APPENDIX 6G

DERIVATION OF ALLOWABLE DAILY INTAKE

Sodium

The recommended intake of sodium is 2,300 mg/day, according to some authorities (Luft, 1990). This number was rounded to 2,000 and divided by 10 to insure to add a ten-fold measure of safety since no official RDA was available. Back calculations were then done as follows to determine acceptable daily intakes in water, soil, and fish, using 2 l/day as the ingestion rate of water, 200 mg/kg as the soil ingestion rate (for a child) (USEPA, 1989), and 16 g/day as the fish consumption rate (for a child) (USEPA, 1994).

Water:

$$X \text{ mg/l} * 2 \text{ l/day} = 200 \text{ mg/day}$$

$$X = 100 \text{ mg/l } (100{,}000 \ \mu\text{g/l})$$

Soil:

$$X \text{ mg/kg} * 200 \text{ mg/day} * \text{kg}/10^6\text{mg} = 200 \text{ mg/day}$$

$$X = 1{,}000{,}000 \text{ mg/kg soil}$$

Fish:

$$X \text{ mg/kg} * 16{,}000 \text{ mg/day} * \text{kg}/10^6\text{mg} = 200 \text{ mg/day}$$

$$X = 12{,}500 \text{ mg/kg fish}$$

Calcium

The recommended daily allowance of calcium is 800 mg/day for adults (NRC, 1989). This number was selected as acceptable and back calculations done as follows to determine acceptable daily intakes in water, soil, and fish, using 2 l/day as the ingestion rate of water, 200 mg/kg as the soil ingestion rate (for a child) (USEPA, 1989), and 16 g/day as the fish consumption rate (for a child) (USEPA, 1994).

Water:

$$X \text{ mg/l} * 2 \text{ l/day} = 800 \text{ mg/day}$$

$$X = 400 \text{ mg/l } (400{,}000 \ \mu\text{g/l})$$

Soil:

$$X \text{ mg/kg} * 200 \text{ mg/day} * \text{kg}/10^6 \text{ mg} = 800 \text{ mg/day}$$

$$X = 4{,}000{,}000 \text{ mg/kg soil}$$

Fish:

$$X \text{ mg/kg} * 16{,}000 \text{ mg/day} * \text{kg}/10^6 \text{ mg} = 800 \text{ mg/day}$$

$$X = 50{,}000 \text{ mg/kg fish}$$

Magnesium

Average daily magnesium intake in the United States reportedly ranges from 230 to 310 mg/kg (Shils, 1990). Therefore, 230 mg/kg was chosen as the acceptable level and that number divided by 10 to insure to add a ten-fold measure of safety since no official RDA was available. Back calculations were done as follows to determine acceptable daily intakes in water, soil, and fish, using 2 l/day as the ingestion rate of water, 200 mg/kg as the soil ingestion rate (for a child) (USEPA, 1989), and 16 g/day as the fish consumption rate (for a child) (USEPA, 1994).

Water:

$$\frac{X \text{ mg/l} * 2 \text{ l/day}}{70 \text{ kg}} = 23 \text{ mg/kg/day}$$

$$X = 805 \text{ mg/l } (805{,}000 \ \mu\text{g/l})$$

Soil:

$$\frac{X \text{ mg/kg} * 200 \text{ mg/day} * \text{kg}/10^6 \text{ mg}}{70 \text{ kg}} = 23 \text{ mg/kg/day}$$

$$X = 8{,}050{,}000 \text{ mg/kg soil}$$

Fish:

$$\frac{X \text{ mg/kg} * 16{,}000 \text{ mg/day} * \text{kg}/10^6 \text{ mg}}{70 \text{ kg}} = 23 \text{ mg/kg/day}$$

$$X = 100{,}630 \text{ mg/kg fish}$$

Potassium

The NRC has determined that the estimated adequate and safe intake level for potassium is between 1,875 and 5,600 mg/day (NRC, 1989). However, acute poisoning in children has been observed at levels as low as 2,000 mg/day (NRC, 1980). Therefore, 2,000 mg/day was chosen as the acceptable level and that number divided by 10 to insure to add a ten-fold measure of safety since no official RDA was available. Back calculations were done as follows to determine acceptable daily intakes in water, soil, and fish, using 2 l/day as the ingestion rate of water, 200 mg/kg as the soil ingestion rate (for a child) (USEPA, 1989), and 16 g/day as the fish consumption rate (for a child) (USEPA, 1994).

<u>Water:</u>

$$X \text{ mg/l} * 2 \text{ l/day} = 200 \text{ mg/day}$$

$$X = 100 \text{ mg/l } (100{,}000 \ \mu\text{g/l})$$

<u>Soil:</u>

$$X \text{ mg/kg} * 200 \text{ mg/day} * \text{kg}/10^6 \text{ mg} = 200 \text{ mg/day}$$

$$X = 1{,}000{,}000 \text{ mg/kg soil}$$

Fish:

$$X \text{ mg/kg} * 16{,}000 \text{ mg/day} * \text{kg}/10^6 \text{ mg} = 200 \text{ mg/day}$$

$$X = 12{,}500 \text{ mg/kg fish}$$

REFERENCES

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APPENDIX 6H

UCL SUPPORTING DOCUMENTATION

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\SW-02-base-cf-121304.xls	
Variable:	Trichloroethene	
Raw Statistics		
Number of Observations	3	
Number of Missing Data	0	
Number of Valid Observations	3	
Constant Data	1	
Minimum	2	
Maximum	2	
Mean	2	
Standard Deviation	0	
Variance	0	
Coefficient of Variation	0	
Skewness	0	Data not skewed
Too Few Distinct Observations?	YES	Too Few Observations To Calculate UCLs
Normal Statistics		
Lilliefors Test Statisitic	N/A	Too Few Distinct Observations To Calculate
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic		
Shapiro-Wilk 5% Critical Value		
5% Normality Test Result		
95% Student's-t UCL	N/A	Too Few Observations To Calculate UCLs
Gamma Statistics		
k hat	N/A	
k star (bias corrected)	N/A	
Theta hat	N/A	
Theta star	N/A	
nu hat	N/A	
nu star	N/A	
5% Approximate Chi Square Value	N/A	
Adjusted Level of Significance	0	
Adjusted Chi Square Value	0	
Anderson-Darling Test Statistic	N/A	
Anderson-Darling 5% Critical Value	N/A	
Anderson-Darling 5% Gamma Test Result	N/A	
Kolmogrov-Smirnov Test Statistic	N/A	
Kolmogrov-Smirnov 5% Critical Value	N/A	
Kolmogrov-Smirnov 5% Gamma Test Result	N/A	
5% Gamma Test Result	N/A	
95% Approximate Gamma UCL	N/A	Too Few Observations To Calculate UCLs
95% Adjusted Gamma UCL	N/A	Too Few Observations To Calculate UCLs
Lognormal Statistics		
Minimum of log data	0.693147	
Maximum of log data	0.693147	
Mean of log data	0.693147	
Standard Deviation of log data	0	
Variance of log data	0	
Lilliefors Test Statisitic	N/A	Too Few Distinct Observations To Calculate UCLs
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic		
Shapiro-Wilk 5% Critical Value		
5% Lognormality Test Result		
MLE Mean	2	
MLE Standard Deviation	0	
MLE Coefficient of Variation	-1	
MLE Skewness	0	
MLE Median	2	
MLE 80% Quantile	2	
MLE 90% Quantile	2	
MLE 95% Quantile	2	
MLE 99% Quantile	2	
MVU Estimate of Median	2	
MVU Estimate of Mean	2	
MVU Estimate of Standard Deviation	0	
MVU Estimate of SE of Mean	0	
95% H-UCL	N/A	Too Few Observations To Calculate UCLs
95% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
97.5% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
99% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
Non-parametric Statisitics		
95% CLT UCL	N/A	Too Few Observations To Calculate UCLs
95% Adjusted-CLT UCL	N/A	Too Few Observations To Calculate UCLs
95% Modified-t UCL	N/A	Too Few Observations To Calculate UCLs
95% Jackknife UCL	N/A	Too Few Observations To Calculate UCLs
95% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
97.5% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
99% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% Bootstrap-t UCL	N/A	Too Few Observations To Calculate UCLs
95% Hall's Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% Percentile Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% BCA Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution		
1st Recommended UCL	N/A	Too Few Observations To Calculate UCLs
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!		
Alternative UCL		

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\SW-02-base-cf-121304.xls	
Variable:	Antimony	
Raw Statistics		
Number of Observations	15	
Number of Missing Data	0	
Number of Valid Observations	15	
Number of Distinct Observations	11	
Minimum	0.8	
Maximum	13.7	
Mean	3.81	
Standard Deviation	4.220071	
Variance	17.809	
Coefficient of Variation	1.10763	
Skewness	1.369525	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.716532	
Shapiro-Wilk 5% Critical Value	0.881	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	5.729155	
Gamma Statistics		
k hat	1.108873	
k star (bias corrected)	0.931543	
Theta hat	3.435921	
Theta star	4.08999	
nu hat	33.26619	
nu star	27.94628	
5% Approximate Chi Square Value	16.88432	
Adjusted Level of Significance	0.03235	
Adjusted Chi Square Value	15.83167	
Anderson-Darling Test Statistic	1.337354	
Anderson-Darling 5% Critical Value	0.761018	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.24338	
Kolmogrov-Smirnov 5% Critical Value	0.227395	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	6.306167	
95% Adjusted Gamma UCL	6.725463	
Lognormal Statistics		
Minimum of log data	-0.223144	
Maximum of log data	2.617396	
Mean of log data	0.823175	
Standard Deviation of log data	1.00744	
Variance of log data	1.014935	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.845226	
Shapiro-Wilk 5% Critical Value	0.881	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	3.783472	
MLE Standard Deviation	5.018178	
MLE Coefficient of Variation	1.326342	
MLE Skewness	6.312304	
MLE Median	2.27772	
MLE 80% Quantile	5.33592	
MLE 90% Quantile	8.312288	
MLE 95% Quantile	11.9462	
MLE 99% Quantile	23.72382	
MVU Estimate of Median	2.201793	
MVU Estimate of Mean	3.609946	
MVU Estimate of Standard Deviation	4.11136	
MVU Estimate of SE of Mean	1.026878	
95% H-UCL	7.945815	
95% Chebyshev (MVUE) UCL	8.086002	
97.5% Chebyshev (MVUE) UCL	10.0228	
99% Chebyshev (MVUE) UCL	13.82725	
Non-parametric Statisitics		
95% CLT UCL	5.602262	
95% Adjusted-CLT UCL	6.01396	
95% Modified-t UCL	5.793371	
95% Jackknife UCL	5.729155	
95% Chebyshev (Mean, Sd) UCL	8.559533	
97.5% Chebyshev (Mean, Sd) UCL	10.61466	
99% Chebyshev (Mean, Sd) UCL	14.65156	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	5.53083	
95% Bootstrap-t UCL	6.150816	
95% Hall's Bootstrap UCL	5.446298	
95% Percentile Bootstrap UCL	5.716667	
95% BCA Bootstrap UCL	5.913333	
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	14.65156	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	YES	Cosider using 95% or 97.5% Chebyshev (Mean, Sd) UCL

