLT UCL | | | | | 26439 |
| 694 | | | Adjusted Chi Square Value | | | 162.4 | 95% Jackknife UCL | | | | | 26998 |
| 695 | | | | | | | 95% Standard Bootstrap UCL | | | | | 26266 |
| 696 | | | Anderson-Darling Test Statistic | | | 0.291 | 95% Bootstrap-t UCL | | | | | 27110 |
| 697 | | | Anderson-Darling 5% Critical Value | | | 0.707 | 95% Hall's Bootstrap UCL | | | | | 25963 |
| 698 | | | Kolmogorov-Smirnov Test Statistic | | | 0.206 | 95% Percentile Bootstrap UCL | | | | | 26243 |
| 699 | | | Kolmogorov-Smirnov 5% Critical Value | | | 0.311 | 95% BCA Bootstrap UCL | | | | | 26186 |
| 700 | | | Data appear Gamma Distributed at 5% Significance Level | | | | 95% Chebyshev(Mean, Sd) UCL | | | | | 31524 |
| 701 | | | | | | | 97.5% Chebyshev(Mean, Sd) UCL | | | | | 35058 |
| 702 | | | Assuming Gamma Distribution | | | | 99% Chebyshev(Mean, Sd) UCL | | | | | 41999 |
| 703 | | | 95% Approximate Gamma UCL | | | 27719 | | | | | | |
| 704 | | | 95% Adjusted Gamma UCL | | | 29237 | | | | | | |
| 705 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 706 | | | Potential UCL to Use | | | | | | | Use 95% Student's-t UCL | | 26998 |
| 707 | | | | | | | | | | | | |
| 708 | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | |
| 709 | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | |
| 710 | | | and Singh and Singh (2003). For additional insight, the user may want to consult a statistician. | | | | | | | | | |
| 711 | | | | | | | | | | | | |
| 712 | | | | | | | | | | | | |
| 713 | Lead | | | | | | | | | | | |
| 714 | | | | | | | | | | | | |
| 715 | | | | General Statistics | | | | | | | | |
| 716 | | | Number of Valid Observations | 7 | | | Number of Distinct Observations | | | | | 7 |
| 717 | | | | | | | | | | | | |
| 718 | | | Raw Statistics | | | | Log-transformed Statistics | | | | | |
| 719 | | | Minimum | 3.09 | | | Minimum of Log Data | | | | | 1.128 |
| 720 | | | Maximum | 5.41 | | | Maximum of Log Data | | | | | 1.688 |
| 721 | | | Mean | 4.22 | | | Mean of log Data | | | | | 1.414 |
| 722 | | | Median | 4.06 | | | SD of log Data | | | | | 0.245 |
| 723 | | | SD | 1.019 | | | | | | | | |
| 724 | | | Std. Error of Mean | 0.385 | | | | | | | | |
| 725 | | | Coefficient of Variation | 0.241 | | | | | | | | |
| 726 | | | Skewness | 0.105 | | | | | | | | |
| 727 | | | | | | | | | | | | |
| 728 | | | | | | | | | | | | |
| 729 | | | Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates! | | | | | | | | | |
| 730 | | | | | | | | | | | | |
| 731 | | | It is suggested to collect at least 8 to 10 observations using these statistical methods! | | | | | | | | | |
| 732 | | | If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results. | | | | | | | | | |
| 733 | | | | | | | | | | | | |
| 734 | | | | | | | | | | | | |
| 735 | | | Warning: There are only 7 Values in this data | | | | | | | | | |
| 736 | | | Note: It should be noted that even though bootstrap methods may be performed on this data set, | | | | | | | | | |
| 737 | | | the resulting calculations may not be reliable enough to draw conclusions | | | | | | | | | |
| 738 | | | | | | | | | | | | |
| 739 | | | The literature suggests to use bootstrap methods on data sets having more than 10-15 observations. | | | | | | | | | |
| 740 | | | | | | | | | | | | |
| 741 | | | | Relevant UCL Statistics | | | | | | | | |
| 742 | | | Normal Distribution Test | | | | Lognormal Distribution Test | | | | | |
| 743 | | | Shapiro Wilk Test Statistic | 0.84 | | | Shapiro Wilk Test Statistic | | | | | 0.847 |
| 744 | | | Shapiro Wilk Critical Value | 0.803 | | | Shapiro Wilk Critical Value | | | | | 0.803 |
| 745 | | | Data appear Normal at 5% Significance Level | | | | Data appear Lognormal at 5% Significance Level | | | | | |
| 746 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 747 | | | Assuming Normal Distribution | | | | | | Assuming Lognormal Distribution | | | |
| 748 | | | 95% Student's-t UCL | | | 4.968 | | | 95% H-UCL | | | 5.216 |
| 749 | | | 95% UCLs (Adjusted for Skewness) | | | | | | 95% Chebyshev (MVUE) UCL | | | 5.924 |
| 750 | | | 95% Adjusted-CLT UCL (Chen-1995) | | | 4.87 | | | 97.5% Chebyshev (MVUE) UCL | | | 6.661 |
| 751 | | | 95% Modified-t UCL (Johnson-1978) | | | 4.971 | | | 99% Chebyshev (MVUE) UCL | | | 8.108 |
| 752 | | | | | | | | | | | | |
| 753 | | | Gamma Distribution Test | | | | | | Data Distribution | | | |
| 754 | | | k star (bias corrected) | | | 11.41 | | | Data appear Normal at 5% Significance Level | | | |
| 755 | | | Theta Star | | | 0.37 | | | | | | |
| 756 | | | MLE of Mean | | | 4.22 | | | | | | |
| 757 | | | MLE of Standard Deviation | | | 1.249 | | | | | | |
| 758 | | | nu star | | | 159.8 | | | | | | |
| 759 | | | Approximate Chi Square Value (.05) | | | 131.6 | | | Nonparametric Statistics | | | |
| 760 | | | Adjusted Level of Significance | | | 0.0158 | | | 95% CLT UCL | | | 4.853 |
| 761 | | | Adjusted Chi Square Value | | | 123.8 | | | 95% Jackknife UCL | | | 4.968 |
| 762 | | | | | | | | | 95% Standard Bootstrap UCL | | | 4.811 |
| 763 | | | Anderson-Darling Test Statistic | | | 0.591 | | | 95% Bootstrap-t UCL | | | 5.022 |
| 764 | | | Anderson-Darling 5% Critical Value | | | 0.707 | | | 95% Hall's Bootstrap UCL | | | 4.651 |
| 765 | | | Kolmogorov-Smirnov Test Statistic | | | 0.272 | | | 95% Percentile Bootstrap UCL | | | 4.791 |
| 766 | | | Kolmogorov-Smirnov 5% Critical Value | | | 0.311 | | | 95% BCA Bootstrap UCL | | | 4.82 |
| 767 | | | Data appear Gamma Distributed at 5% Significance Level | | | | | | 95% Chebyshev(Mean, Sd) UCL | | | 5.899 |
| 768 | | | | | | | | | 97.5% Chebyshev(Mean, Sd) UCL | | | 6.625 |
| 769 | | | Assuming Gamma Distribution | | | | | | 99% Chebyshev(Mean, Sd) UCL | | | 8.051 |
| 770 | | | 95% Approximate Gamma UCL | | | 5.125 | | | | | | |
| 771 | | | 95% Adjusted Gamma UCL | | | 5.446 | | | | | | |
| 772 | | | | | | | | | | | | |
| 773 | | | Potential UCL to Use | | | | | | Use 95% Student's-t UCL | | | 4.968 |
| 774 | | | | | | | | | | | | |
| 775 | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | |
| 776 | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | |
| 777 | | | and Singh and Singh (2003). For additional insight, the user may want to consult a statistician. | | | | | | | | | |
| 778 | | | | | | | | | | | | |
| 779 | | | | | | | | | | | | |
| 780 | Lithium | | | | | | | | | | | |
| 781 | | | | | | | | | | | | |
| 782 | | | | | | General Statistics | | | | | | |
| 783 | | | Number of Valid Observations | | | 7 | | | Number of Distinct Observations | | | 7 |
| 784 | | | | | | | | | | | | |
| 785 | | | Raw Statistics | | | | | | Log-transformed Statistics | | | |
| 786 | | | Minimum | | | 4.6 | | | Minimum of Log Data | | | 1.526 |
| 787 | | | Maximum | | | 11.9 | | | Maximum of Log Data | | | 2.477 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 788 | | | | | Mean | 7.786 | | | | Mean of log Data | | 2.002 |
| 789 | | | | | Median | 7.6 | | | | SD of log Data | | 0.345 |
| 790 | | | | | SD | 2.639 | | | | | | |
| 791 | | | | | Std. Error of Mean | 0.997 | | | | | | |
| 792 | | | | | Coefficient of Variation | 0.339 | | | | | | |
| 793 | | | | | Skewness | 0.375 | | | | | | |
| 794 | | | | | | | | | | | | |
| 795 | | | | | | | | | | | | |
| 796 | | | | Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates! | | | | | | | | |
| 797 | | | | | | | | | | | | |
| 798 | | | | It is suggested to collect at least 8 to 10 observations using these statistical methods! | | | | | | | | |
| 799 | | | | If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results. | | | | | | | | |
| 800 | | | | | | | | | | | | |
| 801 | | | | | | | | | | | | |
| 802 | | | | Warning: There are only 7 Values in this data | | | | | | | | |
| 803 | | | | Note: It should be noted that even though bootstrap methods may be performed on this data set, | | | | | | | | |
| 804 | | | | the resulting calculations may not be reliable enough to draw conclusions | | | | | | | | |
| 805 | | | | | | | | | | | | |
| 806 | | | | The literature suggests to use bootstrap methods on data sets having more than 10-15 observations. | | | | | | | | |
| 807 | | | | | | | | | | | | |
| 808 | | | | Relevant UCL Statistics | | | | | | | | |
| 809 | | | | Normal Distribution Test | | | | | | Lognormal Distribution Test | | |
| 810 | | | | | Shapiro Wilk Test Statistic | 0.945 | | | | Shapiro Wilk Test Statistic | | 0.952 |
| 811 | | | | | Shapiro Wilk Critical Value | 0.803 | | | | Shapiro Wilk Critical Value | | 0.803 |
| 812 | | | | Data appear Normal at 5% Significance Level | | | | | | Data appear Lognormal at 5% Significance Level | | |
| 813 | | | | | | | | | | | | |
| 814 | | | | Assuming Normal Distribution | | | | | | Assuming Lognormal Distribution | | |
| 815 | | | | | 95% Student's-t UCL | 9.724 | | | | 95% H-UCL | | 10.81 |
| 816 | | | | 95% UCLs (Adjusted for Skewness) | | | | | | 95% Chebyshev (MVUE) UCL | | 12.23 |
| 817 | | | | | 95% Adjusted-CLT UCL (Chen-1995) | 9.577 | | | | 97.5% Chebyshev (MVUE) UCL | | 14.15 |
| 818 | | | | | 95% Modified-t UCL (Johnson-1978) | 9.748 | | | | 99% Chebyshev (MVUE) UCL | | 17.93 |
| 819 | | | | | | | | | | | | |
| 820 | | | | Gamma Distribution Test | | | | | | Data Distribution | | |
| 821 | | | | | k star (bias corrected) | 5.862 | | | | Data appear Normal at 5% Significance Level | | |
| 822 | | | | | Theta Star | 1.328 | | | | | | |
| 823 | | | | | MLE of Mean | 7.786 | | | | | | |
| 824 | | | | | MLE of Standard Deviation | 3.216 | | | | | | |
| 825 | | | | | nu star | 82.07 | | | | | | |
| 826 | | | | | Approximate Chi Square Value (.05) | 62.19 | | | | Nonparametric Statistics | | |
| 827 | | | | | Adjusted Level of Significance | 0.0158 | | | | 95% CLT UCL | | 9.426 |
| 828 | | | | | Adjusted Chi Square Value | 57 | | | | 95% Jackknife UCL | | 9.724 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 829 | | | | | | | | | | 95% Standard Bootstrap UCL | | 9.258 |
| 830 | | | Anderson-Darling Test Statistic | | | 0.273 | | | | 95% Bootstrap-t UCL | | 10.16 |
| 831 | | | Anderson-Darling 5% Critical Value | | | 0.708 | | | | 95% Hall's Bootstrap UCL | | 9.412 |
| 832 | | | Kolmogorov-Smirnov Test Statistic | | | 0.212 | | | | 95% Percentile Bootstrap UCL | | 9.329 |
| 833 | | | Kolmogorov-Smirnov 5% Critical Value | | | 0.312 | | | | 95% BCA Bootstrap UCL | | 9.386 |
| 834 | | | Data appear Gamma Distributed at 5% Significance Level | | | | | | | 95% Chebyshev(Mean, Sd) UCL | | 12.13 |
| 835 | | | | | | | | | | 97.5% Chebyshev(Mean, Sd) UCL | | 14.01 |
| 836 | | | Assuming Gamma Distribution | | | | | | | 99% Chebyshev(Mean, Sd) UCL | | 17.71 |
| 837 | | | 95% Approximate Gamma UCL | | | 10.27 | | | | | | |
| 838 | | | 95% Adjusted Gamma UCL | | | 11.21 | | | | | | |
| 839 | | | | | | | | | | | | |
| 840 | | | Potential UCL to Use | | | | | | | Use 95% Student's-t UCL | | 9.724 |
| 841 | | | | | | | | | | | | |
| 842 | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | |
| 843 | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | |
| 844 | | | and Singh and Singh (2003). For additional insight, the user may want to consult a statistician. | | | | | | | | | |
| 845 | | | | | | | | | | | | |
| 846 | | | | | | | | | | | | |
| 847 | Manganese | | | | | | | | | | | |
| 848 | | | | | | | | | | | | |
| 849 | | | | General Statistics | | | | | | | | |
| 850 | | | Number of Valid Observations | | | 7 | | | | Number of Distinct Observations | | 7 |
| 851 | | | | | | | | | | | | |
| 852 | | | Raw Statistics | | | | Log-transformed Statistics | | | | | |
| 853 | | | Minimum | | | 182 | | | | Minimum of Log Data | | 5.204 |
| 854 | | | Maximum | | | 537 | | | | Maximum of Log Data | | 6.286 |
| 855 | | | Mean | | | 309.9 | | | | Mean of log Data | | 5.678 |
| 856 | | | Median | | | 277 | | | | SD of log Data | | 0.361 |
| 857 | | | SD | | | 120.1 | | | | | | |
| 858 | | | Std. Error of Mean | | | 45.38 | | | | | | |
| 859 | | | Coefficient of Variation | | | 0.388 | | | | | | |
| 860 | | | Skewness | | | 1.245 | | | | | | |
| 861 | | | | | | | | | | | | |
| 862 | | | | | | | | | | | | |
| 863 | | | Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates! | | | | | | | | | |
| 864 | | | | | | | | | | | | |
| 865 | | | It is suggested to collect at least 8 to 10 observations using these statistical methods! | | | | | | | | | |
| 866 | | | If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results. | | | | | | | | | |
| 867 | | | | | | | | | | | | |
| 868 | | | | | | | | | | | | |
| 869 | | | Warning: There are only 7 Values in this data | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 870 | | | Note: It should be noted that even though bootstrap methods may be performed on this data set, | | | | | | | | | |
| 871 | | | the resulting calculations may not be reliable enough to draw conclusions | | | | | | | | | |
| 872 | | | | | | | | | | | | |
| 873 | | | The literature suggests to use bootstrap methods on data sets having more than 10-15 observations. | | | | | | | | | |
| 874 | | | | | | | | | | | | |
| 875 | | | Relevant UCL Statistics | | | | | | | | | |
| 876 | | | Normal Distribution Test | | | | Lognormal Distribution Test | | | | | |
| 877 | | | Shapiro Wilk Test Statistic | | | 0.907 | Shapiro Wilk Test Statistic | | | | | 0.977 |
| 878 | | | Shapiro Wilk Critical Value | | | 0.803 | Shapiro Wilk Critical Value | | | | | 0.803 |
| 879 | | | Data appear Normal at 5% Significance Level | | | | Data appear Lognormal at 5% Significance Level | | | | | |
| 880 | | | | | | | | | | | | |
| 881 | | | Assuming Normal Distribution | | | | Assuming Lognormal Distribution | | | | | |
| 882 | | | 95% Student's-t UCL | | | 398 | 95% H-UCL | | | | | 436.2 |
| 883 | | | 95% UCLs (Adjusted for Skewness) | | | | 95% Chebyshev (MVUE) UCL | | | | | 493.3 |
| 884 | | | 95% Adjusted-CLT UCL (Chen-1995) | | | 407.3 | 97.5% Chebyshev (MVUE) UCL | | | | | 573 |
| 885 | | | 95% Modified-t UCL (Johnson-1978) | | | 401.6 | 99% Chebyshev (MVUE) UCL | | | | | 729.6 |
| 886 | | | | | | | | | | | | |
| 887 | | | Gamma Distribution Test | | | | Data Distribution | | | | | |
| 888 | | | k star (bias corrected) | | | 5.101 | Data appear Normal at 5% Significance Level | | | | | |
| 889 | | | Theta Star | | | 60.75 | | | | | | |
| 890 | | | MLE of Mean | | | 309.9 | | | | | | |
| 891 | | | MLE of Standard Deviation | | | 137.2 | | | | | | |
| 892 | | | nu star | | | 71.41 | | | | | | |
| 893 | | | Approximate Chi Square Value (.05) | | | 52.95 | Nonparametric Statistics | | | | | |