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\SW-02-base-cf-121304.xls	
Variable:	Arsenic	
Raw Statistics		
Number of Observations	15	
Number of Missing Data	0	
Number of Valid Observations	15	
Number of Distinct Observations	15	
Minimum	6.8	
Maximum	32.7	
Mean	21.31333	
Standard Deviation	7.156003	
Variance	51.20838	
Coefficient of Variation	0.335752	
Skewness	-0.356141	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.978174	
Shapiro-Wilk 5% Critical Value	0.881	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	24.56766	
Gamma Statistics		
k hat	7.548095	
k star (bias corrected)	6.08292	
Theta hat	2.823671	
Theta star	3.5038	
nu hat	226.4428	
nu star	182.4876	
5% Approximate Chi Square Value	152.2351	
Adjusted Level of Significance	0.03235	
Adjusted Chi Square Value	148.8346	
Anderson-Darling Test Statistic	0.391047	
Anderson-Darling 5% Critical Value	0.737959	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.193875	
Kolmogrov-Smirnov 5% Critical Value	0.22179	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	25.54876	
95% Adjusted Gamma UCL	26.1325	
Lognormal Statistics		
Minimum of log data	1.916923	
Maximum of log data	3.487375	
Mean of log data	2.991631	
Standard Deviation of log data	0.411814	
Variance of log data	0.169591	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.894023	
Shapiro-Wilk 5% Critical Value	0.881	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	21.68078	
MLE Standard Deviation	9.320714	
MLE Coefficient of Variation	0.429907	
MLE Skewness	1.369175	
MLE Median	19.91814	
MLE 80% Quantile	28.20822	
MLE 90% Quantile	33.81186	
MLE 95% Quantile	39.21521	
MLE 99% Quantile	51.90992	
MVU Estimate of Median	19.80582	
MVU Estimate of Mean	21.55022	
MVU Estimate of Standard Deviation	9.071408	
MVU Estimate of SE of Mean	2.339341	
95% H-UCL	26.95713	
95% Chebyshev (MVUE) UCL	31.74717	
97.5% Chebyshev (MVUE) UCL	36.1594	
99% Chebyshev (MVUE) UCL	44.82637	
Non-parametric Statisitics		
95% CLT UCL	24.35248	
95% Adjusted-CLT UCL	24.17094	
95% Modified-t UCL	24.53934	
95% Jackknife UCL	24.56766	
95% Chebyshev (Mean, Sd) UCL	29.36715	
97.5% Chebyshev (Mean, Sd) UCL	32.85204	
99% Chebyshev (Mean, Sd) UCL	39.69744	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	24.242	
95% Bootstrap-t UCL	24.37809	
95% Hall's Bootstrap UCL	24.28166	
95% Percentile Bootstrap UCL	24.28667	
95% BCA Bootstrap UCL	23.94667	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	24.56766	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\SW-02-base-cf-121304.xls	
Variable:	Manganese	
Raw Statistics		
Number of Observations	15	
Number of Missing Data	0	
Number of Valid Observations	15	
Number of Distinct Observations	15	
Minimum	291	
Maximum	724	
Mean	474.2	
Standard Deviation	130.4833	
Variance	17025.89	
Coefficient of Variation	0.275165	
Skewness	0.210598	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.956599	
Shapiro-Wilk 5% Critical Value	0.881	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	533.5397	
Gamma Statistics		
k hat	13.83502	
k star (bias corrected)	11.11246	
Theta hat	34.27535	
Theta star	42.67283	
nu hat	415.0505	
nu star	333.3737	
5% Approximate Chi Square Value	292.0598	
Adjusted Level of Significance	0.03235	
Adjusted Chi Square Value	287.2997	
Anderson-Darling Test Statistic	0.30216	
Anderson-Darling 5% Critical Value	0.736343	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.122247	
Kolmogrov-Smirnov 5% Critical Value	0.221387	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	541.2789	
95% Adjusted Gamma UCL	550.2471	
Lognormal Statistics		
Minimum of log data	5.673323	
Maximum of log data	6.584791	
Mean of log data	6.125054	
Standard Deviation of log data	0.282979	
Variance of log data	0.080077	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.952167	
Shapiro-Wilk 5% Critical Value	0.881	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	475.8451	
MLE Standard Deviation	137.3953	
MLE Coefficient of Variation	0.28874	
MLE Skewness	0.890291	
MLE Median	457.1693	
MLE 80% Quantile	580.6633	
MLE 90% Quantile	657.6559	
MLE 95% Quantile	728.1843	
MLE 99% Quantile	882.945	
MVU Estimate of Median	455.9505	
MVU Estimate of Mean	474.5355	
MVU Estimate of Standard Deviation	135.6921	
MVU Estimate of SE of Mean	35.02557	
95% H-UCL	548.078	
95% Chebyshev (MVUE) UCL	627.2084	
97.5% Chebyshev (MVUE) UCL	693.2701	
99% Chebyshev (MVUE) UCL	823.0355	
Non-parametric Statisitics		
95% CLT UCL	529.6162	
95% Adjusted-CLT UCL	531.5737	
95% Modified-t UCL	533.845	
95% Jackknife UCL	533.5397	
95% Chebyshev (Mean, Sd) UCL	621.0541	
97.5% Chebyshev (Mean, Sd) UCL	684.598	
99% Chebyshev (Mean, Sd) UCL	809.4176	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	527.2988	
95% Bootstrap-t UCL	537.4455	
95% Hall's Bootstrap UCL	530.5915	
95% Percentile Bootstrap UCL	527.4	
95% BCA Bootstrap UCL	533.6667	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	533.5397	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\SW-02-base-cf-121304.xls	
Variable:	Thallium	
Raw Statistics		
Number of Observations	15	
Number of Missing Data	0	
Number of Valid Observations	15	
Number of Distinct Observations	10	
Minimum	0.6	
Maximum	5.4	
Mean	1.863333	
Standard Deviation	1.263423	
Variance	1.596238	
Coefficient of Variation	0.678045	
Skewness	1.600827	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.843548	
Shapiro-Wilk 5% Critical Value	0.881	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	2.437898	
Gamma Statistics		
k hat	2.70256	
k star (bias corrected)	2.206493	
Theta hat	0.68947	
Theta star	0.844477	
nu hat	81.07681	
nu star	66.19478	
5% Approximate Chi Square Value	48.46889	
Adjusted Level of Significance	0.03235	
Adjusted Chi Square Value	46.60452	
Anderson-Darling Test Statistic	0.382043	
Anderson-Darling 5% Critical Value	0.745203	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.169695	
Kolmogrov-Smirnov 5% Critical Value	0.223601	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	2.544786	
95% Adjusted Gamma UCL	2.646588	
Lognormal Statistics		
Minimum of log data	-0.510826	
Maximum of log data	1.686399	
Mean of log data	0.426095	
Standard Deviation of log data	0.652427	
Variance of log data	0.42566	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.941124	
Shapiro-Wilk 5% Critical Value	0.881	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	1.894444	
MLE Standard Deviation	1.379958	
MLE Coefficient of Variation	0.728424	
MLE Skewness	2.571773	
MLE Median	1.531266	
MLE 80% Quantile	2.657525	
MLE 90% Quantile	3.541191	
MLE 95% Quantile	4.478717	
MLE 99% Quantile	6.984122	
MVU Estimate of Median	1.509674	
MVU Estimate of Mean	1.863284	
MVU Estimate of Standard Deviation	1.28291	
MVU Estimate of SE of Mean	0.328913	
95% H-UCL	2.802154	
95% Chebyshev (MVUE) UCL	3.296982	
97.5% Chebyshev (MVUE) UCL	3.917344	
99% Chebyshev (MVUE) UCL	5.135926	
Non-parametric Statisitics		
95% CLT UCL	2.399908	
95% Adjusted-CLT UCL	2.543981	
95% Modified-t UCL	2.460371	
95% Jackknife UCL	2.437898	
95% Chebyshev (Mean, Sd) UCL	3.285269	
97.5% Chebyshev (Mean, Sd) UCL	3.900542	
99% Chebyshev (Mean, Sd) UCL	5.109126	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	2.391065	
95% Bootstrap-t UCL	2.651313	
95% Hall's Bootstrap UCL	3.013418	
95% Percentile Bootstrap UCL	2.426667	
95% BCA Bootstrap UCL	2.57	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	2.544786	95% Approximate Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\SW-02-base-cf-121304.xls	
Variable:	Vanadium	
Raw Statistics		
Number of Observations	15	
Number of Missing Data	0	
Number of Valid Observations	15	
Number of Distinct Observations	15	
Minimum	0.15	
Maximum	5.1	
Mean	1.474	
Standard Deviation	1.623728	
Variance	2.636494	
Coefficient of Variation	1.10158	
Skewness	1.580385	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.741035	
Shapiro-Wilk 5% Critical Value	0.881	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	2.21242	
Gamma Statistics		
k hat	1.116796	
k star (bias corrected)	0.937882	
Theta hat	1.319847	
Theta star	1.571627	
nu hat	33.50389	
nu star	28.13645	
5% Approximate Chi Square Value	17.03239	
Adjusted Level of Significance	0.03235	
Adjusted Chi Square Value	15.97465	
Anderson-Darling Test Statistic	0.57073	
Anderson-Darling 5% Critical Value	0.760872	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.172398	
Kolmogrov-Smirnov 5% Critical Value	0.227357	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	2.434956	
95% Adjusted Gamma UCL	2.596184	
Lognormal Statistics		
Minimum of log data	-1.89712	
Maximum of log data	1.629241	
Mean of log data	-0.122424	
Standard Deviation of log data	1.04608	
Variance of log data	1.094283	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.962062	
Shapiro-Wilk 5% Critical Value	0.881	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	1.529158	
MLE Standard Deviation	2.155538	
MLE Coefficient of Variation	1.409624	
MLE Skewness	7.029852	
MLE Median	0.884773	
MLE 80% Quantile	2.141514	
MLE 90% Quantile	3.393251	
MLE 95% Quantile	4.945001	
MLE 99% Quantile	10.08206	
MVU Estimate of Median	0.85301	
MVU Estimate of Mean	1.452181	
MVU Estimate of Standard Deviation	1.732546	
MVU Estimate of SE of Mean	0.430787	
95% H-UCL	3.361951	
95% Chebyshev (MVUE) UCL	3.329938	
97.5% Chebyshev (MVUE) UCL	4.142444	
99% Chebyshev (MVUE) UCL	5.738457	
Non-parametric Statisitics		
95% CLT UCL	2.163596	
95% Adjusted-CLT UCL	2.346392	
95% Modified-t UCL	2.240933	
95% Jackknife UCL	2.21242	
95% Chebyshev (Mean, Sd) UCL	3.301446	
97.5% Chebyshev (Mean, Sd) UCL	4.092183	
99% Chebyshev (Mean, Sd) UCL	5.645434	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	2.145038	
95% Bootstrap-t UCL	2.803271	
95% Hall's Bootstrap UCL	2.247447	
95% Percentile Bootstrap UCL	2.201	
95% BCA Bootstrap UCL	2.267333	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	2.434956	95% Approximate Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Arsenic
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	10	Shapiro-Wilk Test Statisitic	0.929374
Number of Unique Samples	10	Shapiro-Wilk 5% Critical Value	0.842
Minimum	6	Data are normal at 5% significance level	
Maximum	81.5		
Mean	38.48	95% UCL (Assuming Normal Distribution)	
Median	33.75	Student's-t UCL	53.71965
Standard Deviation	26.2897		
Variance	691.1484	Gamma Distribution Test	
Coefficient of Variation	0.683204	A-D Test Statistic	0.18213
Skewness	0.573063	A-D 5% Critical Value	0.735625
		K-S Test Statistic	0.109859
Gamma Statistics		K-S 5% Critical Value	0.269826
k hat	1.993803	Data follow gamma distribution	
k star (bias corrected)	1.462329	at 5% significance level	
Theta hat	19.2998		
Theta star	26.31419	95% UCLs (Assuming Gamma Distribution)	
nu hat	39.87606	Approximate Gamma UCL	62.8734
nu star	29.24657	Adjusted Gamma UCL	68.73348
Approx.Chi Square Value (.05)	17.89959		
Adjusted Level of Significance	0.0267	Lognormal Distribution Test	
Adjusted Chi Square Value	16.37351	Shapiro-Wilk Test Statisitic	0.943092
		Shapiro-Wilk 5% Critical Value	0.842
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	1.791759		
Maximum of log data	4.400603	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	3.378875	95% H-UCL	93.42545
Standard Deviation of log data	0.851074	95% Chebyshev (MVUE) UCL	89.44091
Variance of log data	0.724326	97.5% Chebyshev (MVUE) UCL	110.7146
		99% Chebyshev (MVUE) UCL	152.5025
		95% Non-parametric UCLs	
		CLT UCL	52.15455
		Adj-CLT UCL (Adjusted for skewness)	53.76433
		Mod-t UCL (Adjusted for skewness)	53.97074
		Jackknife UCL	53.71965
		Standard Bootstrap UCL	51.65738
		Bootstrap-t UCL	56.63025
RECOMMENDATION		Hall's Bootstrap UCL	57.06652
Data are normal (0.05)		Percentile Bootstrap UCL	51.65
		BCA Bootstrap UCL	49.53
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	74.71785
		97.5% Chebyshev (Mean, Sd) UCL	90.398
		99% Chebyshev (Mean, Sd) UCL	121.1986

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Cadmium
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	10	Shapiro-Wilk Test Statisitic	0.714982
Number of Unique Samples	8	Shapiro-Wilk 5% Critical Value	0.842
Minimum	0.2	Data not normal at 5% significance level	
Maximum	2.4		
Mean	0.652	95% UCL (Assuming Normal Distribution)	
Median	0.365	Student's-t UCL	1.055616
Standard Deviation	0.696273		
Variance	0.484796	Gamma Distribution Test	
Coefficient of Variation	1.067903	A-D Test Statistic	0.749925
Skewness	2.085349	A-D 5% Critical Value	0.740793
		K-S Test Statistic	0.264072
Gamma Statistics		K-S 5% Critical Value	0.271575
k hat	1.413545	Data follow approximate gamma distibution	
k star (bias corrected)	1.056148	at 5% significance level	
Theta hat	0.461252		
Theta star	0.617338	95% UCLs (Assuming Gamma Distribution)	
nu hat	28.2709	Approximate Gamma UCL	1.178969
nu star	21.12297	Adjusted Gamma UCL	1.314036
Approx.Chi Square Value (.05)	11.68154		
Adjusted Level of Significance	0.0267	Lognormal Distribution Test	
Adjusted Chi Square Value	10.48082	Shapiro-Wilk Test Statisitic	0.852069
		Shapiro-Wilk 5% Critical Value	0.842
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	-1.609438		
Maximum of log data	0.875469	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-0.821397	95% H-UCL	1.525569
Standard Deviation of log data	0.886988	95% Chebyshev (MVUE) UCL	1.410411
Variance of log data	0.786747	97.5% Chebyshev (MVUE) UCL	1.752413
		99% Chebyshev (MVUE) UCL	2.424208
		95% Non-parametric UCLs	
		CLT UCL	1.014165
		Adj-CLT UCL (Adjusted for skewness)	1.16931
		Mod-t UCL (Adjusted for skewness)	1.079816
		Jackknife UCL	1.055616
		Standard Bootstrap UCL	0.986939
		Bootstrap-t UCL	1.694165
RECOMMENDATION		Hall's Bootstrap UCL	2.607404
Assuming gamma distribution (0.05)		Percentile Bootstrap UCL	1.021
		BCA Bootstrap UCL	0.992
Use Approximate Gamma UCL		95% Chebyshev (Mean, Sd) UCL	1.611746
		97.5% Chebyshev (Mean, Sd) UCL	2.027028
		99% Chebyshev (Mean, Sd) UCL	2.842771

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Manganese
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	10	Shapiro-Wilk Test Statisitic	0.866298
Number of Unique Samples	10	Shapiro-Wilk 5% Critical Value	0.842
Minimum	81.5	Data are normal at 5% significance level	
Maximum	570		
Mean	368.1	95% UCL (Assuming Normal Distribution)	
Median	364.75	Student's-t UCL	440.8164
Standard Deviation	125.4421		
Variance	15735.71	Gamma Distribution Test	
Coefficient of Variation	0.340783	A-D Test Statistic	1.179396
Skewness	-0.958728	A-D 5% Critical Value	0.728823
		K-S Test Statistic	0.354096
Gamma Statistics		K-S 5% Critical Value	0.267316
k hat	5.714308	Data do not follow gamma distribution	
k star (bias corrected)	4.066682	at 5% significance level	
Theta hat	64.41725		
Theta star	90.51605	95% UCLs (Assuming Gamma Distribution)	
nu hat	114.2862	Approximate Gamma UCL	486.4306
nu star	81.33364	Adjusted Gamma UCL	511.208
Approx.Chi Square Value (.05)	61.54817		
Adjusted Level of Significance	0.0267	Lognormal Distribution Test	
Adjusted Chi Square Value	58.56503	Shapiro-Wilk Test Statisitic	0.67012
		Shapiro-Wilk 5% Critical Value	0.842
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	4.400603		
Maximum of log data	6.345636	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	5.818311	95% H-UCL	574.3758
Standard Deviation of log data	0.526611	95% Chebyshev (MVUE) UCL	662.2648
Variance of log data	0.277319	97.5% Chebyshev (MVUE) UCL	784.1455
		99% Chebyshev (MVUE) UCL	1023.557
		95% Non-parametric UCLs	
		CLT UCL	433.3485
		Adj-CLT UCL (Adjusted for skewness)	420.498
		Mod-t UCL (Adjusted for skewness)	438.812
		Jackknife UCL	440.8164
		Standard Bootstrap UCL	427.7275
		Bootstrap-t UCL	431.2982
RECOMMENDATION		Hall's Bootstrap UCL	433.0326
Data are normal (0.05)		Percentile Bootstrap UCL	425.45
		BCA Bootstrap UCL	412.15
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	541.01
		97.5% Chebyshev (Mean, Sd) UCL	615.8282
		99% Chebyshev (Mean, Sd) UCL	762.7942

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Arsenic
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	10	Shapiro-Wilk Test Statisitic	0.949168
Number of Unique Samples	10	Shapiro-Wilk 5% Critical Value	0.842
Minimum	5.55	Data are normal at 5% significance level	
Maximum	34.8		
Mean	19.555	95% UCL (Assuming Normal Distribution)	
Median	18.2	Student's-t UCL	25.45378
Standard Deviation	10.17591		
Variance	103.5491	Gamma Distribution Test	
Coefficient of Variation	0.520374	A-D Test Statistic	0.253672
Skewness	0.172636	A-D 5% Critical Value	0.730886
		K-S Test Statistic	0.132652
Gamma Statistics		K-S 5% Critical Value	0.268158
k hat	3.463761	Data follow gamma distribution	
k star (bias corrected)	2.491299	at 5% significance level	
Theta hat	5.645598		
Theta star	7.849319	95% UCLs (Assuming Gamma Distribution)	
nu hat	69.27521	Approximate Gamma UCL	28.14709
nu star	49.82598	Adjusted Gamma UCL	30.04903
Approx.Chi Square Value (.05)	34.61626		
Adjusted Level of Significance	0.0267	Lognormal Distribution Test	
Adjusted Chi Square Value	32.42524	Shapiro-Wilk Test Statisitic	0.929052
		Shapiro-Wilk 5% Critical Value	0.842
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	1.713798		
Maximum of log data	3.549617	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	2.821989	95% H-UCL	33.40659
Standard Deviation of log data	0.619235	95% Chebyshev (MVUE) UCL	37.366
Variance of log data	0.383452	97.5% Chebyshev (MVUE) UCL	44.91314
		99% Chebyshev (MVUE) UCL	59.73804
		95% Non-parametric UCLs	
		CLT UCL	24.84798
		Adj-CLT UCL (Adjusted for skewness)	25.03569
		Mod-t UCL (Adjusted for skewness)	25.48306
		Jackknife UCL	25.45378
		Standard Bootstrap UCL	24.619
		Bootstrap-t UCL	25.80687
RECOMMENDATION		Hall's Bootstrap UCL	25.34977
Data are normal (0.05)		Percentile Bootstrap UCL	24.38
		BCA Bootstrap UCL	26.51
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	33.58152
		97.5% Chebyshev (Mean, Sd) UCL	39.65081
		99% Chebyshev (Mean, Sd) UCL	51.57275

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Manganese
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	10	Shapiro-Wilk Test Statisitic	0.970674
Number of Unique Samples	10	Shapiro-Wilk 5% Critical Value	0.842
Minimum	257	Data are normal at 5% significance level	
Maximum	670		
Mean	445.7	95% UCL (Assuming Normal Distribution)	
Median	436	Student's-t UCL	519.0082
Standard Deviation	126.463		
Variance	15992.9	Gamma Distribution Test	
Coefficient of Variation	0.28374	A-D Test Statistic	0.249745
Skewness	0.121382	A-D 5% Critical Value	0.724906
		K-S Test Statistic	0.152769
Gamma Statistics		K-S 5% Critical Value	0.266491
k hat	13.02772	Data follow gamma distribution	
k star (bias corrected)	9.186067	at 5% significance level	
Theta hat	34.21168		
Theta star	48.51913	95% UCLs (Assuming Gamma Distribution)	
nu hat	260.5543	Approximate Gamma UCL	533.9278
nu star	183.7213	Adjusted Gamma UCL	551.2539
Approx.Chi Square Value (.05)	153.3627		
Adjusted Level of Significance	0.0267	Lognormal Distribution Test	
Adjusted Chi Square Value	148.5425	Shapiro-Wilk Test Statisitic	0.947641
		Shapiro-Wilk 5% Critical Value	0.842
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	5.549076		
Maximum of log data	6.507278	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	6.060776	95% H-UCL	546.8526
Standard Deviation of log data	0.300662	95% Chebyshev (MVUE) UCL	632.7636
Variance of log data	0.090397	97.5% Chebyshev (MVUE) UCL	713.386
		99% Chebyshev (MVUE) UCL	871.753
		95% Non-parametric UCLs	
		CLT UCL	511.4795
		Adj-CLT UCL (Adjusted for skewness)	513.1197
		Mod-t UCL (Adjusted for skewness)	519.2641
		Jackknife UCL	519.0082
		Standard Bootstrap UCL	507.9167
		Bootstrap-t UCL	519.1714
RECOMMENDATION		Hall's Bootstrap UCL	522.5949
Data are normal (0.05)		Percentile Bootstrap UCL	507.4
		BCA Bootstrap UCL	526.7
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	620.0173
		97.5% Chebyshev (Mean, Sd) UCL	695.4445
		99% Chebyshev (Mean, Sd) UCL	843.6067