| 894 | | | Adjusted Level of Significance | | | 0.0158 | 95% CLT UCL | | | | | 384.5 |
| 895 | | | Adjusted Chi Square Value | | | 48.19 | 95% Jackknife UCL | | | | | 398 |
| 896 | | | | | | | 95% Standard Bootstrap UCL | | | | | 378.9 |
| 897 | | | Anderson-Darling Test Statistic | | | 0.231 | 95% Bootstrap-t UCL | | | | | 466.9 |
| 898 | | | Anderson-Darling 5% Critical Value | | | 0.709 | 95% Hall's Bootstrap UCL | | | | | 853.5 |
| 899 | | | Kolmogorov-Smirnov Test Statistic | | | 0.173 | 95% Percentile Bootstrap UCL | | | | | 383.9 |
| 900 | | | Kolmogorov-Smirnov 5% Critical Value | | | 0.312 | 95% BCA Bootstrap UCL | | | | | 403.6 |
| 901 | | | Data appear Gamma Distributed at 5% Significance Level | | | | 95% Chebyshev(Mean, Sd) UCL | | | | | 507.7 |
| 902 | | | | | | | 97.5% Chebyshev(Mean, Sd) UCL | | | | | 593.3 |
| 903 | | | Assuming Gamma Distribution | | | | 99% Chebyshev(Mean, Sd) UCL | | | | | 761.4 |
| 904 | | | 95% Approximate Gamma UCL | | | 417.9 | | | | | | |
| 905 | | | 95% Adjusted Gamma UCL | | | 459.2 | | | | | | |
| 906 | | | | | | | | | | | | |
| 907 | | | Potential UCL to Use | | | | Use 95% Student's-t UCL | | | | | 398 |
| 908 | | | | | | | | | | | | |
| 909 | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | |
| 910 | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 911 | and Singh and Singh (2003). For additional insight, the user may want to consult a statistician. | | | | | | | | | | | |
| 912 | | | | | | | | | | | | |
| 913 | | | | | | | | | | | | |
| 914 | Molybdenum | | | | | | | | | | | |
| 915 | | | | | | | | | | | | |
| 916 | General Statistics | | | | | | | | | | | |
| 917 | | | Number of Valid Data | | | 7 | | | Number of Detected Data | | | 1 |
| 918 | | | Number of Distinct Detected Data | | | 1 | | | Number of Non-Detect Data | | | 6 |
| 919 | | | | | | | | | Percent Non-Detects | | | 85.71% |
| 920 | | | | | | | | | | | | |
| 921 | Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! | | | | | | | | | | | |
| 922 | It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV). | | | | | | | | | | | |
| 923 | | | | | | | | | | | | |
| 924 | The data set for variable Molybdenum was not processed! | | | | | | | | | | | |
| 925 | | | | | | | | | | | | |
| 926 | | | | | | | | | | | | |
| 927 | | | | | | | | | | | | |
| 928 | Nickel | | | | | | | | | | | |
| 929 | | | | | | | | | | | | |
| 930 | General Statistics | | | | | | | | | | | |
| 931 | | | Number of Valid Data | | | 49 | | | Number of Detected Data | | | 46 |
| 932 | | | Number of Distinct Detected Data | | | 38 | | | Number of Non-Detect Data | | | 3 |
| 933 | | | | | | | | | Percent Non-Detects | | | 6.12% |
| 934 | | | | | | | | | | | | |
| 935 | Raw Statistics | | | | | | Log-transformed Statistics | | | | | |
| 936 | | | Minimum Detected | | | 5.1 | | | Minimum Detected | | | 1.629 |
| 937 | | | Maximum Detected | | | 11 | | | Maximum Detected | | | 2.398 |
| 938 | | | Mean of Detected | | | 7.619 | | | Mean of Detected | | | 2.011 |
| 939 | | | SD of Detected | | | 1.497 | | | SD of Detected | | | 0.2 |
| 940 | | | Minimum Non-Detect | | | 5 | | | Minimum Non-Detect | | | 1.609 |
| 941 | | | Maximum Non-Detect | | | 5 | | | Maximum Non-Detect | | | 1.609 |
| 942 | | | | | | | | | | | | |
| 943 | | | | | | | | | | | | |
| 944 | UCL Statistics | | | | | | | | | | | |
| 945 | Normal Distribution Test with Detected Values Only | | | | | | Lognormal Distribution Test with Detected Values Only | | | | | |
| 946 | | | Shapiro Wilk Test Statistic | | | 0.962 | | | Shapiro Wilk Test Statistic | | | 0.958 |
| 947 | | | 5% Shapiro Wilk Critical Value | | | 0.945 | | | 5% Shapiro Wilk Critical Value | | | 0.945 |
| 948 | Data appear Normal at 5% Significance Level | | | | | | Data appear Lognormal at 5% Significance Level | | | | | |
| 949 | | | | | | | | | | | | |
| 950 | Assuming Normal Distribution | | | | | | Assuming Lognormal Distribution | | | | | |
| 951 | | | DL/2 Substitution Method | | | | | | DL/2 Substitution Method | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 952 | | | | | Mean | 7.306 | | | | Mean | | 1.944 |
| 953 | | | | | SD | 1.908 | | | | SD | | 0.329 |
| 954 | | | | | 95% DL/2 (t) UCL | 7.763 | | | | 95% H-Stat (DL/2) UCL | | 8.034 |
| 955 | | | | | | | | | | | | |
| 956 | | | | | Maximum Likelihood Estimate(MLE) Method | | | | | Log ROS Method | | |
| 957 | | | | | Mean | 7.414 | | | | Mean in Log Scale | | 1.982 |
| 958 | | | | | SD | 1.652 | | | | SD in Log Scale | | 0.225 |
| 959 | | | | | 95% MLE (t) UCL | 7.81 | | | | Mean in Original Scale | | 7.438 |
| 960 | | | | | 95% MLE (Tiku) UCL | 7.81 | | | | SD in Original Scale | | 1.618 |
| 961 | | | | | | | | | | 95% t UCL | | 7.826 |
| 962 | | | | | | | | | | 95% Percentile Bootstrap UCL | | 7.83 |
| 963 | | | | | | | | | | 95% BCA Bootstrap UCL | | 7.806 |
| 964 | | | | | | | | | | 95% H UCL | | 7.9 |
| 965 | | | | | | | | | | | | |
| 966 | | | Gamma Distribution Test with Detected Values Only | | | | | | | Data Distribution Test with Detected Values Only | | |
| 967 | | | | | k star (bias corrected) | 24.37 | | | | Data appear Normal at 5% Significance Level | | |
| 968 | | | | | Theta Star | 0.313 | | | | | | |
| 969 | | | | | nu star | 2242 | | | | | | |
| 970 | | | | | | | | | | | | |
| 971 | | | | | A-D Test Statistic | 0.474 | | | | Nonparametric Statistics | | |
| 972 | | | | | 5% A-D Critical Value | 0.748 | | | | Kaplan-Meier (KM) Method | | |
| 973 | | | | | K-S Test Statistic | 0.748 | | | | Mean | | 7.465 |
| 974 | | | | | 5% K-S Critical Value | 0.13 | | | | SD | | 1.557 |
| 975 | | | Data appear Gamma Distributed at 5% Significance Level | | | | | | | SE of Mean | | 0.225 |
| 976 | | | | | | | | | | 95% KM (t) UCL | | 7.842 |
| 977 | | | Assuming Gamma Distribution | | | | | | | 95% KM (z) UCL | | 7.835 |
| 978 | | | | | Gamma ROS Statistics using Extrapolated Data | | | | | 95% KM (jackknife) UCL | | 7.838 |
| 979 | | | | | Minimum | 1.591 | | | | 95% KM (bootstrap t) UCL | | 7.821 |
| 980 | | | | | Maximum | 11 | | | | 95% KM (BCA) UCL | | 7.837 |
| 981 | | | | | Mean | 7.304 | | | | 95% KM (Percentile Bootstrap) UCL | | 7.83 |
| 982 | | | | | Median | 7.74 | | | | 95% KM (Chebyshev) UCL | | 8.445 |
| 983 | | | | | SD | 1.92 | | | | 97.5% KM (Chebyshev) UCL | | 8.869 |
| 984 | | | | | k star | 10.07 | | | | 99% KM (Chebyshev) UCL | | 9.702 |
| 985 | | | | | Theta star | 0.725 | | | | | | |
| 986 | | | | | Nu star | 987.2 | | | | Potential UCLs to Use | | |
| 987 | | | | | AppChi2 | 915.2 | | | | 95% KM (t) UCL | | 7.842 |
| 988 | | | | | 95% Gamma Approximate UCL | 7.878 | | | | 95% KM (Percentile Bootstrap) UCL | | 7.83 |
| 989 | | | | | 95% Adjusted Gamma UCL | 7.896 | | | | | | |
| 990 | Note: DL/2 is not a recommended method. | | | | | | | | | | | |
| 991 | | | | | | | | | | | | |
| 992 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 993 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 994 | For additional insight, the user may want to consult a statistician. | | | | | | | | | | | |
| 995 | | | | | | | | | | | | |
| 996 | | | | | | | | | | | | |
| 997 | Selenium | | | | | | | | | | | |
| 998 | | | | | | | | | | | | |
| 999 | General Statistics | | | | | | | | | | | |
| 1000 | | | | | Number of Valid Data | 7 | | | Number of Detected Data | | | 0 |
| 1001 | | | | | Number of Distinct Detected Data | 0 | | | Number of Non-Detect Data | | | 7 |
| 1002 | | | | | | | | | Percent Non-Detects | | | 100.00% |
| 1003 | | | | | | | | | | | | |
| 1004 | Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs! | | | | | | | | | | | |
| 1005 | Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit! | | | | | | | | | | | |
| 1006 | The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV). | | | | | | | | | | | |
| 1007 | | | | | | | | | | | | |
| 1008 | The data set for variable Selenium was not processed! | | | | | | | | | | | |
| 1009 | | | | | | | | | | | | |
| 1010 | | | | | | | | | | | | |
| 1011 | | | | | | | | | | | | |
| 1012 | Silver | | | | | | | | | | | |
| 1013 | | | | | | | | | | | | |
| 1014 | General Statistics | | | | | | | | | | | |
| 1015 | | | | | Number of Valid Data | 7 | | | Number of Detected Data | | | 0 |
| 1016 | | | | | Number of Distinct Detected Data | 0 | | | Number of Non-Detect Data | | | 7 |
| 1017 | | | | | | | | | Percent Non-Detects | | | 100.00% |
| 1018 | | | | | | | | | | | | |
| 1019 | Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs! | | | | | | | | | | | |
| 1020 | Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit! | | | | | | | | | | | |
| 1021 | The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV). | | | | | | | | | | | |
| 1022 | | | | | | | | | | | | |
| 1023 | The data set for variable Silver was not processed! | | | | | | | | | | | |
| 1024 | | | | | | | | | | | | |
| 1025 | | | | | | | | | | | | |
| 1026 | | | | | | | | | | | | |
| 1027 | Thallium | | | | | | | | | | | |
| 1028 | | | | | | | | | | | | |
| 1029 | General Statistics | | | | | | | | | | | |
| 1030 | | | | | Number of Valid Observations | 7 | | | Number of Distinct Observations | | | 7 |
| 1031 | | | | | | | | | | | | |
| 1032 | Raw Statistics | | | | | | Log-transformed Statistics | | | | | |
| 1033 | | | | | Minimum | 0.058 | | | Minimum of Log Data | | | -2.847 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 1034 | | | | | Maximum | 0.093 | | | | Maximum of Log Data | | -2.375 |
| 1035 | | | | | Mean | 0.0756 | | | | Mean of log Data | | -2.596 |
| 1036 | | | | | Median | 0.074 | | | | SD of log Data | | 0.18 |
| 1037 | | | | | SD | 0.0135 | | | | | | |
| 1038 | | | | | Std. Error of Mean | 0.00509 | | | | | | |
| 1039 | | | | | Coefficient of Variation | 0.178 | | | | | | |
| 1040 | | | | | Skewness | 0.169 | | | | | | |
| 1041 | | | | | | | | | | | | |
| 1042 | | | | | | | | | | | | |
| 1043 | | | | Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates! | | | | | | | | |
| 1044 | | | | | | | | | | | | |
| 1045 | | | | It is suggested to collect at least 8 to 10 observations using these statistical methods! | | | | | | | | |
| 1046 | | | | If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results. | | | | | | | | |
| 1047 | | | | | | | | | | | | |
| 1048 | | | | | | | | | | | | |
| 1049 | | | | Warning: There are only 7 Values in this data | | | | | | | | |
| 1050 | | | | Note: It should be noted that even though bootstrap methods may be performed on this data set, | | | | | | | | |
| 1051 | | | | the resulting calculations may not be reliable enough to draw conclusions | | | | | | | | |
| 1052 | | | | | | | | | | | | |
| 1053 | | | | The literature suggests to use bootstrap methods on data sets having more than 10-15 observations. | | | | | | | | |
| 1054 | | | | | | | | | | | | |
| 1055 | | | | Relevant UCL Statistics | | | | | | | | |
| 1056 | | | | Normal Distribution Test | | | | | | Lognormal Distribution Test | | |
| 1057 | | | | | Shapiro Wilk Test Statistic | 0.927 | | | | Shapiro Wilk Test Statistic | | 0.934 |
| 1058 | | | | | Shapiro Wilk Critical Value | 0.803 | | | | Shapiro Wilk Critical Value | | 0.803 |
| 1059 | | | | Data appear Normal at 5% Significance Level | | | | | | Data appear Lognormal at 5% Significance Level | | |
| 1060 | | | | | | | | | | | | |
| 1061 | | | | Assuming Normal Distribution | | | | | | Assuming Lognormal Distribution | | |
| 1062 | | | | | 95% Student's-t UCL | 0.0855 | | | | 95% H-UCL | | 0.0875 |
| 1063 | | | | 95% UCLs (Adjusted for Skewness) | | | | | | 95% Chebyshev (MVUE) UCL | | 0.098 |
| 1064 | | | | | 95% Adjusted-CLT UCL (Chen-1995) | 0.0843 | | | | 97.5% Chebyshev (MVUE) UCL | | 0.108 |
| 1065 | | | | | 95% Modified-t UCL (Johnson-1978) | 0.0855 | | | | 99% Chebyshev (MVUE) UCL | | 0.127 |
| 1066 | | | | | | | | | | | | |
| 1067 | | | | Gamma Distribution Test | | | | | | Data Distribution | | |
| 1068 | | | | | k star (bias corrected) | 20.99 | | | | Data appear Normal at 5% Significance Level | | |
| 1069 | | | | | Theta Star | 0.0036 | | | | | | |
| 1070 | | | | | MLE of Mean | 0.0756 | | | | | | |
| 1071 | | | | | MLE of Standard Deviation | 0.0165 | | | | | | |
| 1072 | | | | | nu star | 293.9 | | | | | | |
| 1073 | | | | | Approximate Chi Square Value (.05) | 255.2 | | | | Nonparametric Statistics | | |
| 1074 | | | | | Adjusted Level of Significance | 0.0158 | | | | 95% CLT UCL | | 0.0839 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 1075 | | | Adjusted Chi Square Value | | | 244.2 | | | 95% Jackknife UCL | | | 0.0855 |
| 1076 | | | | | | | | | 95% Standard Bootstrap UCL | | | 0.0834 |
| 1077 | | | Anderson-Darling Test Statistic | | | 0.288 | | | 95% Bootstrap-t UCL | | | 0.0867 |
| 1078 | | | Anderson-Darling 5% Critical Value | | | 0.707 | | | 95% Hall's Bootstrap UCL | | | 0.0879 |
| 1079 | | | Kolmogorov-Smirnov Test Statistic | | | 0.186 | | | 95% Percentile Bootstrap UCL | | | 0.0831 |
| 1080 | | | Kolmogorov-Smirnov 5% Critical Value | | | 0.311 | | | 95% BCA Bootstrap UCL | | | 0.0836 |
| 1081 | | | Data appear Gamma Distributed at 5% Significance Level | | | | | | 95% Chebyshev(Mean, Sd) UCL | | | 0.0978 |
| 1082 | | | | | | | | | 97.5% Chebyshev(Mean, Sd) UCL | | | 0.107 |
| 1083 | | | Assuming Gamma Distribution | | | | | | 99% Chebyshev(Mean, Sd) UCL | | | 0.126 |
| 1084 | | | 95% Approximate Gamma UCL | | | 0.087 | | | | | | |
| 1085 | | | 95% Adjusted Gamma UCL | | | 0.0909 | | | | | | |
| 1086 | | | | | | | | | | | | |
| 1087 | | | Potential UCL to Use | | | | | | Use 95% Student's-t UCL | | | 0.0855 |
| 1088 | | | | | | | | | | | | |
| 1089 | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | |
| 1090 | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | |
| 1091 | | | and Singh and Singh (2003). For additional insight, the user may want to consult a statistician. | | | | | | | | | |
| 1092 | | | | | | | | | | | | |
| 1093 | | | | | | | | | | | | |
| 1094 | Tin | | | | | | | | | | | |
| 1095 | | | | | | | | | | | | |
| 1096 | | | | General Statistics | | | | | | | | |
| 1097 | | | Number of Valid Data | | | 7 | | | Number of Detected Data | | | 0 |
| 1098 | | | Number of Distinct Detected Data | | | 0 | | | Number of Non-Detect Data | | | 7 |
| 1099 | | | | | | | | | Percent Non-Detects | | | 100.00% |
| 1100 | | | | | | | | | | | | |
| 1101 | | | Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs! | | | | | | | | | |
| 1102 | | | Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit! | | | | | | | | | |
| 1103 | | | The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV). | | | | | | | | | |