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Arsenic
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	6	Shapiro-Wilk Test Statisitic	0.86312
Number of Unique Samples	6	Shapiro-Wilk 5% Critical Value	0.788
Minimum	7.5	Data are normal at 5% significance level	
Maximum	28.4		
Mean	15.225	95% UCL (Assuming Normal Distribution)	
Median	12.125	Student's-t UCL	21.41592
Standard Deviation	7.525673		
Variance	56.63575	Gamma Distribution Test	
Coefficient of Variation	0.494297	A-D Test Statistic	0.416748
Skewness	1.267413	A-D 5% Critical Value	0.698081
		K-S Test Statistic	0.310318
Gamma Statistics		K-S 5% Critical Value	0.332755
k hat	5.558912	Data follow gamma distribution	
k star (bias corrected)	2.890567	at 5% significance level	
Theta hat	2.738845		
Theta star	5.267132	95% UCLs (Assuming Gamma Distribution)	
nu hat	66.70695	Approximate Gamma UCL	23.77593
nu star	34.68681	Adjusted Gamma UCL	28.24975
Approx.Chi Square Value (.05)	22.21181		
Adjusted Level of Significance	0.01222	Lognormal Distribution Test	
Adjusted Chi Square Value	18.69421	Shapiro-Wilk Test Statisitic	0.932103
		Shapiro-Wilk 5% Critical Value	0.788
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	2.014903		
Maximum of log data	3.346389	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	2.630305	95% H-UCL	26.54926
Standard Deviation of log data	0.463205	95% Chebyshev (MVUE) UCL	27.64156
Variance of log data	0.214559	97.5% Chebyshev (MVUE) UCL	33.04278
		99% Chebyshev (MVUE) UCL	43.65245
		95% Non-parametric UCLs	
		CLT UCL	20.27855
		Adj-CLT UCL (Adjusted for skewness)	21.97716
		Mod-t UCL (Adjusted for skewness)	21.68087
		Jackknife UCL	21.41592
		Standard Bootstrap UCL	19.82209
		Bootstrap-t UCL	31.34544
RECOMMENDATION		Hall's Bootstrap UCL	61.04667
Data are normal (0.05)		Percentile Bootstrap UCL	20.05
		BCA Bootstrap UCL	19.35
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	28.61703
		97.5% Chebyshev (Mean, Sd) UCL	34.41178
		99% Chebyshev (Mean, Sd) UCL	45.79443

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Manganese
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	6	Shapiro-Wilk Test Statisitic	0.95266
Number of Unique Samples	6	Shapiro-Wilk 5% Critical Value	0.788
Minimum	52.4	Data are normal at 5% significance level	
Maximum	245.5		
Mean	138.0667	95% UCL (Assuming Normal Distribution)	
Median	119.5	Student's-t UCL	193.9491
Standard Deviation	67.9306		
Variance	4614.567	Gamma Distribution Test	
Coefficient of Variation	0.492013	A-D Test Statistic	0.229168
Skewness	0.63742	A-D 5% Critical Value	0.698594
		K-S Test Statistic	0.177189
Gamma Statistics		K-S 5% Critical Value	0.333001
k hat	4.718193	Data follow gamma distribution	
k star (bias corrected)	2.470207	at 5% significance level	
Theta hat	29.26262		
Theta star	55.89274	95% UCLs (Assuming Gamma Distribution)	
nu hat	56.61831	Approximate Gamma UCL	224.7468
nu star	29.64249	Adjusted Gamma UCL	271.6046
Approx.Chi Square Value (.05)	18.21		
Adjusted Level of Significance	0.01222	Lognormal Distribution Test	
Adjusted Chi Square Value	15.06837	Shapiro-Wilk Test Statisitic	0.960684
		Shapiro-Wilk 5% Critical Value	0.788
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	3.958907		
Maximum of log data	5.503297	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	4.818037	95% H-UCL	276.4438
Standard Deviation of log data	0.531456	95% Chebyshev (MVUE) UCL	270.0533
Variance of log data	0.282445	97.5% Chebyshev (MVUE) UCL	326.8001
		99% Chebyshev (MVUE) UCL	438.2682
		95% Non-parametric UCLs	
		CLT UCL	183.6827
		Adj-CLT UCL (Adjusted for skewness)	191.3938
		Mod-t UCL (Adjusted for skewness)	195.1519
		Jackknife UCL	193.9491
		Standard Bootstrap UCL	179.0184
		Bootstrap-t UCL	232.498
RECOMMENDATION		Hall's Bootstrap UCL	631.6585
Data are normal (0.05)		Percentile Bootstrap UCL	183.6667
		BCA Bootstrap UCL	196.4167
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	258.9501
		97.5% Chebyshev (Mean, Sd) UCL	311.2564
		99% Chebyshev (Mean, Sd) UCL	414.0021

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\SW-04-base-cf-121304.xls	
Variable:	Trichloroethene	
Raw Statistics		
Number of Observations	4	
Number of Missing Data	0	
Number of Valid Observations	4	
Number of Distinct Observations	2	
Minimum	1	
Maximum	2	
Mean	1.25	
Standard Deviation	0.5	
Variance	0.25	
Coefficient of Variation	0.4	
Skewness	2	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.629658	
Shapiro-Wilk 5% Critical Value	0.748	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1.838341	
Gamma Statistics		
k hat	10.19256	
k star (bias corrected)	2.714807	
Theta hat	0.122638	
Theta star	0.460438	
nu hat	81.54049	
nu star	21.71846	
5% Approximate Chi Square Value	12.12587	
Adjusted Level of Significance	N/A	
Adjusted Chi Square Value	N/A	
Anderson-Darling Test Statistic	0.961413	
Anderson-Darling 5% Critical Value	0.6571	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.469173	
Kolmogrov-Smirnov 5% Critical Value	0.394917	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	2.238856	
95% Adjusted Gamma UCL	N/A	
Lognormal Statistics		
Minimum of log data	0	
Maximum of log data	0.693147	
Mean of log data	0.173287	
Standard Deviation of log data	0.346574	
Variance of log data	0.120113	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.629658	
Shapiro-Wilk 5% Critical Value	0.748	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	1.262815	
MLE Standard Deviation	0.451135	
MLE Coefficient of Variation	0.357246	
MLE Skewness	1.117331	
MLE Median	1.189207	
MLE 80% Quantile	1.593832	
MLE 90% Quantile	1.85639	
MLE 95% Quantile	2.103075	
MLE 99% Quantile	2.662903	
MVU Estimate of Median	1.171432	
MVU Estimate of Mean	1.2435	
MVU Estimate of Standard Deviation	0.427147	
MVU Estimate of SE of Mean	0.21355	
95% H-UCL	2.569891	
95% Chebyshev (MVUE) UCL	2.174341	
97.5% Chebyshev (MVUE) UCL	2.577117	
99% Chebyshev (MVUE) UCL	3.368292	
Non-parametric Statisitics		
95% CLT UCL	1.661213	
95% Adjusted-CLT UCL	1.928342	
95% Modified-t UCL	1.880007	
95% Jackknife UCL	1.838341	
95% Chebyshev (Mean, Sd) UCL	2.339725	
97.5% Chebyshev (Mean, Sd) UCL	2.811249	
99% Chebyshev (Mean, Sd) UCL	3.737469	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/A	Not enough distinct data error
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	YES	Users must select one of the recommended UCLS
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	1.838341	95% Student's-t UCL
2nd Recommended UCL	1.880007	95% Modified-t UCL
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\SW-04-base-cf-121304.xls	
Variable:	Arsenic	
Raw Statistics		
Number of Observations	16	
Number of Missing Data	0	
Number of Valid Observations	16	
Number of Distinct Observations	15	
Minimum	8.6	
Maximum	50.1	
Mean	28.08125	
Standard Deviation	11.62608	
Variance	135.1656	
Coefficient of Variation	0.414016	
Skewness	0.535569	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.945517	
Shapiro-Wilk 5% Critical Value	0.887	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	33.17652	
Gamma Statistics		
k hat	5.760243	
k star (bias corrected)	4.721864	
Theta hat	4.875012	
Theta star	5.947069	
nu hat	184.3278	
nu star	151.0996	
5% Approximate Chi Square Value	123.6816	
Adjusted Level of Significance	0.03348	
Adjusted Chi Square Value	120.8592	
Anderson-Darling Test Statistic	0.287361	
Anderson-Darling 5% Critical Value	0.74099	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.123704	
Kolmogrov-Smirnov 5% Critical Value	0.215684	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	34.30637	
95% Adjusted Gamma UCL	35.10753	
Lognormal Statistics		
Minimum of log data	2.151762	
Maximum of log data	3.914021	
Mean of log data	3.245796	
Standard Deviation of log data	0.458398	
Variance of log data	0.210128	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.939623	
Shapiro-Wilk 5% Critical Value	0.887	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	28.52727	
MLE Standard Deviation	13.79483	
MLE Coefficient of Variation	0.483566	
MLE Skewness	1.563775	
MLE Median	25.68215	
MLE 80% Quantile	37.8315	
MLE 90% Quantile	46.28589	
MLE 95% Quantile	54.59052	
MLE 99% Quantile	74.59169	
MVU Estimate of Median	25.51399	
MVU Estimate of Mean	28.32461	
MVU Estimate of Standard Deviation	13.35912	
MVU Estimate of SE of Mean	3.333319	
95% H-UCL	36.20064	
95% Chebyshev (MVUE) UCL	42.8542	
97.5% Chebyshev (MVUE) UCL	49.14117	
99% Chebyshev (MVUE) UCL	61.49071	
Non-parametric Statisitics		
95% CLT UCL	32.86205	
95% Adjusted-CLT UCL	33.27787	
95% Modified-t UCL	33.24138	
95% Jackknife UCL	33.17652	
95% Chebyshev (Mean, Sd) UCL	40.75047	
97.5% Chebyshev (Mean, Sd) UCL	46.23245	
99% Chebyshev (Mean, Sd) UCL	57.00075	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	32.76222	
95% Bootstrap-t UCL	33.49659	
95% Hall's Bootstrap UCL	33.55418	
95% Percentile Bootstrap UCL	32.65	
95% BCA Bootstrap UCL	33.39375	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	33.17652	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\SW-04-base-cf-121304.xls	
Variable:	Chromium	
Raw Statistics		
Number of Observations	16	
Number of Missing Data	0	
Number of Valid Observations	16	
Number of Distinct Observations	13	
Minimum	0.55	
Maximum	14.1	
Mean	5.55	
Standard Deviation	3.383834	
Variance	11.45033	
Coefficient of Variation	0.6097	
Skewness	0.984613	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.937239	
Shapiro-Wilk 5% Critical Value	0.887	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	7.033008	
Gamma Statistics		
k hat	2.41462	
k star (bias corrected)	2.003545	
Theta hat	2.298498	
Theta star	2.770089	
nu hat	77.26784	
nu star	64.11345	
5% Approximate Chi Square Value	46.68857	
Adjusted Level of Significance	0.03348	
Adjusted Chi Square Value	44.9981	
Anderson-Darling Test Statistic	0.303168	
Anderson-Darling 5% Critical Value	0.747805	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.160236	
Kolmogrov-Smirnov 5% Critical Value	0.217368	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	7.621344	
95% Adjusted Gamma UCL	7.90766	
Lognormal Statistics		
Minimum of log data	-0.597837	
Maximum of log data	2.646175	
Mean of log data	1.492661	
Standard Deviation of log data	0.780348	
Variance of log data	0.608944	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.905465	
Shapiro-Wilk 5% Critical Value	0.887	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	6.032327	
MLE Standard Deviation	5.523743	
MLE Coefficient of Variation	0.91569	
MLE Skewness	3.514866	
MLE Median	4.448918	
MLE 80% Quantile	8.602523	
MLE 90% Quantile	12.12669	
MLE 95% Quantile	16.06004	
MLE 99% Quantile	27.32362	
MVU Estimate of Median	4.364965	
MVU Estimate of Mean	5.891397	
MVU Estimate of Standard Deviation	4.980836	
MVU Estimate of SE of Mean	1.227734	
95% H-UCL	9.770059	
95% Chebyshev (MVUE) UCL	11.24297	
97.5% Chebyshev (MVUE) UCL	13.5586	
99% Chebyshev (MVUE) UCL	18.1072	
Non-parametric Statisitics		
95% CLT UCL	6.941478	
95% Adjusted-CLT UCL	7.16398	
95% Modified-t UCL	7.067714	
95% Jackknife UCL	7.033008	
95% Chebyshev (Mean, Sd) UCL	9.237448	
97.5% Chebyshev (Mean, Sd) UCL	10.83301	
99% Chebyshev (Mean, Sd) UCL	13.96718	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	6.900946	
95% Bootstrap-t UCL	7.316937	
95% Hall's Bootstrap UCL	7.582181	
95% Percentile Bootstrap UCL	6.96875	
95% BCA Bootstrap UCL	7.08125	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	7.033008	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\SW-04-base-cf-121304.xls	
Variable:	Manganese	
Raw Statistics		
Number of Observations	16	
Number of Missing Data	0	
Number of Valid Observations	16	
Number of Distinct Observations	16	
Minimum	313	
Maximum	846	
Mean	601.125	
Standard Deviation	141.4581	
Variance	20010.38	
Coefficient of Variation	0.235322	
Skewness	-0.329153	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.970432	
Shapiro-Wilk 5% Critical Value	0.887	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	663.1208	
Gamma Statistics		
k hat	17.1742	
k star (bias corrected)	13.9957	
Theta hat	35.00163	
Theta star	42.95068	
nu hat	549.5744	
nu star	447.8625	
5% Approximate Chi Square Value	399.7873	
Adjusted Level of Significance	0.03348	
Adjusted Chi Square Value	394.6186	
Anderson-Darling Test Statistic	0.383468	
Anderson-Darling 5% Critical Value	0.737201	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.161582	
Kolmogrov-Smirnov 5% Critical Value	0.21477	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	673.4115	
95% Adjusted Gamma UCL	682.2317	
Lognormal Statistics		
Minimum of log data	5.746203	
Maximum of log data	6.740519	
Mean of log data	6.369407	
Standard Deviation of log data	0.259846	
Variance of log data	0.06752	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.927497	
Shapiro-Wilk 5% Critical Value	0.887	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	603.7541	
MLE Standard Deviation	159.5687	
MLE Coefficient of Variation	0.264294	
MLE Skewness	0.811344	
MLE Median	583.7116	
MLE 80% Quantile	727.0365	
MLE 90% Quantile	815.0984	
MLE 95% Quantile	895.0265	
MLE 99% Quantile	1068.283	
MVU Estimate of Median	582.4811	
MVU Estimate of Mean	602.4461	
MVU Estimate of Standard Deviation	157.9991	
MVU Estimate of SE of Mean	39.49142	
95% H-UCL	683.2521	
95% Chebyshev (MVUE) UCL	774.5852	
97.5% Chebyshev (MVUE) UCL	849.07	
99% Chebyshev (MVUE) UCL	995.3808	
Non-parametric Statisitics		
95% CLT UCL	659.2945	
95% Adjusted-CLT UCL	656.185	
95% Modified-t UCL	662.6358	
95% Jackknife UCL	663.1208	
95% Chebyshev (Mean, Sd) UCL	755.2753	
97.5% Chebyshev (Mean, Sd) UCL	821.9763	
99% Chebyshev (Mean, Sd) UCL	952.9975	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	656.3795	
95% Bootstrap-t UCL	661.1091	
95% Hall's Bootstrap UCL	656.9119	
95% Percentile Bootstrap UCL	655.25	
95% BCA Bootstrap UCL	655.1875	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	663.1208	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\SW-04-base-cf-121304.xls	
Variable:	Vanadium	
Raw Statistics		
Number of Observations	16	
Number of Missing Data	0	
Number of Valid Observations	16	
Number of Distinct Observations	14	
Minimum	0.2	
Maximum	5.9	
Mean	1.663125	
Standard Deviation	2.051412	
Variance	4.208293	
Coefficient of Variation	1.233469	
Skewness	1.386587	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.676745	
Shapiro-Wilk 5% Critical Value	0.887	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	2.562182	
Gamma Statistics		
k hat	0.916393	
k star (bias corrected)	0.786236	
Theta hat	1.814861	
Theta star	2.115301	
nu hat	29.32456	
nu star	25.15954	
5% Approximate Chi Square Value	14.73202	
Adjusted Level of Significance	0.03348	
Adjusted Chi Square Value	13.82857	
Anderson-Darling Test Statistic	1.547715	
Anderson-Darling 5% Critical Value	0.767052	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.263712	
Kolmogrov-Smirnov 5% Critical Value	0.221849	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	2.840307	
95% Adjusted Gamma UCL	3.02587	
Lognormal Statistics		
Minimum of log data	-1.609438	
Maximum of log data	1.774952	
Mean of log data	-0.127826	
Standard Deviation of log data	1.109937	
Variance of log data	1.231959	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.859324	
Shapiro-Wilk 5% Critical Value	0.887	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	1.629305	
MLE Standard Deviation	2.538758	
MLE Coefficient of Variation	1.558184	
MLE Skewness	8.457729	
MLE Median	0.880007	
MLE 80% Quantile	2.248066	
MLE 90% Quantile	3.663586	
MLE 95% Quantile	5.463118	
MLE 99% Quantile	11.63347	
MVU Estimate of Median	0.846697	
MVU Estimate of Mean	1.539531	
MVU Estimate of Standard Deviation	1.995968	
MVU Estimate of SE of Mean	0.475658	
95% H-UCL	3.728179	
95% Chebyshev (MVUE) UCL	3.612875	
97.5% Chebyshev (MVUE) UCL	4.510013	
99% Chebyshev (MVUE) UCL	6.272266	
Non-parametric Statisitics		
95% CLT UCL	2.506693	
95% Adjusted-CLT UCL	2.696653	
95% Modified-t UCL	2.591812	
95% Jackknife UCL	2.562182	
95% Chebyshev (Mean, Sd) UCL	3.8986	
97.5% Chebyshev (Mean, Sd) UCL	4.865892	
99% Chebyshev (Mean, Sd) UCL	6.765949	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	2.496569	
95% Bootstrap-t UCL	3.004872	
95% Hall's Bootstrap UCL	2.339415	
95% Percentile Bootstrap UCL	2.56	
95% BCA Bootstrap UCL	2.651875	
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	6.765949	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	YES	Cosider using 95% or 97.5% Chebyshev (Mean, Sd) UCL