| 1104 | | | | | | | | | | | | |
| 1105 | | | The data set for variable Tin was not processed! | | | | | | | | | |
| 1106 | | | | | | | | | | | | |
| 1107 | | | | | | | | | | | | |
| 1108 | | | | | | | | | | | | |
| 1109 | Uranium | | | | | | | | | | | |
| 1110 | | | | | | | | | | | | |
| 1111 | | | | General Statistics | | | | | | | | |
| 1112 | | | Number of Valid Observations | | | 7 | | | Number of Distinct Observations | | | 6 |
| 1113 | | | | | | | | | | | | |
| 1114 | | | Raw Statistics | | | | | | Log-transformed Statistics | | | |
| 1115 | | | Minimum | | | 0.332 | | | Minimum of Log Data | | | -1.103 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 1116 | | | | | Maximum | 0.499 | | | | Maximum of Log Data | | -0.695 |
| 1117 | | | | | Mean | 0.397 | | | | Mean of log Data | | -0.933 |
| 1118 | | | | | Median | 0.366 | | | | SD of log Data | | 0.139 |
| 1119 | | | | | SD | 0.0572 | | | | | | |
| 1120 | | | | | Std. Error of Mean | 0.0216 | | | | | | |
| 1121 | | | | | Coefficient of Variation | 0.144 | | | | | | |
| 1122 | | | | | Skewness | 0.98 | | | | | | |
| 1123 | | | | | | | | | | | | |
| 1124 | | | | | | | | | | | | |
| 1125 | | | | Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates! | | | | | | | | |
| 1126 | | | | | | | | | | | | |
| 1127 | | | | It is suggested to collect at least 8 to 10 observations using these statistical methods! | | | | | | | | |
| 1128 | | | | If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results. | | | | | | | | |
| 1129 | | | | | | | | | | | | |
| 1130 | | | | | | | | | | | | |
| 1131 | | | | Warning: There are only 7 Values in this data | | | | | | | | |
| 1132 | | | | Note: It should be noted that even though bootstrap methods may be performed on this data set, | | | | | | | | |
| 1133 | | | | the resulting calculations may not be reliable enough to draw conclusions | | | | | | | | |
| 1134 | | | | | | | | | | | | |
| 1135 | | | | The literature suggests to use bootstrap methods on data sets having more than 10-15 observations. | | | | | | | | |
| 1136 | | | | | | | | | | | | |
| 1137 | | | | Relevant UCL Statistics | | | | | | | | |
| 1138 | | | | Normal Distribution Test | | | | | | Lognormal Distribution Test | | |
| 1139 | | | | | Shapiro Wilk Test Statistic | 0.906 | | | | Shapiro Wilk Test Statistic | | 0.925 |
| 1140 | | | | | Shapiro Wilk Critical Value | 0.803 | | | | Shapiro Wilk Critical Value | | 0.803 |
| 1141 | | | | Data appear Normal at 5% Significance Level | | | | | | Data appear Lognormal at 5% Significance Level | | |
| 1142 | | | | | | | | | | | | |
| 1143 | | | | Assuming Normal Distribution | | | | | | Assuming Lognormal Distribution | | |
| 1144 | | | | | 95% Student's-t UCL | 0.439 | | | | 95% H-UCL | | 0.443 |
| 1145 | | | | 95% UCLs (Adjusted for Skewness) | | | | | | 95% Chebyshev (MVUE) UCL | | 0.487 |
| 1146 | | | | | 95% Adjusted-CLT UCL (Chen-1995) | 0.441 | | | | 97.5% Chebyshev (MVUE) UCL | | 0.527 |
| 1147 | | | | | 95% Modified-t UCL (Johnson-1978) | 0.44 | | | | 99% Chebyshev (MVUE) UCL | | 0.604 |
| 1148 | | | | | | | | | | | | |
| 1149 | | | | Gamma Distribution Test | | | | | | Data Distribution | | |
| 1150 | | | | | k star (bias corrected) | 33.89 | | | | Data appear Normal at 5% Significance Level | | |
| 1151 | | | | | Theta Star | 0.0117 | | | | | | |
| 1152 | | | | | MLE of Mean | 0.397 | | | | | | |
| 1153 | | | | | MLE of Standard Deviation | 0.0681 | | | | | | |
| 1154 | | | | | nu star | 474.5 | | | | | | |
| 1155 | | | | | Approximate Chi Square Value (.05) | 425 | | | | Nonparametric Statistics | | |
| 1156 | | | | | Adjusted Level of Significance | 0.0158 | | | | 95% CLT UCL | | 0.432 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 1157 | | | | | Adjusted Chi Square Value | 410.8 | | | | 95% Jackknife UCL | | 0.439 |
| 1158 | | | | | | | | | | 95% Standard Bootstrap UCL | | 0.43 |
| 1159 | | | | | Anderson-Darling Test Statistic | 0.394 | | | | 95% Bootstrap-t UCL | | 0.468 |
| 1160 | | | | | Anderson-Darling 5% Critical Value | 0.708 | | | | 95% Hall's Bootstrap UCL | | 0.467 |
| 1161 | | | | | Kolmogorov-Smirnov Test Statistic | 0.285 | | | | 95% Percentile Bootstrap UCL | | 0.431 |
| 1162 | | | | | Kolmogorov-Smirnov 5% Critical Value | 0.311 | | | | 95% BCA Bootstrap UCL | | 0.433 |
| 1163 | | | | | Data appear Gamma Distributed at 5% Significance Level | | | | | 95% Chebyshev(Mean, Sd) UCL | | 0.491 |
| 1164 | | | | | | | | | | 97.5% Chebyshev(Mean, Sd) UCL | | 0.532 |
| 1165 | | | | | Assuming Gamma Distribution | | | | | 99% Chebyshev(Mean, Sd) UCL | | 0.612 |
| 1166 | | | | | 95% Approximate Gamma UCL | 0.443 | | | | | | |
| 1167 | | | | | 95% Adjusted Gamma UCL | 0.458 | | | | | | |
| 1168 | | | | | | | | | | | | |
| 1169 | | | | | Potential UCL to Use | | | | | Use 95% Student's-t UCL | | 0.439 |
| 1170 | | | | | | | | | | | | |
| 1171 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 1172 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | |
| 1173 | | | | | and Singh and Singh (2003). For additional insight, the user may want to consult a statistician. | | | | | | | |
| 1174 | | | | | | | | | | | | |
| 1175 | | | | | | | | | | | | |
| 1176 | Vanadium | | | | | | | | | | | |
| 1177 | | | | | | | | | | | | |
| 1178 | | | | | General Statistics | | | | | | | |
| 1179 | | | | | Number of Valid Observations | 7 | | | | Number of Distinct Observations | | 7 |
| 1180 | | | | | | | | | | | | |
| 1181 | | | | | Raw Statistics | | | | | Log-transformed Statistics | | |
| 1182 | | | | | Minimum | 40.1 | | | | Minimum of Log Data | | 3.691 |
| 1183 | | | | | Maximum | 92.6 | | | | Maximum of Log Data | | 4.528 |
| 1184 | | | | | Mean | 61.71 | | | | Mean of log Data | | 4.078 |
| 1185 | | | | | Median | 58.1 | | | | SD of log Data | | 0.324 |
| 1186 | | | | | SD | 19.95 | | | | | | |
| 1187 | | | | | Std. Error of Mean | 7.539 | | | | | | |
| 1188 | | | | | Coefficient of Variation | 0.323 | | | | | | |
| 1189 | | | | | Skewness | 0.442 | | | | | | |
| 1190 | | | | | | | | | | | | |
| 1191 | | | | | | | | | | | | |
| 1192 | | | | | Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates! | | | | | | | |
| 1193 | | | | | | | | | | | | |
| 1194 | | | | | It is suggested to collect at least 8 to 10 observations using these statistical methods! | | | | | | | |
| 1195 | | | | | If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results. | | | | | | | |
| 1196 | | | | | | | | | | | | |
| 1197 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 1198 | Warning: There are only 7 Values in this data | | | | | | | | | | | |
| 1199 | Note: It should be noted that even though bootstrap methods may be performed on this data set, | | | | | | | | | | | |
| 1200 | the resulting calculations may not be reliable enough to draw conclusions | | | | | | | | | | | |
| 1201 | | | | | | | | | | | | |
| 1202 | The literature suggests to use bootstrap methods on data sets having more than 10-15 observations. | | | | | | | | | | | |
| 1203 | | | | | | | | | | | | |
| 1204 | Relevant UCL Statistics | | | | | | | | | | | |
| 1205 | Normal Distribution Test | | | | | | Lognormal Distribution Test | | | | | |
| 1206 | | | Shapiro Wilk Test Statistic | 0.928 | | | | | Shapiro Wilk Test Statistic | | | 0.935 |
| 1207 | | | Shapiro Wilk Critical Value | 0.803 | | | | | Shapiro Wilk Critical Value | | | 0.803 |
| 1208 | Data appear Normal at 5% Significance Level | | | | | | Data appear Lognormal at 5% Significance Level | | | | | |
| 1209 | | | | | | | | | | | | |
| 1210 | Assuming Normal Distribution | | | | | | Assuming Lognormal Distribution | | | | | |
| 1211 | | | 95% Student's-t UCL | 76.36 | | | | | 95% H-UCL | | | 83.67 |
| 1212 | 95% UCLs (Adjusted for Skewness) | | | | | | | | 95% Chebyshev (MVUE) UCL | | | 94.7 |
| 1213 | | | 95% Adjusted-CLT UCL (Chen-1995) | 75.46 | | | | | 97.5% Chebyshev (MVUE) UCL | | | 109 |
| 1214 | | | 95% Modified-t UCL (Johnson-1978) | 76.57 | | | | | 99% Chebyshev (MVUE) UCL | | | 137 |
| 1215 | | | | | | | | | | | | |
| 1216 | Gamma Distribution Test | | | | | | Data Distribution | | | | | |
| 1217 | | | k star (bias corrected) | 6.558 | | | Data appear Normal at 5% Significance Level | | | | | |
| 1218 | | | Theta Star | 9.41 | | | | | | | | |
| 1219 | | | MLE of Mean | 61.71 | | | | | | | | |
| 1220 | | | MLE of Standard Deviation | 24.1 | | | | | | | | |
| 1221 | | | nu star | 91.82 | | | | | | | | |
| 1222 | | | Approximate Chi Square Value (.05) | 70.72 | | | Nonparametric Statistics | | | | | |
| 1223 | | | Adjusted Level of Significance | 0.0158 | | | | | 95% CLT UCL | | | 74.11 |
| 1224 | | | Adjusted Chi Square Value | 65.15 | | | | | 95% Jackknife UCL | | | 76.36 |
| 1225 | | | | | | | | | 95% Standard Bootstrap UCL | | | 73.15 |
| 1226 | | | Anderson-Darling Test Statistic | 0.29 | | | | | 95% Bootstrap-t UCL | | | 79.54 |
| 1227 | | | Anderson-Darling 5% Critical Value | 0.708 | | | | | 95% Hall's Bootstrap UCL | | | 73.4 |
| 1228 | | | Kolmogorov-Smirnov Test Statistic | 0.178 | | | | | 95% Percentile Bootstrap UCL | | | 73.44 |
| 1229 | | | Kolmogorov-Smirnov 5% Critical Value | 0.312 | | | | | 95% BCA Bootstrap UCL | | | 74.13 |
| 1230 | Data appear Gamma Distributed at 5% Significance Level | | | | | | | | 95% Chebyshev(Mean, Sd) UCL | | | 94.57 |
| 1231 | | | | | | | | | 97.5% Chebyshev(Mean, Sd) UCL | | | 108.8 |
| 1232 | Assuming Gamma Distribution | | | | | | | | 99% Chebyshev(Mean, Sd) UCL | | | 136.7 |
| 1233 | | | 95% Approximate Gamma UCL | 80.12 | | | | | | | | |
| 1234 | | | 95% Adjusted Gamma UCL | 86.97 | | | | | | | | |
| 1235 | | | | | | | | | | | | |
| 1236 | Potential UCL to Use | | | | | | | | Use 95% Student's-t UCL | | | 76.36 |
| 1237 | | | | | | | | | | | | |
| 1238 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 1239 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 1240 | and Singh and Singh (2003). For additional insight, the user may want to consult a statistician. | | | | | | | | | | | |
| 1241 | | | | | | | | | | | | |
| 1242 | | | | | | | | | | | | |
| 1243 | Zinc | | | | | | | | | | | |
| 1244 | | | | | | | | | | | | |
| 1245 | General Statistics | | | | | | | | | | | |
| 1246 | | | Number of Valid Observations | 49 | | | Number of Distinct Observations | 48 | | | | |
| 1247 | | | | | | | | | | | | |
| 1248 | Raw Statistics | | | | | | Log-transformed Statistics | | | | | |
| 1249 | | | Minimum | 26.1 | | | Minimum of Log Data | 3.262 | | | | |
| 1250 | | | Maximum | 71.9 | | | Maximum of Log Data | 4.275 | | | | |
| 1251 | | | Mean | 50.56 | | | Mean of log Data | 3.903 | | | | |
| 1252 | | | Median | 52.2 | | | SD of log Data | 0.207 | | | | |
| 1253 | | | SD | 9.674 | | | | | | | | |
| 1254 | | | Std. Error of Mean | 1.382 | | | | | | | | |
| 1255 | | | Coefficient of Variation | 0.191 | | | | | | | | |
| 1256 | | | Skewness | -0.375 | | | | | | | | |
| 1257 | | | | | | | | | | | | |
| 1258 | Relevant UCL Statistics | | | | | | | | | | | |
| 1259 | Normal Distribution Test | | | | | | Lognormal Distribution Test | | | | | |
| 1260 | | | Shapiro Wilk Test Statistic | 0.97 | | | Shapiro Wilk Test Statistic | 0.935 | | | | |
| 1261 | | | Shapiro Wilk Critical Value | 0.947 | | | Shapiro Wilk Critical Value | 0.947 | | | | |
| 1262 | Data appear Normal at 5% Significance Level | | | | | | Data not Lognormal at 5% Significance Level | | | | | |
| 1263 | | | | | | | | | | | | |
| 1264 | Assuming Normal Distribution | | | | | | Assuming Lognormal Distribution | | | | | |
| 1265 | | | 95% Student's-t UCL | 52.88 | | | 95% H-UCL | 53.46 | | | | |
| 1266 | 95% UCLs (Adjusted for Skewness) | | | | | | 95% Chebyshev (MVUE) UCL | 57.22 | | | | |
| 1267 | | | 95% Adjusted-CLT UCL (Chen-1995) | 52.75 | | | 97.5% Chebyshev (MVUE) UCL | 60.07 | | | | |
| 1268 | | | 95% Modified-t UCL (Johnson-1978) | 52.86 | | | 99% Chebyshev (MVUE) UCL | 65.68 | | | | |
| 1269 | | | | | | | | | | | | |
| 1270 | Gamma Distribution Test | | | | | | Data Distribution | | | | | |
| 1271 | | | k star (bias corrected) | 23.81 | | | Data appear Normal at 5% Significance Level | | | | | |
| 1272 | | | Theta Star | 2.123 | | | | | | | | |
| 1273 | | | MLE of Mean | 50.56 | | | | | | | | |
| 1274 | | | MLE of Standard Deviation | 10.36 | | | | | | | | |
| 1275 | | | nu star | 2333 | | | | | | | | |
| 1276 | | | Approximate Chi Square Value (.05) | 2222 | | | Nonparametric Statistics | | | | | |
| 1277 | | | Adjusted Level of Significance | 0.0451 | | | 95% CLT UCL | 52.83 | | | | |
| 1278 | | | Adjusted Chi Square Value | 2219 | | | 95% Jackknife UCL | 52.88 | | | | |
| 1279 | | | | | | | 95% Standard Bootstrap UCL | 52.81 | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Data Sets with Non-Detects | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 1280 | | | | | | Anderson-Darling Test Statistic | 1.005 | | | 95% Bootstrap-t UCL | | 52.69 |
| 1281 | | | | | | Anderson-Darling 5% Critical Value | 0.748 | | | 95% Hall's Bootstrap UCL | | 52.79 |
| 1282 | | | | | | Kolmogorov-Smirnov Test Statistic | 0.121 | | | 95% Percentile Bootstrap UCL | | 52.76 |
| 1283 | | | | | | Kolmogorov-Smirnov 5% Critical Value | 0.126 | | | 95% BCA Bootstrap UCL | | 52.61 |
| 1284 | | | | Data follow Appr. Gamma Distribution at 5% Significance Level | | | | | | 95% Chebyshev(Mean, Sd) UCL | | 56.58 |
| 1285 | | | | | | | | | | 97.5% Chebyshev(Mean, Sd) UCL | | 59.19 |
| 1286 | | | | Assuming Gamma Distribution | | | | | | 99% Chebyshev(Mean, Sd) UCL | | 64.31 |
| 1287 | | | | | | 95% Approximate Gamma UCL | 53.09 | | | | | |
| 1288 | | | | | | 95% Adjusted Gamma UCL | 53.17 | | | | | |
| 1289 | | | | | | | | | | | | |
| 1290 | | | | Potential UCL to Use | | | | | | Use 95% Student's-t UCL | | 52.88 |
| 1291 | | | | | | | | | | | | |
| 1292 | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | |
| 1293 | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | |
| 1294 | | | | and Singh and Singh (2003). For additional insight, the user may want to consult a statistician. | | | | | | | | |
| 1295 | | | | | | | | | | | | |
| 1296 | | | | Note: For highly negative-skewed data, confidence limits | | | | | | | | |
| 1297 | | | | (e.g., Chen, Johnson, Lognormal, and Gamma) may not be | | | | | | | | |
| 1298 | | | | reliable. Chen's and Johnson's methods provide | | | | | | | | |
| 1299 | | | | adjustments for positvely skewed data sets. | | | | | | | | |
| 1300 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | **General Statistics on Uncensored Data** | | | | | | | | |