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	bis(2-Ethylhexyl)phthalate
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	6	Shapiro-Wilk Test Statisitic	0.503242
Number of Unique Samples	4	Shapiro-Wilk 5% Critical Value	0.788
Minimum	5	Data not normal at 5% significance level	
Maximum	120		
Mean	24.41667	95% UCL (Assuming Normal Distribution)	
Median	5.25	Student's-t UCL	62.93908
Standard Deviation	46.82779		
Variance	2192.842	Gamma Distribution Test	
Coefficient of Variation	1.917862	A-D Test Statistic	1.614621
Skewness	2.449088	A-D 5% Critical Value	0.729294
		K-S Test Statistic	0.501298
Gamma Statistics		K-S 5% Critical Value	0.346333
k hat	0.610301	Data do not follow gamma distribution	
k star (bias corrected)	0.416261	at 5% significance level	
Theta hat	40.00761		
Theta star	58.65705	95% UCLs (Assuming Gamma Distribution)	
nu hat	7.323607	Approximate Gamma UCL	106.0987
nu star	4.995137	Adjusted Gamma UCL	197.5572
Approx.Chi Square Value (.05)	1.149539		
Adjusted Level of Significance	0.01222	Lognormal Distribution Test	
Adjusted Chi Square Value	0.617364	Shapiro-Wilk Test Statisitic	0.542672
		Shapiro-Wilk 5% Critical Value	0.788
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	1.609438		
Maximum of log data	4.787492	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	2.185386	95% H-UCL	417.6213
Standard Deviation of log data	1.276876	95% Chebyshev (MVUE) UCL	52.94658
Variance of log data	1.630412	97.5% Chebyshev (MVUE) UCL	68.67312
		99% Chebyshev (MVUE) UCL	99.56485
		95% Non-parametric UCLs	
		CLT UCL	55.86193
		Adj-CLT UCL (Adjusted for skewness)	76.28577
		Mod-t UCL (Adjusted for skewness)	66.12478
		Jackknife UCL	62.93908
		Standard Bootstrap UCL	N/R
		Bootstrap-t UCL	N/R
RECOMMENDATION		Hall's Bootstrap UCL	N/R
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	N/R
		BCA Bootstrap UCL	N/R
Use 99% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	107.7473
		97.5% Chebyshev (Mean, Sd) UCL	143.8046
		99% Chebyshev (Mean, Sd) UCL	214.632
Recommended UCL exceeds the maximum observation			

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Antimony
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	12	Shapiro-Wilk Test Statisitic	0.84526
Number of Unique Samples	10	Shapiro-Wilk 5% Critical Value	0.859
Minimum	0.75	Data not normal at 5% significance level	
Maximum	2.683512		
Mean	1.607898	95% UCL (Assuming Normal Distribution)	
Median	1.38171	Student's-t UCL	2.002302
Standard Deviation	0.760769		
Variance	0.57877	Gamma Distribution Test	
Coefficient of Variation	0.473145	A-D Test Statistic	0.723403
Skewness	0.338856	A-D 5% Critical Value	0.732817
		K-S Test Statistic	0.233508
Gamma Statistics		K-S 5% Critical Value	0.246032
k hat	4.783438	Data follow gamma distribution	
k star (bias corrected)	3.643134	at 5% significance level	
Theta hat	0.336139		
Theta star	0.44135	95% UCLs (Assuming Gamma Distribution)	
nu hat	114.8025	Approximate Gamma UCL	2.10224
nu star	87.43521	Adjusted Gamma UCL	2.192006
Approx.Chi Square Value (.05)	66.87483		
Adjusted Level of Significance	0.02896	Lognormal Distribution Test	
Adjusted Chi Square Value	64.13621	Shapiro-Wilk Test Statisitic	0.873481
		Shapiro-Wilk 5% Critical Value	0.859
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	-0.287682		
Maximum of log data	0.987126	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	0.366774	95% H-UCL	2.23209
Standard Deviation of log data	0.491224	95% Chebyshev (MVUE) UCL	2.628564
Variance of log data	0.241301	97.5% Chebyshev (MVUE) UCL	3.069149
		99% Chebyshev (MVUE) UCL	3.934592
		95% Non-parametric UCLs	
		CLT UCL	1.969133
		Adj-CLT UCL (Adjusted for skewness)	1.992088
		Mod-t UCL (Adjusted for skewness)	2.005882
		Jackknife UCL	2.002302
		Standard Bootstrap UCL	1.961958
		Bootstrap-t UCL	2.049109
RECOMMENDATION		Hall's Bootstrap UCL	1.92912
Data follow gamma distribution (0.05)		Percentile Bootstrap UCL	1.944118
		BCA Bootstrap UCL	1.893704
Use Approximate Gamma UCL		95% Chebyshev (Mean, Sd) UCL	2.565179
		97.5% Chebyshev (Mean, Sd) UCL	2.979395
		99% Chebyshev (Mean, Sd) UCL	3.793042

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Arsenic
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	12	Shapiro-Wilk Test Statisitic	0.858655
Number of Unique Samples	12	Shapiro-Wilk 5% Critical Value	0.859
Minimum	7.2	Data not normal at 5% significance level	
Maximum	56.85205		
Mean	24.0766	95% UCL (Assuming Normal Distribution)	
Median	20.93021	Student's-t UCL	31.76016
Standard Deviation	14.8209		
Variance	219.6592	Gamma Distribution Test	
Coefficient of Variation	0.615573	A-D Test Statistic	0.402937
Skewness	1.276009	A-D 5% Critical Value	0.738231
		K-S Test Statistic	0.239019
Gamma Statistics		K-S 5% Critical Value	0.247164
k hat	3.243415	Data follow gamma distribution	
k star (bias corrected)	2.488117	at 5% significance level	
Theta hat	7.423226		
Theta star	9.676637	95% UCLs (Assuming Gamma Distribution)	
nu hat	77.84196	Approximate Gamma UCL	33.48019
nu star	59.7148	Adjusted Gamma UCL	35.25605
Approx.Chi Square Value (.05)	42.9427		
Adjusted Level of Significance	0.02896	Lognormal Distribution Test	
Adjusted Chi Square Value	40.77966	Shapiro-Wilk Test Statisitic	0.958148
		Shapiro-Wilk 5% Critical Value	0.859
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	1.974081		
Maximum of log data	4.040452	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	3.019233	95% H-UCL	36.81304
Standard Deviation of log data	0.597243	95% Chebyshev (MVUE) UCL	42.73263
Variance of log data	0.356699	97.5% Chebyshev (MVUE) UCL	50.81051
		99% Chebyshev (MVUE) UCL	66.67795
		95% Non-parametric UCLs	
		CLT UCL	31.11399
		Adj-CLT UCL (Adjusted for skewness)	32.79793
		Mod-t UCL (Adjusted for skewness)	32.02283
		Jackknife UCL	31.76016
		Standard Bootstrap UCL	30.761
		Bootstrap-t UCL	35.68812
RECOMMENDATION		Hall's Bootstrap UCL	43.63225
Data follow gamma distribution (0.05)		Percentile Bootstrap UCL	31.24607
		BCA Bootstrap UCL	34.8429
Use Approximate Gamma UCL		95% Chebyshev (Mean, Sd) UCL	42.72583
		97.5% Chebyshev (Mean, Sd) UCL	50.79537
		99% Chebyshev (Mean, Sd) UCL	66.64641

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Manganese
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	12	Shapiro-Wilk Test Statisitic	0.946435
Number of Unique Samples	11	Shapiro-Wilk 5% Critical Value	0.859
Minimum	170	Data are normal at 5% significance level	
Maximum	450.8701		
Mean	333.7152	95% UCL (Assuming Normal Distribution)	
Median	340	Student's-t UCL	379.9157
Standard Deviation	89.11674		
Variance	7941.792	Gamma Distribution Test	
Coefficient of Variation	0.267044	A-D Test Statistic	0.386022
Skewness	-0.466043	A-D 5% Critical Value	0.730823
		K-S Test Statistic	0.185306
Gamma Statistics		K-S 5% Critical Value	0.24532
k hat	13.35196	Data follow gamma distribution	
k star (bias corrected)	10.06953	at 5% significance level	
Theta hat	24.99372		
Theta star	33.14109	95% UCLs (Assuming Gamma Distribution)	
nu hat	320.4472	Approximate Gamma UCL	390.2251
nu star	241.6687	Adjusted Gamma UCL	399.7793
Approx.Chi Square Value (.05)	206.6718		
Adjusted Level of Significance	0.02896	Lognormal Distribution Test	
Adjusted Chi Square Value	201.7326	Shapiro-Wilk Test Statisitic	0.912268
		Shapiro-Wilk 5% Critical Value	0.859
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	5.135798		
Maximum of log data	6.111179	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	5.772373	95% H-UCL	399.9131
Standard Deviation of log data	0.299554	95% Chebyshev (MVUE) UCL	462.0727
Variance of log data	0.089733	97.5% Chebyshev (MVUE) UCL	517.1671
		99% Chebyshev (MVUE) UCL	625.3895
		95% Non-parametric UCLs	
		CLT UCL	376.0304
		Adj-CLT UCL (Adjusted for skewness)	372.3322
		Mod-t UCL (Adjusted for skewness)	379.3389
		Jackknife UCL	379.9157
		Standard Bootstrap UCL	374.6502
		Bootstrap-t UCL	376.4431
RECOMMENDATION		Hall's Bootstrap UCL	372.8773
Data are normal (0.05)		Percentile Bootstrap UCL	373.6668
		BCA Bootstrap UCL	386.3298
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	445.8513
		97.5% Chebyshev (Mean, Sd) UCL	494.3727
		99% Chebyshev (Mean, Sd) UCL	589.6835

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Thallium
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	12	Shapiro-Wilk Test Statisitic	0.917873
Number of Unique Samples	10	Shapiro-Wilk 5% Critical Value	0.859
Minimum	1.1	Data are normal at 5% significance level	
Maximum	4.2		
Mean	2.426191	95% UCL (Assuming Normal Distribution)	
Median	2.246521	Student's-t UCL	2.967451
Standard Deviation	1.044042		
Variance	1.090025	Gamma Distribution Test	
Coefficient of Variation	0.430322	A-D Test Statistic	0.323015
Skewness	0.519437	A-D 5% Critical Value	0.731692
		K-S Test Statistic	0.164974
Gamma Statistics		K-S 5% Critical Value	0.245833
k hat	5.880675	Data follow gamma distribution	
k star (bias corrected)	4.466062	at 5% significance level	
Theta hat	0.41257		
Theta star	0.543251	95% UCLs (Assuming Gamma Distribution)	
nu hat	141.1362	Approximate Gamma UCL	3.085304
nu star	107.1855	Adjusted Gamma UCL	3.20289
Approx.Chi Square Value (.05)	84.28746		
Adjusted Level of Significance	0.02896	Lognormal Distribution Test	
Adjusted Chi Square Value	81.19308	Shapiro-Wilk Test Statisitic	0.94631
		Shapiro-Wilk 5% Critical Value	0.859
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	0.09531		
Maximum of log data	1.435085	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	0.798896	95% H-UCL	3.230684
Standard Deviation of log data	0.441949	95% Chebyshev (MVUE) UCL	3.806646
Variance of log data	0.195319	97.5% Chebyshev (MVUE) UCL	4.402408
		99% Chebyshev (MVUE) UCL	5.572665
		95% Non-parametric UCLs	
		CLT UCL	2.921932
		Adj-CLT UCL (Adjusted for skewness)	2.970221
		Mod-t UCL (Adjusted for skewness)	2.974983
		Jackknife UCL	2.967451
		Standard Bootstrap UCL	2.890725
		Bootstrap-t UCL	3.024963
RECOMMENDATION		Hall's Bootstrap UCL	3.047793
Data are normal (0.05)		Percentile Bootstrap UCL	2.892059
		BCA Bootstrap UCL	2.818957
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	3.739916
		97.5% Chebyshev (Mean, Sd) UCL	4.308365
		99% Chebyshev (Mean, Sd) UCL	5.424975

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Antimony

Raw Statistics		Normal Distribution Test	
Number of Valid Samples	6	Shapiro-Wilk Test Statisitic	0.56113
Number of Unique Samples	6	Shapiro-Wilk 5% Critical Value	0.788
Minimum	0.55	Data not normal at 5% significance level	
Maximum	20.3		
Mean	4.641667	95% UCL (Assuming Normal Distribution)	
Median	1.8	Student's-t UCL	10.96655
Standard Deviation	7.688525		
Variance	59.11342	Gamma Distribution Test	
Coefficient of Variation	1.656415	A-D Test Statistic	0.98399
Skewness	2.423939	A-D 5% Critical Value	0.720328
		K-S Test Statistic	0.432804
Gamma Statistics		K-S 5% Critical Value	0.343158
k hat	0.778116	Data do not follow gamma distribution	
k star (bias corrected)	0.500169	at 5% significance level	
Theta hat	5.965266		
Theta star	9.280198	95% UCLs (Assuming Gamma Distribution)	
nu hat	9.337388	Approximate Gamma UCL	16.98325
nu star	6.002027	Adjusted Gamma UCL	29.31066
Approx.Chi Square Value (.05)	1.640405		
Adjusted Level of Significance	0.01222	Lognormal Distribution Test	
Adjusted Chi Square Value	0.950487	Shapiro-Wilk Test Statisitic	0.822439
		Shapiro-Wilk 5% Critical Value	0.788
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	-0.597837		
Maximum of log data	3.010621	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	0.769534	95% H-UCL	64.49164
Standard Deviation of log data	1.196114	95% Chebyshev (MVUE) UCL	11.50011
Variance of log data	1.430688	97.5% Chebyshev (MVUE) UCL	14.85272
		99% Chebyshev (MVUE) UCL	21.43828
		95% Non-parametric UCLs	
		CLT UCL	9.804578
		Adj-CLT UCL (Adjusted for skewness)	13.12348
		Mod-t UCL (Adjusted for skewness)	11.48424
		Jackknife UCL	10.96655
		Standard Bootstrap UCL	9.292551
		Bootstrap-t UCL	102.6367
RECOMMENDATION		Hall's Bootstrap UCL	69.45216
Data are lognormal (0.05)		Percentile Bootstrap UCL	10.80833
		BCA Bootstrap UCL	13.91667
Use 95% Chebyshev (MVUE) UCL		95% Chebyshev (Mean, Sd) UCL	18.3235
		97.5% Chebyshev (Mean, Sd) UCL	24.24364
		99% Chebyshev (Mean, Sd) UCL	35.8726

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Arsenic
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	6	Shapiro-Wilk Test Statisitic	0.940631
Number of Unique Samples	6	Shapiro-Wilk 5% Critical Value	0.788
Minimum	16.1	Data are normal at 5% significance level	
Maximum	889		
Mean	363.5167	95% UCL (Assuming Normal Distribution)	
Median	310	Student's-t UCL	623.794
Standard Deviation	316.3928		
Variance	100104.4	Gamma Distribution Test	
Coefficient of Variation	0.870367	A-D Test Statistic	0.231648
Skewness	0.876956	A-D 5% Critical Value	0.714584
		K-S Test Statistic	0.220009
Gamma Statistics		K-S 5% Critical Value	0.34061
k hat	1.035279	Data follow gamma distribution	
k star (bias corrected)	0.62875	at 5% significance level	
Theta hat	351.1293		
Theta star	578.1573	95% UCLs (Assuming Gamma Distribution)	
nu hat	12.42334	Approximate Gamma UCL	1108.709
nu star	7.545005	Adjusted Gamma UCL	1761.941
Approx.Chi Square Value (.05)	2.473809		
Adjusted Level of Significance	0.01222	Lognormal Distribution Test	
Adjusted Chi Square Value	1.556656	Shapiro-Wilk Test Statisitic	0.894237
		Shapiro-Wilk 5% Critical Value	0.788
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	2.778819		
Maximum of log data	6.790097	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	5.34052	95% H-UCL	26069.83
Standard Deviation of log data	1.436319	95% Chebyshev (MVUE) UCL	1549.739
Variance of log data	2.063011	97.5% Chebyshev (MVUE) UCL	2024.437
		99% Chebyshev (MVUE) UCL	2956.889
		95% Non-parametric UCLs	
		CLT UCL	575.9772
		Adj-CLT UCL (Adjusted for skewness)	625.3893
		Mod-t UCL (Adjusted for skewness)	631.5013
		Jackknife UCL	623.794
		Standard Bootstrap UCL	557.7194
		Bootstrap-t UCL	767.7043
RECOMMENDATION		Hall's Bootstrap UCL	1872.438
Data are normal (0.05)		Percentile Bootstrap UCL	566.1667
		BCA Bootstrap UCL	675.8333
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	926.5418
		97.5% Chebyshev (Mean, Sd) UCL	1170.163
		99% Chebyshev (Mean, Sd) UCL	1648.71