| 2 | | Date/Time of Computation | | 5/18/2016 3:13:44 PM | | | | | | | | |
| 3 | | **User Selected Options** | | | | | | | | | | |
| 4 | | From File | | WB_Metals_Input.xls | | | | | | | | |
| 5 | | Full Precision | | OFF | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | **From File: WB_Metals_Input.xls** | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 9 | **General Statistics for Censored Data Set (with NDs) using Kaplan Meier Method** | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 11 | **Variable** | | **NumObs** | **# Missing** | **Num Ds** | **NumNDs** | **% NDs** | **Min ND** | **Max ND** | **KM Mean** | **KM Var** | **KM SD** |
| 12 | Copper | | 18 | 0 | 18 | 0 | 0.00% | N/A | N/A | 49.12 | 9626 | 98.11 |
| 13 | Nickel | | 18 | 0 | 18 | 0 | 0.00% | N/A | N/A | 9.624 | 4.212 | 2.052 |
| 14 | Sulfur | | 16 | 0 | 10 | 6 | 37.50% | 100 | 500 | 927.2 | 1488423 | 1220 |
| 15 | Zinc | | 18 | 0 | 18 | 0 | 0.00% | N/A | N/A | 57.64 | 147.9 | 12.16 |
| 16 | | | | | | | | | | | | |
| 17 | **General Statistics for Raw Data Sets using Detected Data Only** | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | **Variable** | | **NumObs** | **# Missing** | **Minimum** | **Maximum** | **Mean** | **Median** | **Var** | **SD** | **MAD/0.675** | **Skewness** |
| 20 | Copper | | 18 | 0 | 14.9 | 441 | 49.12 | 25.05 | 9626 | 98.11 | 6.301 | 4.198 |
| 21 | Nickel | | 18 | 0 | 7.2 | 13.8 | 9.624 | 9.205 | 4.212 | 2.052 | 1.905 | 0.821 |
| 22 | Sulfur | | 10 | 0 | 240 | 5150 | 1341 | 900 | 2129699 | 1459 | 800.6 | 2.308 |
| 23 | Zinc | | 18 | 0 | 35.5 | 80 | 57.64 | 59.4 | 147.9 | 12.16 | 9.711 | -0.152 |
| 24 | | | | | | | | | | | | |
| 25 | **Percentiles using all Detects (Ds) and Non-Detects (NDs)** | | | | | | | | | | | |
| 26 | | | | | | | | | | | | |
| 27 | **Variable** | | **NumObs** | **# Missing** | **10%ile** | **20%ile** | **25%ile(Q1)** | **50%ile(Q2)** | **75%ile(Q3)** | **80%ile** | **90%ile** | **95%ile** |
| 28 | Copper | | 18 | 0 | 18.03 | 20.54 | 22.28 | 25.05 | 30.85 | 32.28 | 41.28 | 106.4 |
| 29 | Nickel | | 18 | 0 | 7.523 | 7.884 | 8.108 | 9.205 | 10.85 | 11.28 | 12.81 | 13.38 |
| 30 | Sulfur | | 16 | 0 | 290 | 380 | 470 | 500 | 1150 | 1300 | 1800 | 2788 |
| 31 | Zinc | | 18 | 0 | 40.9 | 50.4 | 52.25 | 59.4 | 63.73 | 64.38 | 73.4 | 76.18 |

| | M |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | **KM CV** |
| 12 | 1.997 |
| 13 | 0.213 |
| 14 | 1.316 |
| 15 | 0.211 |
| 16 | |
| 17 | |
| 18 | |
| 19 | **CV** |
| 20 | 1.997 |
| 21 | 0.213 |
| 22 | 1.088 |
| 23 | 0.211 |
| 24 | |
| 25 | |
| 26 | |
| 27 | **99%ile** |
| 28 | 374.1 |
| 29 | 13.72 |
| 30 | 4678 |
| 31 | 79.24 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | General UCL Statistics for Full Data Sets | | | | | | | | |
| 2 | | | User Selected Options | | | | | | | | | |
| 3 | | | From File | INPUT.wst | | | | | | | | |
| 4 | | | Full Precision | OFF | | | | | | | | |
| 5 | | | Confidence Coefficient | 95% | | | | | | | | |
| 6 | | | Number of Bootstrap Operations | 2000 | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 9 | Copper | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 11 | | | | | | General Statistics | | | | | | |
| 12 | | | | | | Number of Valid Observations | 18 | | | | Number of Distinct Observations | 18 |
| 13 | | | | | | | | | | | | |
| 14 | | | | | | Raw Statistics | | | | | Log-transformed Statistics | |
| 15 | | | | | | Minimum | 14.9 | | | | Minimum of Log Data | 2.701 |
| 16 | | | | | | Maximum | 441 | | | | Maximum of Log Data | 6.089 |
| 17 | | | | | | Mean | 49.27 | | | | Mean of log Data | 3.393 |
| 18 | | | | | | Median | 25.8 | | | | SD of log Data | 0.721 |
| 19 | | | | | | SD | 97.99 | | | | | |
| 20 | | | | | | Std. Error of Mean | 23.1 | | | | | |
| 21 | | | | | | Coefficient of Variation | 1.989 | | | | | |
| 22 | | | | | | Skewness | 4.209 | | | | | |
| 23 | | | | | | | | | | | | |
| 24 | | | | | | Relevant UCL Statistics | | | | | | |
| 25 | | | | | | Normal Distribution Test | | | | | Lognormal Distribution Test | |
| 26 | | | | | | Shapiro Wilk Test Statistic | 0.312 | | | | Shapiro Wilk Test Statistic | 0.601 |
| 27 | | | | | | Shapiro Wilk Critical Value | 0.897 | | | | Shapiro Wilk Critical Value | 0.897 |
| 28 | | | | | | Data not Normal at 5% Significance Level | | | | | Data not Lognormal at 5% Significance Level | |
| 29 | | | | | | | | | | | | |
| 30 | | | | | | Assuming Normal Distribution | | | | | Assuming Lognormal Distribution | |
| 31 | | | | | | 95% Student's-t UCL | 89.45 | | | | 95% H-UCL | 57.29 |
| 32 | | | | | | 95% UCLs (Adjusted for Skewness) | | | | | 95% Chebyshev (MVUE) UCL | 67.82 |
| 33 | | | | | | 95% Adjusted-CLT UCL (Chen-1995) | 111.7 | | | | 97.5% Chebyshev (MVUE) UCL | 80.76 |
| 34 | | | | | | 95% Modified-t UCL (Johnson-1978) | 93.27 | | | | 99% Chebyshev (MVUE) UCL | 106.2 |
| 35 | | | | | | | | | | | | |
| 36 | | | | | | Gamma Distribution Test | | | | | Data Distribution | |
| 37 | | | | | | k star (bias corrected) | 0.977 | | | | Data do not follow a Discernable Distribution (0.05) | |
| 38 | | | | | | Theta Star | 50.43 | | | | | |
| 39 | | | | | | MLE of Mean | 49.27 | | | | | |
| 40 | | | | | | MLE of Standard Deviation | 49.85 | | | | | |
| 41 | | | | | | nu star | 35.18 | | | | | |
| 42 | | | | | | Approximate Chi Square Value (.05) | 22.61 | | | | Nonparametric Statistics | |
| 43 | | | | | | Adjusted Level of Significance | 0.0357 | | | | 95% CLT UCL | 87.26 |
| 44 | | | | | | Adjusted Chi Square Value | 21.64 | | | | 95% Jackknife UCL | 89.45 |
| 45 | | | | | | | | | | | 95% Standard Bootstrap UCL | 85.21 |
| 46 | | | | | | Anderson-Darling Test Statistic | 3.938 | | | | 95% Bootstrap-t UCL | 483.4 |
| 47 | | | | | | Anderson-Darling 5% Critical Value | 0.764 | | | | 95% Hall's Bootstrap UCL | 282.8 |
| 48 | | | | | | Kolmogorov-Smirnov Test Statistic | 0.397 | | | | 95% Percentile Bootstrap UCL | 95.51 |
| 49 | | | | | | Kolmogorov-Smirnov 5% Critical Value | 0.209 | | | | 95% BCA Bootstrap UCL | 119.3 |
| 50 | | | | | | Data not Gamma Distributed at 5% Significance Level | | | | | 95% Chebyshev(Mean, Sd) UCL | 149.9 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | | | | | | | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 193.5 |
| 52 | | | | **Assuming Gamma Distribution** | | | | | | | 99% Chebyshev(Mean, Sd) UCL | 279.1 |
| 53 | | | | | 95% Approximate Gamma UCL | 76.67 | | | | | | |
| 54 | | | | | 95% Adjusted Gamma UCL | 80.09 | | | | | | |
| 55 | | | | | | | | | | | | |
| 56 | | | | **Potential UCL to Use** | | | | | | | Use 95% Chebyshev (Mean, Sd) UCL | 149.9 |
| 57 | | | | | | | | | | | | |
| 58 | **Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.** | | | | | | | | | | | |
| 59 | **These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)** | | | | | | | | | | | |
| 60 | **and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.** | | | | | | | | | | | |
| 61 | | | | | | | | | | | | |
| 62 | | | | | | | | | | | | |
| 63 | **Nickel** | | | | | | | | | | | |
| 64 | | | | | | | | | | | | |
| 65 | | | | | **General Statistics** | | | | | | | |
| 66 | | | | | Number of Valid Observations | 18 | | | | | Number of Distinct Observations | 17 |
| 67 | | | | | | | | | | | | |
| 68 | | | | **Raw Statistics** | | | | | | **Log-transformed Statistics** | | |
| 69 | | | | | Minimum | 7.2 | | | | | Minimum of Log Data | 1.974 |
| 70 | | | | | Maximum | 15.3 | | | | | Maximum of Log Data | 2.728 |
| 71 | | | | | Mean | 9.89 | | | | | Mean of log Data | 2.266 |
| 72 | | | | | Median | 9.3 | | | | | SD of log Data | 0.228 |
| 73 | | | | | SD | 2.386 | | | | | | |
| 74 | | | | | Std. Error of Mean | 0.562 | | | | | | |
| 75 | | | | | Coefficient of Variation | 0.241 | | | | | | |
| 76 | | | | | Skewness | 0.935 | | | | | | |
| 77 | | | | | | | | | | | | |
| 78 | | | | | **Relevant UCL Statistics** | | | | | | | |
| 79 | | | | **Normal Distribution Test** | | | | | | **Lognormal Distribution Test** | | |
| 80 | | | | | Shapiro Wilk Test Statistic | 0.9 | | | | | Shapiro Wilk Test Statistic | 0.933 |
| 81 | | | | | Shapiro Wilk Critical Value | 0.897 | | | | | Shapiro Wilk Critical Value | 0.897 |
| 82 | | | | **Data appear Normal at 5% Significance Level** | | | | | | **Data appear Lognormal at 5% Significance Level** | | |
| 83 | | | | | | | | | | | | |
| 84 | | | | **Assuming Normal Distribution** | | | | | | **Assuming Lognormal Distribution** | | |
| 85 | | | | | 95% Student's-t UCL | 10.87 | | | | | 95% H-UCL | 10.93 |
| 86 | | | | **95% UCLs (Adjusted for Skewness)** | | | | | | | 95% Chebyshev (MVUE) UCL | 12.21 |
| 87 | | | | | 95% Adjusted-CLT UCL (Chen-1995) | 10.95 | | | | | 97.5% Chebyshev (MVUE) UCL | 13.22 |
| 88 | | | | | 95% Modified-t UCL (Johnson-1978) | 10.89 | | | | | 99% Chebyshev (MVUE) UCL | 15.2 |
| 89 | | | | | | | | | | | | |
| 90 | | | | **Gamma Distribution Test** | | | | | | **Data Distribution** | | |
| 91 | | | | | k star (bias corrected) | 16.58 | | | | **Data appear Normal at 5% Significance Level** | | |
| 92 | | | | | Theta Star | 0.597 | | | | | | |
| 93 | | | | | MLE of Mean | 9.89 | | | | | | |
| 94 | | | | | MLE of Standard Deviation | 2.429 | | | | | | |
| 95 | | | | | nu star | 596.7 | | | | | | |
| 96 | | | | | Approximate Chi Square Value (.05) | 541.1 | | | | **Nonparametric Statistics** | | |
| 97 | | | | | Adjusted Level of Significance | 0.0357 | | | | | 95% CLT UCL | 10.81 |
| 98 | | | | | Adjusted Chi Square Value | 536 | | | | | 95% Jackknife UCL | 10.87 |
| 99 | | | | | | | | | | | 95% Standard Bootstrap UCL | 10.79 |
| 100 | | | | | Anderson-Darling Test Statistic | 0.509 | | | | | 95% Bootstrap-t UCL | 11.05 |

| | A–E | F | G–K | L |
|---|---|---|---|---|
| 101 | Anderson-Darling 5% Critical Value | 0.739 | 95% Hall's Bootstrap UCL | 10.98 |
| 102 | Kolmogorov-Smirnov Test Statistic | 0.157 | 95% Percentile Bootstrap UCL | 10.83 |
| 103 | Kolmogorov-Smirnov 5% Critical Value | 0.203 | 95% BCA Bootstrap UCL | 10.99 |
| 104 | **Data appear Gamma Distributed at 5% Significance Level** | | 95% Chebyshev(Mean, Sd) UCL | 12.34 |
| 105 | | | 97.5% Chebyshev(Mean, Sd) UCL | 13.4 |
| 106 | **Assuming Gamma Distribution** | | 99% Chebyshev(Mean, Sd) UCL | 15.48 |
| 107 | 95% Approximate Gamma UCL | 10.91 | | |
| 108 | 95% Adjusted Gamma UCL | 11.01 | | |
| 109 | | | | |
| 110 | **Potential UCL to Use** | | Use 95% Student's-t UCL | 10.87 |
| 111 | | | | |
| 112 | **Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.** | | | |
| 113 | **These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)** | | | |
| 114 | **and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.** | | | |
| 115 | | | | |
| 116 | | | | |
| 117 | **Zinc** | | | |
| 118 | | | | |
| 119 | **General Statistics** | | | |
| 120 | Number of Valid Observations | 18 | Number of Distinct Observations | 17 |
| 121 | | | | |
| 122 | **Raw Statistics** | | **Log-transformed Statistics** | |
| 123 | Minimum | 35.5 | Minimum of Log Data | 3.57 |
| 124 | Maximum | 80 | Maximum of Log Data | 4.382 |
| 125 | Mean | 57.41 | Mean of log Data | 4.027 |
| 126 | Median | 57.25 | SD of log Data | 0.226 |
| 127 | SD | 12.3 | | |
| 128 | Std. Error of Mean | 2.898 | | |
| 129 | Coefficient of Variation | 0.214 | | |
| 130 | Skewness | -0.0631 | | |
| 131 | | | | |
| 132 | **Relevant UCL Statistics** | | | |
| 133 | **Normal Distribution Test** | | **Lognormal Distribution Test** | |
| 134 | Shapiro Wilk Test Statistic | 0.974 | Shapiro Wilk Test Statistic | 0.949 |
| 135 | Shapiro Wilk Critical Value | 0.897 | Shapiro Wilk Critical Value | 0.897 |
| 136 | **Data appear Normal at 5% Significance Level** | | **Data appear Lognormal at 5% Significance Level** | |
| 137 | | | | |
| 138 | **Assuming Normal Distribution** | | **Assuming Lognormal Distribution** | |
| 139 | 95% Student's-t UCL | 62.45 | 95% H-UCL | 63.53 |
| 140 | **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 70.92 |
| 141 | 95% Adjusted-CLT UCL (Chen-1995) | 62.13 | 97.5% Chebyshev (MVUE) UCL | 76.74 |
| 142 | 95% Modified-t UCL (Johnson-1978) | 62.45 | 99% Chebyshev (MVUE) UCL | 88.17 |
| 143 | | | | |
| 144 | **Gamma Distribution Test** | | **Data Distribution** | |
| 145 | k star (bias corrected) | 18.16 | **Data appear Normal at 5% Significance Level** | |
| 146 | Theta Star | 3.161 | | |
| 147 | MLE of Mean | 57.41 | | |
| 148 | MLE of Standard Deviation | 13.47 | | |
| 149 | nu star | 653.9 | | |
| 150 | Approximate Chi Square Value (.05) | 595.6 | **Nonparametric Statistics** | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 151 | | | | | Adjusted Level of Significance | 0.0357 | | | | | 95% CLT UCL | 62.18 |
| 152 | | | | | Adjusted Chi Square Value | 590.2 | | | | | 95% Jackknife UCL | 62.45 |
| 153 | | | | | | | | | | | 95% Standard Bootstrap UCL | 62.04 |
| 154 | | | | | Anderson-Darling Test Statistic | 0.275 | | | | | 95% Bootstrap-t UCL | 62.57 |
| 155 | | | | | Anderson-Darling 5% Critical Value | 0.739 | | | | | 95% Hall's Bootstrap UCL | 62.47 |
| 156 | | | | | Kolmogorov-Smirnov Test Statistic | 0.135 | | | | | 95% Percentile Bootstrap UCL | 62.05 |
| 157 | | | | | Kolmogorov-Smirnov 5% Critical Value | 0.203 | | | | | 95% BCA Bootstrap UCL | 61.84 |
| 158 | | | **Data appear Gamma Distributed at 5% Significance Level** | | | | | | | | 95% Chebyshev(Mean, Sd) UCL | 70.04 |
| 159 | | | | | | | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 75.51 |
| 160 | | | **Assuming Gamma Distribution** | | | | | | | | 99% Chebyshev(Mean, Sd) UCL | 86.25 |
| 161 | | | | | 95% Approximate Gamma UCL | 63.03 | | | | | | |
| 162 | | | | | 95% Adjusted Gamma UCL | 63.6 | | | | | | |
| 163 | | | | | | | | | | | | |
| 164 | | | **Potential UCL to Use** | | | | | | | | Use 95% Student's-t UCL | 62.45 |
| 165 | | | | | | | | | | | | |
| 166 | | | | | **Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.** | | | | | | | |
| 167 | | | | | **These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)** | | | | | | | |
| 168 | | | | | **and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.** | | | | | | | |
| 169 | | | | | | | | | | | | |
| 170 | | | | | **Note: For highly negative-skewed data, confidence limits** | | | | | | | |
| 171 | | | | | **(e.g., Chen, Johnson, Lognormal, and Gamma) may not be** | | | | | | | |
| 172 | | | | | **reliable. Chen's and Johnson's methods provide** | | | | | | | |
| 173 | | | | | **adjustments for positvely skewed data sets.** | | | | | | | |
| 174 | | | | | | | | | | | | |