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Cadmium
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	6	Shapiro-Wilk Test Statisitic	0.847631
Number of Unique Samples	6	Shapiro-Wilk 5% Critical Value	0.788
Minimum	0.68	Data are normal at 5% significance level	
Maximum	11.6		
Mean	5.03	95% UCL (Assuming Normal Distribution)	
Median	3.05	Student's-t UCL	8.557332
Standard Deviation	4.28782		
Variance	18.3854	Gamma Distribution Test	
Coefficient of Variation	0.852449	A-D Test Statistic	0.392835
Skewness	0.915207	A-D 5% Critical Value	0.707708
		K-S Test Statistic	0.272234
Gamma Statistics		K-S 5% Critical Value	0.337413
k hat	1.511414	Data follow gamma distribution	
k star (bias corrected)	0.866818	at 5% significance level	
Theta hat	3.328009		
Theta star	5.802832	95% UCLs (Assuming Gamma Distribution)	
nu hat	18.13697	Approximate Gamma UCL	12.47653
nu star	10.40182	Adjusted Gamma UCL	18.06428
Approx.Chi Square Value (.05)	4.193566		
Adjusted Level of Significance	0.01222	Lognormal Distribution Test	
Adjusted Chi Square Value	2.896386	Shapiro-Wilk Test Statisitic	0.914674
		Shapiro-Wilk 5% Critical Value	0.788
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	-0.385662		
Maximum of log data	2.451005	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	1.249481	95% H-UCL	41.9273
Standard Deviation of log data	1.013804	95% Chebyshev (MVUE) UCL	14.50095
Variance of log data	1.027799	97.5% Chebyshev (MVUE) UCL	18.51249
		99% Chebyshev (MVUE) UCL	26.39238
		95% Non-parametric UCLs	
		CLT UCL	7.909308
		Adj-CLT UCL (Adjusted for skewness)	8.60816
		Mod-t UCL (Adjusted for skewness)	8.666339
		Jackknife UCL	8.557332
		Standard Bootstrap UCL	7.65697
		Bootstrap-t UCL	16.2433
RECOMMENDATION		Hall's Bootstrap UCL	40.83745
Data are normal (0.05)		Percentile Bootstrap UCL	7.88
		BCA Bootstrap UCL	8.53
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	12.66023
		97.5% Chebyshev (Mean, Sd) UCL	15.96184
		99% Chebyshev (Mean, Sd) UCL	22.44721

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Copper
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	6	Shapiro-Wilk Test Statisitic	0.637582
Number of Unique Samples	6	Shapiro-Wilk 5% Critical Value	0.788
Minimum	61.1	Data not normal at 5% significance level	
Maximum	1570		
Mean	400.25	95% UCL (Assuming Normal Distribution)	
Median	209	Student's-t UCL	877.3274
Standard Deviation	579.9346		
Variance	336324.1	Gamma Distribution Test	
Coefficient of Variation	1.448931	A-D Test Statistic	0.572941
Skewness	2.320333	A-D 5% Critical Value	0.717686
		K-S Test Statistic	0.308561
Gamma Statistics		K-S 5% Critical Value	0.341992
k hat	0.890222	Data follow gamma distribution	
k star (bias corrected)	0.556222	at 5% significance level	
Theta hat	449.607		
Theta star	719.5867	95% UCLs (Assuming Gamma Distribution)	
nu hat	10.68266	Approximate Gamma UCL	1340.29
nu star	6.674664	Adjusted Gamma UCL	2222.286
Approx.Chi Square Value (.05)	1.99325		
Adjusted Level of Significance	0.01222	Lognormal Distribution Test	
Adjusted Chi Square Value	1.202156	Shapiro-Wilk Test Statisitic	0.903794
		Shapiro-Wilk 5% Critical Value	0.788
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	4.112512		
Maximum of log data	7.358831	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	5.334494	95% H-UCL	5726.539
Standard Deviation of log data	1.181504	95% Chebyshev (MVUE) UCL	1082.795
Variance of log data	1.395952	97.5% Chebyshev (MVUE) UCL	1397.313
		99% Chebyshev (MVUE) UCL	2015.123
		95% Non-parametric UCLs	
		CLT UCL	789.6811
		Adj-CLT UCL (Adjusted for skewness)	1029.321
		Mod-t UCL (Adjusted for skewness)	914.7063
		Jackknife UCL	877.3274
		Standard Bootstrap UCL	748.7271
		Bootstrap-t UCL	2416.096
RECOMMENDATION		Hall's Bootstrap UCL	2897.078
Data follow gamma distribution (0.05)		Percentile Bootstrap UCL	837.4167
		BCA Bootstrap UCL	1087.85
Use Approximate Gamma UCL		95% Chebyshev (Mean, Sd) UCL	1432.251
		97.5% Chebyshev (Mean, Sd) UCL	1878.799
		99% Chebyshev (Mean, Sd) UCL	2755.955

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Lead
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	6	Shapiro-Wilk Test Statisitic	0.730763
Number of Unique Samples	6	Shapiro-Wilk 5% Critical Value	0.788
Minimum	7.3	Data not normal at 5% significance level	
Maximum	558		
Mean	163.5417	95% UCL (Assuming Normal Distribution)	
Median	115.5	Student's-t UCL	327.7747
Standard Deviation	199.6414		
Variance	39856.71	Gamma Distribution Test	
Coefficient of Variation	1.220737	A-D Test Statistic	0.323307
Skewness	2.098293	A-D 5% Critical Value	0.718059
		K-S Test Statistic	0.245108
Gamma Statistics		K-S 5% Critical Value	0.342156
k hat	0.874412	Data follow gamma distribution	
k star (bias corrected)	0.548317	at 5% significance level	
Theta hat	187.0304		
Theta star	298.261	95% UCLs (Assuming Gamma Distribution)	
nu hat	10.49295	Approximate Gamma UCL	553.9804
nu star	6.579808	Adjusted Gamma UCL	923.3429
Approx.Chi Square Value (.05)	1.942438		
Adjusted Level of Significance	0.01222	Lognormal Distribution Test	
Adjusted Chi Square Value	1.16541	Shapiro-Wilk Test Statisitic	0.931736
		Shapiro-Wilk 5% Critical Value	0.788
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	1.987874		
Maximum of log data	6.324359	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	4.426075	95% H-UCL	10907.1
Standard Deviation of log data	1.442923	95% Chebyshev (MVUE) UCL	626.801
Variance of log data	2.082027	97.5% Chebyshev (MVUE) UCL	819.0114
		99% Chebyshev (MVUE) UCL	1196.572
		95% Non-parametric UCLs	
		CLT UCL	297.6026
		Adj-CLT UCL (Adjusted for skewness)	372.2039
		Mod-t UCL (Adjusted for skewness)	339.411
		Jackknife UCL	327.7747
		Standard Bootstrap UCL	286.492
		Bootstrap-t UCL	558.4817
RECOMMENDATION		Hall's Bootstrap UCL	946.7335
Data follow gamma distribution (0.05)		Percentile Bootstrap UCL	311.0417
		BCA Bootstrap UCL	396.55
Use Approximate Gamma UCL		95% Chebyshev (Mean, Sd) UCL	518.8062
		97.5% Chebyshev (Mean, Sd) UCL	672.5295
		99% Chebyshev (Mean, Sd) UCL	974.489

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Manganese
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	6	Shapiro-Wilk Test Statisitic	0.951303
Number of Unique Samples	6	Shapiro-Wilk 5% Critical Value	0.788
Minimum	138	Data are normal at 5% significance level	
Maximum	402		
Mean	253.3333	95% UCL (Assuming Normal Distribution)	
Median	259.5	Student's-t UCL	335.409
Standard Deviation	99.77107		
Variance	9954.267	Gamma Distribution Test	
Coefficient of Variation	0.393833	A-D Test Statistic	0.27293
Skewness	0.272224	A-D 5% Critical Value	0.698182
		K-S Test Statistic	0.208179
Gamma Statistics		K-S 5% Critical Value	0.332644
k hat	7.362387	Data follow gamma distribution	
k star (bias corrected)	3.792305	at 5% significance level	
Theta hat	34.40913		
Theta star	66.80195	95% UCLs (Assuming Gamma Distribution)	
nu hat	88.34865	Approximate Gamma UCL	371.5413
nu star	45.50766	Adjusted Gamma UCL	430.3995
Approx.Chi Square Value (.05)	31.02914		
Adjusted Level of Significance	0.01222	Lognormal Distribution Test	
Adjusted Chi Square Value	26.78583	Shapiro-Wilk Test Statisitic	0.935353
		Shapiro-Wilk 5% Critical Value	0.788
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	4.927254		
Maximum of log data	5.996452	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	5.465259	95% H-UCL	411.0665
Standard Deviation of log data	0.416728	95% Chebyshev (MVUE) UCL	442.0344
Variance of log data	0.173662	97.5% Chebyshev (MVUE) UCL	523.4464
		99% Chebyshev (MVUE) UCL	683.3644
		95% Non-parametric UCLs	
		CLT UCL	320.3305
		Adj-CLT UCL (Adjusted for skewness)	325.1673
		Mod-t UCL (Adjusted for skewness)	336.1635
		Jackknife UCL	335.409
		Standard Bootstrap UCL	312.2148
		Bootstrap-t UCL	342.7551
RECOMMENDATION		Hall's Bootstrap UCL	322.7451
Data are normal (0.05)		Percentile Bootstrap UCL	318.8333
		BCA Bootstrap UCL	333
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	430.8773
		97.5% Chebyshev (Mean, Sd) UCL	507.7007
		99% Chebyshev (Mean, Sd) UCL	658.6053

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Mercury
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	6	Shapiro-Wilk Test Statisitic	0.906687
Number of Unique Samples	6	Shapiro-Wilk 5% Critical Value	0.788
Minimum	0.025	Data are normal at 5% significance level	
Maximum	2.8		
Mean	1.398333	95% UCL (Assuming Normal Distribution)	
Median	1.55	Student's-t UCL	2.357888
Standard Deviation	1.166433		
Variance	1.360567	Gamma Distribution Test	
Coefficient of Variation	0.83416	A-D Test Statistic	0.642128
Skewness	-0.215096	A-D 5% Critical Value	0.72718
		K-S Test Statistic	0.308559
Gamma Statistics		K-S 5% Critical Value	0.345599
k hat	0.645865	Data follow gamma distribution	
k star (bias corrected)	0.434044	at 5% significance level	
Theta hat	2.165054		
Theta star	3.221641	95% UCLs (Assuming Gamma Distribution)	
nu hat	7.750383	Approximate Gamma UCL	5.829814
nu star	5.208525	Adjusted Gamma UCL	10.66224
Approx.Chi Square Value (.05)	1.249312		
Adjusted Level of Significance	0.01222	Lognormal Distribution Test	
Adjusted Chi Square Value	0.683088	Shapiro-Wilk Test Statisitic	0.78801
		Shapiro-Wilk 5% Critical Value	0.788
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	-3.688879		
Maximum of log data	1.029619	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-0.611168	95% H-UCL	8890.576
Standard Deviation of log data	2.053235	95% Chebyshev (MVUE) UCL	9.737241
Variance of log data	4.215773	97.5% Chebyshev (MVUE) UCL	12.94094
		99% Chebyshev (MVUE) UCL	19.23399
		95% Non-parametric UCLs	
		CLT UCL	2.181603
		Adj-CLT UCL (Adjusted for skewness)	2.136923
		Mod-t UCL (Adjusted for skewness)	2.350919
		Jackknife UCL	2.357888
		Standard Bootstrap UCL	2.123209
		Bootstrap-t UCL	2.335901
RECOMMENDATION		Hall's Bootstrap UCL	2.069572
Data are normal (0.05)		Percentile Bootstrap UCL	2.104167
		BCA Bootstrap UCL	2.316667
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	3.474017
		97.5% Chebyshev (Mean, Sd) UCL	4.372166
		99% Chebyshev (Mean, Sd) UCL	6.136408

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Thallium
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	6	Shapiro-Wilk Test Statisitic	0.853488
Number of Unique Samples	5	Shapiro-Wilk 5% Critical Value	0.788
Minimum	1.55	Data are normal at 5% significance level	
Maximum	3.6		
Mean	2.491667	95% UCL (Assuming Normal Distribution)	
Median	2.15	Student's-t UCL	3.194731
Standard Deviation	0.854644		
Variance	0.730417	Gamma Distribution Test	
Coefficient of Variation	0.343001	A-D Test Statistic	0.470668
Skewness	0.628084	A-D 5% Critical Value	0.698251
		K-S Test Statistic	0.231991
Gamma Statistics		K-S 5% Critical Value	0.332433
k hat	10.63312	Data follow gamma distribution	
k star (bias corrected)	5.427671	at 5% significance level	
Theta hat	0.234331		
Theta star	0.459067	95% UCLs (Assuming Gamma Distribution)	
nu hat	127.5974	Approximate Gamma UCL	3.41232
nu star	65.13205	Adjusted Gamma UCL	3.846594
Approx.Chi Square Value (.05)	47.55925		
Adjusted Level of Significance	0.01222	Lognormal Distribution Test	
Adjusted Chi Square Value	42.18989	Shapiro-Wilk Test Statisitic	0.894291
		Shapiro-Wilk 5% Critical Value	0.788
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	0.438255		
Maximum of log data	1.280934	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	0.865193	95% H-UCL	3.570444
Standard Deviation of log data	0.336324	95% Chebyshev (MVUE) UCL	3.978728
Variance of log data	0.113114	97.5% Chebyshev (MVUE) UCL	4.623195
		99% Chebyshev (MVUE) UCL	5.889126
		95% Non-parametric UCLs	
		CLT UCL	3.065568
		Adj-CLT UCL (Adjusted for skewness)	3.161162
		Mod-t UCL (Adjusted for skewness)	3.209642
		Jackknife UCL	3.194731
		Standard Bootstrap UCL	3.014181
		Bootstrap-t UCL	4.20603
RECOMMENDATION		Hall's Bootstrap UCL	9.743988
Data are normal (0.05)		Percentile Bootstrap UCL	3.033333
		BCA Bootstrap UCL	3.283333
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	4.012517
		97.5% Chebyshev (Mean, Sd) UCL	4.67059
		99% Chebyshev (Mean, Sd) UCL	5.963248

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Vanadium
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	6	Shapiro-Wilk Test Statisitic	0.969276
Number of Unique Samples	6	Shapiro-Wilk 5% Critical Value	0.788
Minimum	7.3	Data are normal at 5% significance level	
Maximum	58.1		
Mean	30.175	95% UCL (Assuming Normal Distribution)	
Median	27.85	Student's-t UCL	45.74255
Standard Deviation	18.92389		
Variance	358.1138	Gamma Distribution Test	
Coefficient of Variation	0.627138	A-D Test Statistic	0.177926
Skewness	0.416666	A-D 5% Critical Value	0.702583
		K-S Test Statistic	0.148297
Gamma Statistics		K-S 5% Critical Value	0.335107
k hat	2.565097	Data follow gamma distribution	
k star (bias corrected)	1.39366	at 5% significance level	
Theta hat	11.76369		
Theta star	21.65163	95% UCLs (Assuming Gamma Distribution)	
nu hat	30.78116	Approximate Gamma UCL	59.55207
nu star	16.72392	Adjusted Gamma UCL	78.02284
Approx.Chi Square Value (.05)	8.473998		
Adjusted Level of Significance	0.01222	Lognormal Distribution Test	
Adjusted Chi Square Value	6.467903	Shapiro-Wilk Test Statisitic	0.957822
		Shapiro-Wilk 5% Critical Value	0.788
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	1.987874		
Maximum of log data	4.062166	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	3.199605	95% H-UCL	106.848
Standard Deviation of log data	0.760498	95% Chebyshev (MVUE) UCL	72.59981
Variance of log data	0.578357	97.5% Chebyshev (MVUE) UCL	90.61551
		99% Chebyshev (MVUE) UCL	126.0039
		95% Non-parametric UCLs	
		CLT UCL	42.88256
		Adj-CLT UCL (Adjusted for skewness)	44.28675
		Mod-t UCL (Adjusted for skewness)	45.96158
		Jackknife UCL	45.74255
		Standard Bootstrap UCL	41.66229
		Bootstrap-t UCL	52.41238
RECOMMENDATION		Hall's Bootstrap UCL	52.63496
Data are normal (0.05)		Percentile Bootstrap UCL	41.64167
		BCA Bootstrap UCL	46.71667
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	63.85032
		97.5% Chebyshev (Mean, Sd) UCL	78.42165
		99% Chebyshev (Mean, Sd) UCL	107.0442

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-BE-1-c-121304.xls	
Variable:	Arsenic	
Raw Statistics		
Number of Observations	2	
Number of Missing Data	0	
Number of Valid Observations	2	
Number of Distinct Observations	2	
Minimum	13.3	
Maximum	29.3	
Mean	21.3	
Standard Deviation	11.31371	
Variance	128	
Coefficient of Variation	0.53116	
Skewness	N/A	Too few observations to calculate
Too Few Distinct Observations?	YES	Too Few Observations To Calculate UCLs
Normal Statistics		
Lilliefors Test Statisitic	N/A	Too Few Distinct Observations To Calculate
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic		
Shapiro-Wilk 5% Critical Value		
5% Normality Test Result		
95% Student's-t UCL	N/A	Too Few Observations To Calculate UCLs
Gamma Statistics		
k hat	0	
k star (bias corrected)	0	
Theta hat	0	
Theta star	0	
nu hat	0	
nu star	0	
5% Approximate Chi Square Value	N/A	
Adjusted Level of Significance	0	
Adjusted Chi Square Value	0	
Anderson-Darling Test Statistic	0	
Anderson-Darling 5% Critical Value	0	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0	
Kolmogrov-Smirnov 5% Critical Value	0	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	N/A	Too Few Observations To Calculate UCLs
95% Adjusted Gamma UCL	N/A	Too Few Observations To Calculate UCLs
Lognormal Statistics		
Minimum of log data	2.587764	
Maximum of log data	3.377588	
Mean of log data	2.982676	
Standard Deviation of log data	0.55849	
Variance of log data	0.311911	
Lilliefors Test Statisitic	N/A	Too Few Distinct Observations To Calculate UCLs
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic		
Shapiro-Wilk 5% Critical Value		
5% Lognormality Test Result		
MLE Mean	0	
MLE Standard Deviation	1.7E+269	
MLE Coefficient of Variation	1.7E+269	
MLE Skewness	2.6E-308	
MLE Median	1.7E+269	
MLE 80% Quantile	3.3E-308	
MLE 90% Quantile	-5E+138	
MLE 95% Quantile	2.6E-308	
MLE 99% Quantile	2.6E-308	
MVU Estimate of Median	0	
MVU Estimate of Mean	21.3	
MVU Estimate of Standard Deviation	11.31371	
MVU Estimate of SE of Mean	8	
95% H-UCL	N/A	Too Few Observations To Calculate UCLs
95% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
97.5% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
99% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
Non-parametric Statisitics		
95% CLT UCL	N/A	Too Few Observations To Calculate UCLs
95% Adjusted-CLT UCL	N/A	Too Few Observations To Calculate UCLs
95% Modified-t UCL	N/A	Too Few Observations To Calculate UCLs
95% Jackknife UCL	N/A	Too Few Observations To Calculate UCLs
95% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
97.5% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
99% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% Bootstrap-t UCL	N/A	Too Few Observations To Calculate UCLs
95% Hall's Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% Percentile Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% BCA Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution		
1st Recommended UCL	N/A	Too Few Observations To Calculate UCLs
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!		
Alternative UCL		

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-BE-1-c-121304.xls	
Variable:	Vanadium	
Raw Statistics		
Number of Observations	2	
Number of Missing Data	0	
Number of Valid Observations	2	
Number of Distinct Observations	2	
Minimum	28.9	
Maximum	30.4	
Mean	29.65	
Standard Deviation	1.06066	
Variance	1.125	
Coefficient of Variation	0.035773	
Skewness	N/A	Too few observations to calculate
Too Few Distinct Observations?	YES	Too Few Observations To Calculate UCLs
Normal Statistics		
Lilliefors Test Statisitic	N/A	Too Few Distinct Observations To Calculate
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic		
Shapiro-Wilk 5% Critical Value		
5% Normality Test Result		
95% Student's-t UCL	N/A	Too Few Observations To Calculate UCLs
Gamma Statistics		
k hat	0	
k star (bias corrected)	0	
Theta hat	0	
Theta star	0	
nu hat	0	
nu star	0	
5% Approximate Chi Square Value	N/A	
Adjusted Level of Significance	0	
Adjusted Chi Square Value	0	
Anderson-Darling Test Statistic	0	
Anderson-Darling 5% Critical Value	0	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0	
Kolmogrov-Smirnov 5% Critical Value	0	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	N/A	Too Few Observations To Calculate UCLs
95% Adjusted Gamma UCL	N/A	Too Few Observations To Calculate UCLs
Lognormal Statistics		
Minimum of log data	3.363842	
Maximum of log data	3.414443	
Mean of log data	3.389142	
Standard Deviation of log data	0.03578	
Variance of log data	0.00128	
Lilliefors Test Statisitic	N/A	Too Few Distinct Observations To Calculate UCLs
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic		
Shapiro-Wilk 5% Critical Value		
5% Lognormality Test Result		
MLE Mean	0	
MLE Standard Deviation	0	
MLE Coefficient of Variation	4.3E-308	
MLE Skewness	1.7E+269	
MLE Median	2.2E-307	
MLE 80% Quantile	4E+129	
MLE 90% Quantile	6.8E-145	
MLE 95% Quantile	0	
MLE 99% Quantile	1E-306	
MVU Estimate of Median	0	
MVU Estimate of Mean	29.65	
MVU Estimate of Standard Deviation	1.06066	
MVU Estimate of SE of Mean	0.75	
95% H-UCL	N/A	Too Few Observations To Calculate UCLs
95% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
97.5% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
99% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
Non-parametric Statisitics		
95% CLT UCL	N/A	Too Few Observations To Calculate UCLs
95% Adjusted-CLT UCL	N/A	Too Few Observations To Calculate UCLs
95% Modified-t UCL	N/A	Too Few Observations To Calculate UCLs
95% Jackknife UCL	N/A	Too Few Observations To Calculate UCLs
95% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
97.5% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
99% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% Bootstrap-t UCL	N/A	Too Few Observations To Calculate UCLs
95% Hall's Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% Percentile Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% BCA Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution		
1st Recommended UCL	N/A	Too Few Observations To Calculate UCLs
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!		
Alternative UCL		

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Arsenic
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	5	Shapiro-Wilk Test Statisitic	0.978925
Number of Unique Samples	5	Shapiro-Wilk 5% Critical Value	0.762
Minimum	13.3	Data are normal at 5% significance level	
Maximum	75		
Mean	45.24	95% UCL (Assuming Normal Distribution)	
Median	50	Student's-t UCL	68.40294
Standard Deviation	24.29533		
Variance	590.263	Gamma Distribution Test	
Coefficient of Variation	0.537032	A-D Test Statistic	0.27542
Skewness	-0.226178	A-D 5% Critical Value	0.682206
		K-S Test Statistic	0.243543
Gamma Statistics		K-S 5% Critical Value	0.359124
k hat	3.304719	Data follow gamma distribution	
k star (bias corrected)	1.455221	at 5% significance level	
Theta hat	13.68952		
Theta star	31.08807	95% UCLs (Assuming Gamma Distribution)	
nu hat	33.04719	Approximate Gamma UCL	94.72596
nu star	14.55221	Adjusted Gamma UCL	136.258
Approx.Chi Square Value (.05)	6.949963		
Adjusted Level of Significance	0.0086	Lognormal Distribution Test	
Adjusted Chi Square Value	4.831585	Shapiro-Wilk Test Statisitic	0.915682
		Shapiro-Wilk 5% Critical Value	0.762
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	2.587764		
Maximum of log data	4.317488	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	3.653119	95% H-UCL	169.6339
Standard Deviation of log data	0.688062	95% Chebyshev (MVUE) UCL	107.465
Variance of log data	0.47343	97.5% Chebyshev (MVUE) UCL	133.8966
		99% Chebyshev (MVUE) UCL	185.8163
		95% Non-parametric UCLs	
		CLT UCL	63.11167
		Adj-CLT UCL (Adjusted for skewness)	61.93736
		Mod-t UCL (Adjusted for skewness)	68.21977
		Jackknife UCL	68.40294
		Standard Bootstrap UCL	61.28013
		Bootstrap-t UCL	66.88229
RECOMMENDATION		Hall's Bootstrap UCL	58.29528
Data are normal (0.05)		Percentile Bootstrap UCL	60.86
		BCA Bootstrap UCL	56.72
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	92.60031
		97.5% Chebyshev (Mean, Sd) UCL	113.0932
		99% Chebyshev (Mean, Sd) UCL	153.3474

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Manganese
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	5	Shapiro-Wilk Test Statisitic	0.637749
Number of Unique Samples	5	Shapiro-Wilk 5% Critical Value	0.762
Minimum	161	Data not normal at 5% significance level	
Maximum	688		
Mean	285.2	95% UCL (Assuming Normal Distribution)	
Median	183	Student's-t UCL	500.8933
Standard Deviation	226.2381		
Variance	51183.7	Gamma Distribution Test	
Coefficient of Variation	0.793261	A-D Test Statistic	0.908744
Skewness	2.184781	A-D 5% Critical Value	0.682685
		K-S Test Statistic	0.391042
Gamma Statistics		K-S 5% Critical Value	0.359452
k hat	2.969639	Data do not follow gamma distribution	
k star (bias corrected)	1.321189	at 5% significance level	
Theta hat	96.03861		
Theta star	215.8662	95% UCLs (Assuming Gamma Distribution)	
nu hat	29.69639	Approximate Gamma UCL	624.4269
nu star	13.21189	Adjusted Gamma UCL	920.0745
Approx.Chi Square Value (.05)	6.034383		
Adjusted Level of Significance	0.0086	Lognormal Distribution Test	
Adjusted Chi Square Value	4.095354	Shapiro-Wilk Test Statisitic	0.7187
		Shapiro-Wilk 5% Critical Value	0.762
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	5.081404		
Maximum of log data	6.533789	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	5.475472	95% H-UCL	773.1537
Standard Deviation of log data	0.60268	95% Chebyshev (MVUE) UCL	594.0893
Variance of log data	0.363223	97.5% Chebyshev (MVUE) UCL	732.0842
		99% Chebyshev (MVUE) UCL	1003.148
		95% Non-parametric UCLs	
		CLT UCL	451.621
		Adj-CLT UCL (Adjusted for skewness)	557.2502
		Mod-t UCL (Adjusted for skewness)	517.3693
		Jackknife UCL	500.8933
		Standard Bootstrap UCL	427.1566
		Bootstrap-t UCL	2910.587
RECOMMENDATION		Hall's Bootstrap UCL	1902.603
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	481.6
		BCA Bootstrap UCL	582.6
Use 95% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	726.2193
		97.5% Chebyshev (Mean, Sd) UCL	917.0488
		99% Chebyshev (Mean, Sd) UCL	1291.896
Recommended UCL exceeds the maximum observation			

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Thallium
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	5	Shapiro-Wilk Test Statisitic	0.842691
Number of Unique Samples	5	Shapiro-Wilk 5% Critical Value	0.762
Minimum	0.79	Data are normal at 5% significance level	
Maximum	1.7		
Mean	1.098	95% UCL (Assuming Normal Distribution)	
Median	1	Student's-t UCL	1.437118
Standard Deviation	0.355696		
Variance	0.12652	Gamma Distribution Test	
Coefficient of Variation	0.323949	A-D Test Statistic	0.394728
Skewness	1.668839	A-D 5% Critical Value	0.678807
		K-S Test Statistic	0.261577
Gamma Statistics		K-S 5% Critical Value	0.357424
k hat	13.85602	Data follow gamma distribution	
k star (bias corrected)	5.675741	at 5% significance level	
Theta hat	0.079244		
Theta star	0.193455	95% UCLs (Assuming Gamma Distribution)	
nu hat	138.5602	Approximate Gamma UCL	1.541119
nu star	56.75741	Adjusted Gamma UCL	1.805854
Approx.Chi Square Value (.05)	40.4379		
Adjusted Level of Significance	0.0086	Lognormal Distribution Test	
Adjusted Chi Square Value	34.50979	Shapiro-Wilk Test Statisitic	0.912001
		Shapiro-Wilk 5% Critical Value	0.762
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	-0.235722		
Maximum of log data	0.530628	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	0.056971	95% H-UCL	1.564735
Standard Deviation of log data	0.292014	95% Chebyshev (MVUE) UCL	1.716719
Variance of log data	0.085272	97.5% Chebyshev (MVUE) UCL	1.985675
		99% Chebyshev (MVUE) UCL	2.513985
		95% Non-parametric UCLs	
		CLT UCL	1.359651
		Adj-CLT UCL (Adjusted for skewness)	1.486505
		Mod-t UCL (Adjusted for skewness)	1.456904
		Jackknife UCL	1.437118
		Standard Bootstrap UCL	1.327704
		Bootstrap-t UCL	1.782137
RECOMMENDATION		Hall's Bootstrap UCL	2.545452
Data are normal (0.05)		Percentile Bootstrap UCL	1.358
		BCA Bootstrap UCL	1.3
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	1.79138
		97.5% Chebyshev (Mean, Sd) UCL	2.091406
		99% Chebyshev (Mean, Sd) UCL	2.68075

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Vanadium
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	5	Shapiro-Wilk Test Statisitic	0.818439
Number of Unique Samples	5	Shapiro-Wilk 5% Critical Value	0.762
Minimum	28.9	Data are normal at 5% significance level	
Maximum	69.8		
Mean	41.68	95% UCL (Assuming Normal Distribution)	
Median	37	Student's-t UCL	57.51596
Standard Deviation	16.61015		
Variance	275.897	Gamma Distribution Test	
Coefficient of Variation	0.398516	A-D Test Statistic	0.428149
Skewness	1.69211	A-D 5% Critical Value	0.679097
		K-S Test Statistic	0.23872
Gamma Statistics		K-S 5% Critical Value	0.357675
k hat	9.406283	Data follow gamma distribution	
k star (bias corrected)	3.895846	at 5% significance level	
Theta hat	4.431081		
Theta star	10.69857	95% UCLs (Assuming Gamma Distribution)	
nu hat	94.06283	Approximate Gamma UCL	63.28258
nu star	38.95846	Adjusted Gamma UCL	77.08046
Approx.Chi Square Value (.05)	25.65933		
Adjusted Level of Significance	0.0086	Lognormal Distribution Test	
Adjusted Chi Square Value	21.06615	Shapiro-Wilk Test Statisitic	0.887683
		Shapiro-Wilk 5% Critical Value	0.762
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	3.363842		
Maximum of log data	4.245634	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	3.675925	95% H-UCL	65.70135
Standard Deviation of log data	0.353308	95% Chebyshev (MVUE) UCL	69.94048
Variance of log data	0.124826	97.5% Chebyshev (MVUE) UCL	82.25113
		99% Chebyshev (MVUE) UCL	106.433
		95% Non-parametric UCLs	
		CLT UCL	53.89844
		Adj-CLT UCL (Adjusted for skewness)	59.90482
		Mod-t UCL (Adjusted for skewness)	58.45283
		Jackknife UCL	57.51596
		Standard Bootstrap UCL	52.40041
		Bootstrap-t UCL	78.15724
RECOMMENDATION		Hall's Bootstrap UCL	104.6621
Data are normal (0.05)		Percentile Bootstrap UCL	53.74
		BCA Bootstrap UCL	51.18
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	74.05914
		97.5% Chebyshev (Mean, Sd) UCL	88.06962
		99% Chebyshev (Mean, Sd) UCL	115.5905

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Arsenic
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	4	Shapiro-Wilk Test Statisitic	0.900795
Number of Unique Samples	4	Shapiro-Wilk 5% Critical Value	0.748
Minimum	122	Data are normal at 5% significance level	
Maximum	375		
Mean	218.75	95% UCL (Assuming Normal Distribution)	
Median	189	Student's-t UCL	354.2418
Standard Deviation	115.1474		
Variance	13258.92	Gamma Distribution Test	
Coefficient of Variation	0.526388	A-D Test Statistic	0.310216
Skewness	1.082355	A-D 5% Critical Value	0.65896
		K-S Test Statistic	0.273972
Gamma Statistics		K-S 5% Critical Value	0.395855
k hat	5.181726	Data follow gamma distribution	
k star (bias corrected)	1.462098	at 5% significance level	
Theta hat	42.21567		
Theta star	149.6138	95% UCLs (Assuming Gamma Distribution)	
nu hat	41.4538	Approximate Gamma UCL	508.9847
nu star	11.69678	Adjusted Gamma UCL	N/A
Approx.Chi Square Value (.05)	5.027011		
Adjusted Level of Significance	N/A	Lognormal Distribution Test	
Adjusted Chi Square Value	N/A	Shapiro-Wilk Test Statisitic	0.939989
		Shapiro-Wilk 5% Critical Value	0.748
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	4.804021		
Maximum of log data	5.926926	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	5.288344	95% H-UCL	922.7196
Standard Deviation of log data	0.509126	95% Chebyshev (MVUE) UCL	454.8911
Variance of log data	0.25921	97.5% Chebyshev (MVUE) UCL	557.4667
		99% Chebyshev (MVUE) UCL	758.9565
		95% Non-parametric UCLs	
		CLT UCL	313.4503
		Adj-CLT UCL (Adjusted for skewness)	346.7426
		Mod-t UCL (Adjusted for skewness)	359.4347
		Jackknife UCL	354.2418
		Standard Bootstrap UCL	N/R
		Bootstrap-t UCL	N/R
RECOMMENDATION		Hall's Bootstrap UCL	N/R
Data are normal (0.05)		Percentile Bootstrap UCL	N/R
		BCA Bootstrap UCL	N/R
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	469.7079
		97.5% Chebyshev (Mean, Sd) UCL	578.2975
		99% Chebyshev (Mean, Sd) UCL	791.6009

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Cadmium
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	4	Shapiro-Wilk Test Statisitic	0.90816
Number of Unique Samples	4	Shapiro-Wilk 5% Critical Value	0.748
Minimum	2.6	Data are normal at 5% significance level	
Maximum	5		
Mean	3.525	95% UCL (Assuming Normal Distribution)	
Median	3.25	Student's-t UCL	4.760516
Standard Deviation	1.05		
Variance	1.1025	Gamma Distribution Test	
Coefficient of Variation	0.297872	A-D Test Statistic	0.297607
Skewness	1.30893	A-D 5% Critical Value	0.657094
		K-S Test Statistic	0.228591
Gamma Statistics		K-S 5% Critical Value	0.394488
k hat	16.39907	Data follow gamma distribution	
k star (bias corrected)	4.266435	at 5% significance level	
Theta hat	0.214951		
Theta star	0.826217	95% UCLs (Assuming Gamma Distribution)	
nu hat	131.1926	Approximate Gamma UCL	5.527253
nu star	34.13148	Adjusted Gamma UCL	N/A
Approx.Chi Square Value (.05)	21.76732		
Adjusted Level of Significance	N/A	Lognormal Distribution Test	
Adjusted Chi Square Value	N/A	Shapiro-Wilk Test Statisitic	0.952544
		Shapiro-Wilk 5% Critical Value	0.748
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	0.955511		
Maximum of log data	1.609438	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	1.229081	95% H-UCL	5.92672
Standard Deviation of log data	0.281125	95% Chebyshev (MVUE) UCL	5.664424
Variance of log data	0.079032	97.5% Chebyshev (MVUE) UCL	6.592191
		99% Chebyshev (MVUE) UCL	8.41461
		95% Non-parametric UCLs	
		CLT UCL	4.388548
		Adj-CLT UCL (Adjusted for skewness)	4.755683
		Mod-t UCL (Adjusted for skewness)	4.817781
		Jackknife UCL	4.760516
		Standard Bootstrap UCL	N/R
		Bootstrap-t UCL	N/R
RECOMMENDATION		Hall's Bootstrap UCL	N/R
Data are normal (0.05)		Percentile Bootstrap UCL	N/R
		BCA Bootstrap UCL	N/R
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	5.813422
		97.5% Chebyshev (Mean, Sd) UCL	6.803624
		99% Chebyshev (Mean, Sd) UCL	8.748684

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Manganese
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	4	Shapiro-Wilk Test Statisitic	0.989003
Number of Unique Samples	4	Shapiro-Wilk 5% Critical Value	0.748
Minimum	124	Data are normal at 5% significance level	
Maximum	652		
Mean	367.75	95% UCL (Assuming Normal Distribution)	
Median	347.5	Student's-t UCL	628.7902
Standard Deviation	221.8444		
Variance	49214.92	Gamma Distribution Test	
Coefficient of Variation	0.603248	A-D Test Statistic	0.202984
Skewness	0.492539	A-D 5% Critical Value	0.6593
		K-S Test Statistic	0.176481
Gamma Statistics		K-S 5% Critical Value	0.396477
k hat	3.208049	Data follow gamma distribution	
k star (bias corrected)	0.968679	at 5% significance level	
Theta hat	114.6335		
Theta star	379.6407	95% UCLs (Assuming Gamma Distribution)	
nu hat	25.66439	Approximate Gamma UCL	1100.274
nu star	7.749432	Adjusted Gamma UCL	N/A
Approx.Chi Square Value (.05)	2.590131		
Adjusted Level of Significance	N/A	Lognormal Distribution Test	
Adjusted Chi Square Value	N/A	Shapiro-Wilk Test Statisitic	0.975345
		Shapiro-Wilk 5% Critical Value	0.748
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	4.820282		
Maximum of log data	6.480045	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	5.743524	95% H-UCL	5259.437
Standard Deviation of log data	0.699536	95% Chebyshev (MVUE) UCL	920.464
Variance of log data	0.48935	97.5% Chebyshev (MVUE) UCL	1157.489
		99% Chebyshev (MVUE) UCL	1623.079
		95% Non-parametric UCLs	
		CLT UCL	550.2007
		Adj-CLT UCL (Adjusted for skewness)	579.3891
		Mod-t UCL (Adjusted for skewness)	633.343
		Jackknife UCL	628.7902
		Standard Bootstrap UCL	N/R
		Bootstrap-t UCL	N/R
RECOMMENDATION		Hall's Bootstrap UCL	N/R
Data are normal (0.05)		Percentile Bootstrap UCL	N/R
		BCA Bootstrap UCL	N/R
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	851.2486
		97.5% Chebyshev (Mean, Sd) UCL	1060.459
		99% Chebyshev (Mean, Sd) UCL	1471.412

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Thallium
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	4	Shapiro-Wilk Test Statisitic	0.967975
Number of Unique Samples	4	Shapiro-Wilk 5% Critical Value	0.748
Minimum	0.295	Data are normal at 5% significance level	
Maximum	2.7		
Mean	1.62375	95% UCL (Assuming Normal Distribution)	
Median	1.75	Student's-t UCL	2.869175
Standard Deviation	1.058422		
Variance	1.120256	Gamma Distribution Test	
Coefficient of Variation	0.651838	A-D Test Statistic	0.353998
Skewness	-0.529619	A-D 5% Critical Value	0.660758
		K-S Test Statistic	0.252137
Gamma Statistics		K-S 5% Critical Value	0.398082
k hat	1.942788	Data follow gamma distribution	
k star (bias corrected)	0.652364	at 5% significance level	
Theta hat	0.835784		
Theta star	2.489026	95% UCLs (Assuming Gamma Distribution)	
nu hat	15.5423	Approximate Gamma UCL	6.756501
nu star	5.218909	Adjusted Gamma UCL	N/A
Approx.Chi Square Value (.05)	1.25423		
Adjusted Level of Significance	N/A	Lognormal Distribution Test	
Adjusted Chi Square Value	N/A	Shapiro-Wilk Test Statisitic	0.864325
		Shapiro-Wilk 5% Critical Value	0.748
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	-1.22078		
Maximum of log data	0.993252	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	0.205823	95% H-UCL	359.6244
Standard Deviation of log data	0.99965	95% Chebyshev (MVUE) UCL	5.271333
Variance of log data	0.9993	97.5% Chebyshev (MVUE) UCL	6.797816
		99% Chebyshev (MVUE) UCL	9.796297
		95% Non-parametric UCLs	
		CLT UCL	2.494224
		Adj-CLT UCL (Adjusted for skewness)	2.344483
		Mod-t UCL (Adjusted for skewness)	2.845819
		Jackknife UCL	2.869175
		Standard Bootstrap UCL	N/R
		Bootstrap-t UCL	N/R
RECOMMENDATION		Hall's Bootstrap UCL	N/R
Data are normal (0.05)		Percentile Bootstrap UCL	N/R
		BCA Bootstrap UCL	N/R
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	3.930526
		97.5% Chebyshev (Mean, Sd) UCL	4.92867
		99% Chebyshev (Mean, Sd) UCL	6.889331
Recommended UCL exceeds the maximum observation			

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Vanadium
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	4	Shapiro-Wilk Test Statisitic	0.962311
Number of Unique Samples	4	Shapiro-Wilk 5% Critical Value	0.748
Minimum	40.1	Data are normal at 5% significance level	
Maximum	79.2		
Mean	57.225	95% UCL (Assuming Normal Distribution)	
Median	54.8	Student's-t UCL	76.48341
Standard Deviation	16.36671		
Variance	267.8692	Gamma Distribution Test	
Coefficient of Variation	0.286006	A-D Test Statistic	0.230177
Skewness	0.828285	A-D 5% Critical Value	0.657093
		K-S Test Statistic	0.206955
Gamma Statistics		K-S 5% Critical Value	0.394457
k hat	16.85326	Data follow gamma distribution	
k star (bias corrected)	4.379982	at 5% significance level	
Theta hat	3.395485		
Theta star	13.06512	95% UCLs (Assuming Gamma Distribution)	
nu hat	134.8261	Approximate Gamma UCL	89.13836
nu star	35.03986	Adjusted Gamma UCL	N/A
Approx.Chi Square Value (.05)	22.49487		
Adjusted Level of Significance	N/A	Lognormal Distribution Test	
Adjusted Chi Square Value	N/A	Shapiro-Wilk Test Statisitic	0.989032
		Shapiro-Wilk 5% Critical Value	0.748
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	3.691376		
Maximum of log data	4.371976	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	4.01703	95% H-UCL	96.39858
Standard Deviation of log data	0.281482	95% Chebyshev (MVUE) UCL	92.08414
Variance of log data	0.079232	97.5% Chebyshev (MVUE) UCL	107.1782
		99% Chebyshev (MVUE) UCL	136.8276
		95% Non-parametric UCLs	
		CLT UCL	70.68542
		Adj-CLT UCL (Adjusted for skewness)	74.3067
		Mod-t UCL (Adjusted for skewness)	77.04825
		Jackknife UCL	76.48341
		Standard Bootstrap UCL	N/R
		Bootstrap-t UCL	N/R
RECOMMENDATION		Hall's Bootstrap UCL	N/R
Data are normal (0.05)		Percentile Bootstrap UCL	N/R
		BCA Bootstrap UCL	N/R
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	92.89542
		97.5% Chebyshev (Mean, Sd) UCL	108.33
		99% Chebyshev (Mean, Sd) UCL	138.6483

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Zinc
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	4	Shapiro-Wilk Test Statisitic	0.661545
Number of Unique Samples	4	Shapiro-Wilk 5% Critical Value	0.748
Minimum	596	Data not normal at 5% significance level	
Maximum	3200		
Mean	1287.5	95% UCL (Assuming Normal Distribution)	
Median	677	Student's-t UCL	2788.604
Standard Deviation	1275.71		
Variance	1627436	Gamma Distribution Test	
Coefficient of Variation	0.990843	A-D Test Statistic	0.823087
Skewness	1.993317	A-D 5% Critical Value	0.660935
		K-S Test Statistic	0.443955
Gamma Statistics		K-S 5% Critical Value	0.398237
k hat	1.894116	Data do not follow gamma distribution	
k star (bias corrected)	0.640196	at 5% significance level	
Theta hat	679.7365		
Theta star	2011.104	95% UCLs (Assuming Gamma Distribution)	
nu hat	15.15293	Approximate Gamma UCL	5457.032
nu star	5.121566	Adjusted Gamma UCL	N/A
Approx.Chi Square Value (.05)	1.208352		
Adjusted Level of Significance	N/A	Lognormal Distribution Test	
Adjusted Chi Square Value	N/A	Shapiro-Wilk Test Statisitic	0.707174
		Shapiro-Wilk 5% Critical Value	0.748
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	6.390241		
Maximum of log data	8.070906	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	6.873834	95% H-UCL	38081.45
Standard Deviation of log data	0.800767	95% Chebyshev (MVUE) UCL	3240.268
Variance of log data	0.641227	97.5% Chebyshev (MVUE) UCL	4115.979
		99% Chebyshev (MVUE) UCL	5836.143
		95% Non-parametric UCLs	
		CLT UCL	2336.678
		Adj-CLT UCL (Adjusted for skewness)	3015.958
		Mod-t UCL (Adjusted for skewness)	2894.558
		Jackknife UCL	2788.604
		Standard Bootstrap UCL	N/R
		Bootstrap-t UCL	N/R
RECOMMENDATION		Hall's Bootstrap UCL	N/R
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	N/R
		BCA Bootstrap UCL	N/R
Use 95% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	4067.845
		97.5% Chebyshev (Mean, Sd) UCL	5270.903
		99% Chebyshev (Mean, Sd) UCL	7634.076
Recommended UCL exceeds the maximum observation			

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-HB01-cf-121304.xls	
Variable:	Benzo(a)anthracene	
Raw Statistics		
Number of Observations	1	
Number of Missing Data	0	
Number of Valid Observations	1	
Constant Data	1	
Minimum	1.3	
Maximum	1.3	
Mean	1.3	
Standard Deviation	N/A	Too few observations to calculate
Variance	N/A	Too few observations to calculate
Coefficient of Variation	0	
Skewness	N/A	Too few observations to calculate
Too Few Distinct Observations?	YES	Too Few Observations To Calculate UCLs
Normal Statistics		
Lilliefors Test Statisitic	N/A	Too Few Distinct Observations To Calculate
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic		
Shapiro-Wilk 5% Critical Value		
5% Normality Test Result		
95% Student's-t UCL	N/A	Too Few Observations To Calculate UCLs
Gamma Statistics		
k hat	N/A	
k star (bias corrected)	N/A	
Theta hat	N/A	
Theta star	N/A	
nu hat	N/A	
nu star	N/A	
5% Approximate Chi Square Value	N/A	
Adjusted Level of Significance	0	
Adjusted Chi Square Value	0	
Anderson-Darling Test Statistic	N/A	
Anderson-Darling 5% Critical Value	N/A	
Anderson-Darling 5% Gamma Test Result	N/A	
Kolmogrov-Smirnov Test Statistic	N/A	
Kolmogrov-Smirnov 5% Critical Value	N/A	
Kolmogrov-Smirnov 5% Gamma Test Result	N/A	
5% Gamma Test Result	N/A	
95% Approximate Gamma UCL	N/A	Too Few Observations To Calculate UCLs
95% Adjusted Gamma UCL	N/A	Too Few Observations To Calculate UCLs
Lognormal Statistics		
Minimum of log data	0.262364	
Maximum of log data	0.262364	
Mean of log data	0.262364	
Standard Deviation of log data	1.7E+269	
Variance of log data	0	
Lilliefors Test Statisitic	N/A	Too Few Distinct Observations To Calculate UCLs
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic		
Shapiro-Wilk 5% Critical Value		
5% Lognormality Test Result		
MLE Mean	0	
MLE Standard Deviation	1.7E+269	
MLE Coefficient of Variation	1.7E+269	
MLE Skewness	0	
MLE Median	1.7E+269	
MLE 80% Quantile	0	
MLE 90% Quantile	-5E+138	
MLE 95% Quantile	2.6E-308	
MLE 99% Quantile	2.6E-308	
MVU Estimate of Median	0	
MVU Estimate of Mean	0	
MVU Estimate of Standard Deviation	0	
MVU Estimate of SE of Mean	0	
95% H-UCL	N/A	Too Few Observations To Calculate UCLs
95% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
97.5% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
99% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
Non-parametric Statisitics		
95% CLT UCL	N/A	Too Few Observations To Calculate UCLs
95% Adjusted-CLT UCL	N/A	Too Few Observations To Calculate UCLs
95% Modified-t UCL	N/A	Too Few Observations To Calculate UCLs
95% Jackknife UCL	N/A	Too Few Observations To Calculate UCLs
95% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
97.5% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
99% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% Bootstrap-t UCL	N/A	Too Few Observations To Calculate UCLs
95% Hall's Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% Percentile Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% BCA Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution		
1st Recommended UCL	N/A	Too Few Observations To Calculate UCLs
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!		
Alternative UCL		

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-HB01-cf-121304.xls	
Variable:	Benzo(a)pyrene	
Raw Statistics		
Number of Observations	1	
Number of Missing Data	0	
Number of Valid Observations	1	
Constant Data	1	
Minimum	1.4	
Maximum	1.4	
Mean	1.4	
Standard Deviation	N/A	Too few observations to calculate
Variance	N/A	Too few observations to calculate
Coefficient of Variation	0	
Skewness	N/A	Too few observations to calculate
Too Few Distinct Observations?	YES	Too Few Observations To Calculate UCLs
Normal Statistics		
Lilliefors Test Statisitic	N/A	Too Few Distinct Observations To Calculate
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic		
Shapiro-Wilk 5% Critical Value		
5% Normality Test Result		
95% Student's-t UCL	N/A	Too Few Observations To Calculate UCLs
Gamma Statistics		
k hat	N/A	
k star (bias corrected)	N/A	
Theta hat	N/A	
Theta star	N/A	
nu hat	N/A	
nu star	N/A	
5% Approximate Chi Square Value	N/A	
Adjusted Level of Significance	0	
Adjusted Chi Square Value	0	
Anderson-Darling Test Statistic	N/A	
Anderson-Darling 5% Critical Value	N/A	
Anderson-Darling 5% Gamma Test Result	N/A	
Kolmogrov-Smirnov Test Statistic	N/A	
Kolmogrov-Smirnov 5% Critical Value	N/A	
Kolmogrov-Smirnov 5% Gamma Test Result	N/A	
5% Gamma Test Result	N/A	
95% Approximate Gamma UCL	N/A	Too Few Observations To Calculate UCLs
95% Adjusted Gamma UCL	N/A	Too Few Observations To Calculate UCLs
Lognormal Statistics		
Minimum of log data	0.336472	
Maximum of log data	0.336472	
Mean of log data	0.336472	
Standard Deviation of log data	2.2E-307	
Variance of log data	0	
Lilliefors Test Statisitic	N/A	Too Few Distinct Observations To Calculate UCLs
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic		
Shapiro-Wilk 5% Critical Value		
5% Lognormality Test Result		
MLE Mean	0	
MLE Standard Deviation	0	
MLE Coefficient of Variation	2.8E-308	
MLE Skewness	1.7E+269	
MLE Median	2.2E-307	
MLE 80% Quantile	4E+129	
MLE 90% Quantile	2.6E-265	
MLE 95% Quantile	0	
MLE 99% Quantile	1.1E-306	
MVU Estimate of Median	0	
MVU Estimate of Mean	7E-306	
MVU Estimate of Standard Deviation	1.7E+269	
MVU Estimate of SE of Mean	0	
95% H-UCL	N/A	Too Few Observations To Calculate UCLs
95% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
97.5% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
99% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
Non-parametric Statisitics		
95% CLT UCL	N/A	Too Few Observations To Calculate UCLs
95% Adjusted-CLT UCL	N/A	Too Few Observations To Calculate UCLs
95% Modified-t UCL	N/A	Too Few Observations To Calculate UCLs
95% Jackknife UCL	N/A	Too Few Observations To Calculate UCLs
95% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
97.5% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
99% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% Bootstrap-t UCL	N/A	Too Few Observations To Calculate UCLs
95% Hall's Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% Percentile Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% BCA Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution		
1st Recommended UCL	N/A	Too Few Observations To Calculate UCLs
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!		
Alternative UCL		

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-HB01-cf-121304.xls	
Variable:	Benzo(b)fluoranthene	
Raw Statistics		
Number of Observations	1	
Number of Missing Data	0	
Number of Valid Observations	1	
Constant Data	1	
Minimum	2.1	
Maximum	2.1	
Mean	2.1	
Standard Deviation	N/A	Too few observations to calculate
Variance	N/A	Too few observations to calculate
Coefficient of Variation	0	
Skewness	N/A	Too few observations to calculate
Too Few Distinct Observations?	YES	Too Few Observations To Calculate UCLs
Normal Statistics		
Lilliefors Test Statisitic	N/A	Too Few Distinct Observations To Calculate
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic		
Shapiro-Wilk 5% Critical Value		
5% Normality Test Result		
95% Student's-t UCL	N/A	Too Few Observations To Calculate UCLs
Gamma Statistics		
k hat	N/A	
k star (bias corrected)	N/A	
Theta hat	N/A	
Theta star	N/A	
nu hat	N/A	
nu star	N/A	
5% Approximate Chi Square Value	N/A	
Adjusted Level of Significance	0	
Adjusted Chi Square Value	0	
Anderson-Darling Test Statistic	N/A	
Anderson-Darling 5% Critical Value	N/A	
Anderson-Darling 5% Gamma Test Result	N/A	
Kolmogrov-Smirnov Test Statistic	N/A	
Kolmogrov-Smirnov 5% Critical Value	N/A	
Kolmogrov-Smirnov 5% Gamma Test Result	N/A	
5% Gamma Test Result	N/A	
95% Approximate Gamma UCL	N/A	Too Few Observations To Calculate UCLs
95% Adjusted Gamma UCL	N/A	Too Few Observations To Calculate UCLs
Lognormal Statistics		
Minimum of log data	0.741937	
Maximum of log data	0.741937	
Mean of log data	0.741937	
Standard Deviation of log data	2.2E-307	
Variance of log data	0	
Lilliefors Test Statisitic	N/A	Too Few Distinct Observations To Calculate UCLs
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic		
Shapiro-Wilk 5% Critical Value		
5% Lognormality Test Result		
MLE Mean	0	
MLE Standard Deviation	0	
MLE Coefficient of Variation	2.4E-308	
MLE Skewness	1.7E+269	
MLE Median	2.2E-307	
MLE 80% Quantile	4E+129	
MLE 90% Quantile	7.8E-304	
MLE 95% Quantile	0	
MLE 99% Quantile	1.1E-306	
MVU Estimate of Median	0	
MVU Estimate of Mean	7E-306	
MVU Estimate of Standard Deviation	1.7E+269	
MVU Estimate of SE of Mean	0	
95% H-UCL	N/A	Too Few Observations To Calculate UCLs
95% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
97.5% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
99% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
Non-parametric Statisitics		
95% CLT UCL	N/A	Too Few Observations To Calculate UCLs
95% Adjusted-CLT UCL	N/A	Too Few Observations To Calculate UCLs
95% Modified-t UCL	N/A	Too Few Observations To Calculate UCLs
95% Jackknife UCL	N/A	Too Few Observations To Calculate UCLs
95% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
97.5% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
99% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% Bootstrap-t UCL	N/A	Too Few Observations To Calculate UCLs
95% Hall's Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% Percentile Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% BCA Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution		
1st Recommended UCL	N/A	Too Few Observations To Calculate UCLs
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!		
Alternative UCL		

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-HB01-cf-121304.xls	
Variable:	bis(2-Ethylhexyl)phthalate	
Raw Statistics		
Number of Observations	1	
Number of Missing Data	0	
Number of Valid Observations	1	
Constant Data	1	
Minimum	37	
Maximum	37	
Mean	37	
Standard Deviation	N/A	Too few observations to calculate
Variance	N/A	Too few observations to calculate
Coefficient of Variation	0	
Skewness	N/A	Too few observations to calculate
Too Few Distinct Observations?	YES	Too Few Observations To Calculate UCLs
Normal Statistics		
Lilliefors Test Statisitic	N/A	Too Few Distinct Observations To Calculate
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic		
Shapiro-Wilk 5% Critical Value		
5% Normality Test Result		
95% Student's-t UCL	N/A	Too Few Observations To Calculate UCLs
Gamma Statistics		
k hat	N/A	
k star (bias corrected)	N/A	
Theta hat	N/A	
Theta star	N/A	
nu hat	N/A	
nu star	N/A	
5% Approximate Chi Square Value	N/A	
Adjusted Level of Significance	0	
Adjusted Chi Square Value	0	
Anderson-Darling Test Statistic	N/A	
Anderson-Darling 5% Critical Value	N/A	
Anderson-Darling 5% Gamma Test Result	N/A	
Kolmogrov-Smirnov Test Statistic	N/A	
Kolmogrov-Smirnov 5% Critical Value	N/A	
Kolmogrov-Smirnov 5% Gamma Test Result	N/A	
5% Gamma Test Result	N/A	
95% Approximate Gamma UCL	N/A	Too Few Observations To Calculate UCLs
95% Adjusted Gamma UCL	N/A	Too Few Observations To Calculate UCLs
Lognormal Statistics		
Minimum of log data	3.610918	
Maximum of log data	3.610918	
Mean of log data	3.610918	
Standard Deviation of log data	2.2E-307	
Variance of log data	0	
Lilliefors Test Statisitic	N/A	Too Few Distinct Observations To Calculate UCLs
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic		
Shapiro-Wilk 5% Critical Value		
5% Lognormality Test Result		
MLE Mean	0	
MLE Standard Deviation	0	
MLE Coefficient of Variation	3.2E-308	
MLE Skewness	1.7E+269	
MLE Median	2.2E-307	
MLE 80% Quantile	4E+129	
MLE 90% Quantile	2.6E-265	
MLE 95% Quantile	0	
MLE 99% Quantile	1.1E-306	
MVU Estimate of Median	0	
MVU Estimate of Mean	7E-306	
MVU Estimate of Standard Deviation	1.7E+269	
MVU Estimate of SE of Mean	0	
95% H-UCL	N/A	Too Few Observations To Calculate UCLs
95% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
97.5% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
99% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
Non-parametric Statisitics		
95% CLT UCL	N/A	Too Few Observations To Calculate UCLs
95% Adjusted-CLT UCL	N/A	Too Few Observations To Calculate UCLs
95% Modified-t UCL	N/A	Too Few Observations To Calculate UCLs
95% Jackknife UCL	N/A	Too Few Observations To Calculate UCLs
95% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
97.5% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
99% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% Bootstrap-t UCL	N/A	Too Few Observations To Calculate UCLs
95% Hall's Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% Percentile Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% BCA Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution		
1st Recommended UCL	N/A	Too Few Observations To Calculate UCLs
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!		
Alternative UCL		

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-HB01-cf-121304.xls	
Variable:	Dibenz(a,h)anthracene	
Raw Statistics		
Number of Observations	1	
Number of Missing Data	0	
Number of Valid Observations	1	
Constant Data	1	
Minimum	0.21	
Maximum	0.21	
Mean	0.21	
Standard Deviation	N/A	Too few observations to calculate
Variance	N/A	Too few observations to calculate
Coefficient of Variation	0	
Skewness	N/A	Too few observations to calculate
Too Few Distinct Observations?	YES	Too Few Observations To Calculate UCLs
Normal Statistics		
Lilliefors Test Statisitic	N/A	Too Few Distinct Observations To Calculate
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic		
Shapiro-Wilk 5% Critical Value		
5% Normality Test Result		
95% Student's-t UCL	N/A	Too Few Observations To Calculate UCLs
Gamma Statistics		
k hat	N/A	
k star (bias corrected)	N/A	
Theta hat	N/A	
Theta star	N/A	
nu hat	N/A	
nu star	N/A	
5% Approximate Chi Square Value	N/A	
Adjusted Level of Significance	0	
Adjusted Chi Square Value	0	
Anderson-Darling Test Statistic	N/A	
Anderson-Darling 5% Critical Value	N/A	
Anderson-Darling 5% Gamma Test Result	N/A	
Kolmogrov-Smirnov Test Statistic	N/A	
Kolmogrov-Smirnov 5% Critical Value	N/A	
Kolmogrov-Smirnov 5% Gamma Test Result	N/A	
5% Gamma Test Result	N/A	
95% Approximate Gamma UCL	N/A	Too Few Observations To Calculate UCLs
95% Adjusted Gamma UCL	N/A	Too Few Observations To Calculate UCLs
Lognormal Statistics		
Minimum of log data	-1.560648	
Maximum of log data	-1.560648	
Mean of log data	-1.560648	
Standard Deviation of log data	2.2E-307	
Variance of log data	0	
Lilliefors Test Statisitic	N/A	Too Few Distinct Observations To Calculate UCLs
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic		
Shapiro-Wilk 5% Critical Value		
5% Lognormality Test Result		
MLE Mean	0	
MLE Standard Deviation	0	
MLE Coefficient of Variation	4.3E-308	
MLE Skewness	1.7E+269	
MLE Median	2.2E-307	
MLE 80% Quantile	4E+129	
MLE 90% Quantile	1.2E+217	
MLE 95% Quantile	0	
MLE 99% Quantile	1.1E-306	
MVU Estimate of Median	0	
MVU Estimate of Mean	7E-306	
MVU Estimate of Standard Deviation	1.7E+269	
MVU Estimate of SE of Mean	0	
95% H-UCL	N/A	Too Few Observations To Calculate UCLs
95% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
97.5% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
99% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
Non-parametric Statisitics		
95% CLT UCL	N/A	Too Few Observations To Calculate UCLs
95% Adjusted-CLT UCL	N/A	Too Few Observations To Calculate UCLs
95% Modified-t UCL	N/A	Too Few Observations To Calculate UCLs
95% Jackknife UCL	N/A	Too Few Observations To Calculate UCLs
95% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
97.5% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
99% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% Bootstrap-t UCL	N/A	Too Few Observations To Calculate UCLs
95% Hall's Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% Percentile Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% BCA Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution		
1st Recommended UCL	N/A	Too Few Observations To Calculate UCLs
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!		
Alternative UCL		

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-HB01-cf-121304.xls	
Variable:	Indeno(1,2,3-cd)pyrene	
Raw Statistics		
Number of Observations	1	
Number of Missing Data	0	
Number of Valid Observations	1	
Constant Data	1	
Minimum	0.94	
Maximum	0.94	
Mean	0.94	
Standard Deviation	N/A	Too few observations to calculate
Variance	N/A	Too few observations to calculate
Coefficient of Variation	0	
Skewness	N/A	Too few observations to calculate
Too Few Distinct Observations?	YES	Too Few Observations To Calculate UCLs
Normal Statistics		
Lilliefors Test Statisitic	N/A	Too Few Distinct Observations To Calculate
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic		
Shapiro-Wilk 5% Critical Value		
5% Normality Test Result		
95% Student's-t UCL	N/A	Too Few Observations To Calculate UCLs
Gamma Statistics		
k hat	N/A	
k star (bias corrected)	N/A	
Theta hat	N/A	
Theta star	N/A	
nu hat	N/A	
nu star	N/A	
5% Approximate Chi Square Value	N/A	
Adjusted Level of Significance	0	
Adjusted Chi Square Value	0	
Anderson-Darling Test Statistic	N/A	
Anderson-Darling 5% Critical Value	N/A	
Anderson-Darling 5% Gamma Test Result	N/A	
Kolmogrov-Smirnov Test Statistic	N/A	
Kolmogrov-Smirnov 5% Critical Value	N/A	
Kolmogrov-Smirnov 5% Gamma Test Result	N/A	
5% Gamma Test Result	N/A	
95% Approximate Gamma UCL	N/A	Too Few Observations To Calculate UCLs
95% Adjusted Gamma UCL	N/A	Too Few Observations To Calculate UCLs
Lognormal Statistics		
Minimum of log data	-0.061875	
Maximum of log data	-0.061875	
Mean of log data	-0.061875	
Standard Deviation of log data	2.2E-307	
Variance of log data	0	
Lilliefors Test Statisitic	N/A	Too Few Distinct Observations To Calculate UCLs
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic		
Shapiro-Wilk 5% Critical Value		
5% Lognormality Test Result		
MLE Mean	0	
MLE Standard Deviation	0	
MLE Coefficient of Variation	5.8E-308	
MLE Skewness	1.7E+269	
MLE Median	2.2E-307	
MLE 80% Quantile	4E+129	
MLE 90% Quantile	7.8E-304	
MLE 95% Quantile	0	
MLE 99% Quantile	1.1E-306	
MVU Estimate of Median	0	
MVU Estimate of Mean	7E-306	
MVU Estimate of Standard Deviation	1.7E+269	
MVU Estimate of SE of Mean	0	
95% H-UCL	N/A	Too Few Observations To Calculate UCLs
95% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
97.5% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
99% Chebyshev (MVUE) UCL	N/A	Too Few Observations To Calculate UCLs
Non-parametric Statisitics		
95% CLT UCL	N/A	Too Few Observations To Calculate UCLs
95% Adjusted-CLT UCL	N/A	Too Few Observations To Calculate UCLs
95% Modified-t UCL	N/A	Too Few Observations To Calculate UCLs
95% Jackknife UCL	N/A	Too Few Observations To Calculate UCLs
95% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
97.5% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
99% Chebyshev (Mean, Sd) UCL	N/A	Too Few Observations To Calculate UCLs
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% Bootstrap-t UCL	N/A	Too Few Observations To Calculate UCLs
95% Hall's Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% Percentile Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
95% BCA Bootstrap UCL	N/A	Too Few Observations To Calculate UCLs
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution		
1st Recommended UCL	N/A	Too Few Observations To Calculate UCLs
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!		
Alternative UCL		

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-HB01-cf-121304.xls	
Variable:	Antimony	
Raw Statistics		
Number of Observations	11	
Number of Missing Data	0	
Number of Valid Observations	11	
Number of Distinct Observations	10	
Minimum	0.45	
Maximum	17.7	
Mean	5.105	
Standard Deviation	5.7616	
Variance	33.19604	
Coefficient of Variation	1.128619	
Skewness	1.303256	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.817753	
Shapiro-Wilk 5% Critical Value	0.85	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	8.253585	
Gamma Statistics		
k hat	0.824248	
k star (bias corrected)	0.660059	
Theta hat	6.193521	
Theta star	7.734152	
nu hat	18.13346	
nu star	14.52131	
5% Approximate Chi Square Value	6.928623	
Adjusted Level of Significance	0.02783	
Adjusted Chi Square Value	6.093344	
Anderson-Darling Test Statistic	0.383974	
Anderson-Darling 5% Critical Value	0.759262	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.186265	
Kolmogrov-Smirnov 5% Critical Value	0.26418	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	10.69928	
95% Adjusted Gamma UCL	12.16594	
Lognormal Statistics		
Minimum of log data	-0.798508	
Maximum of log data	2.873565	
Mean of log data	0.912987	
Standard Deviation of log data	1.356148	
Variance of log data	1.839138	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.916125	
Shapiro-Wilk 5% Critical Value	0.85	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	6.24984	
MLE Standard Deviation	14.37615	
MLE Coefficient of Variation	2.300242	
MLE Skewness	19.07157	
MLE Median	2.491754	
MLE 80% Quantile	7.837596	
MLE 90% Quantile	14.23406	
MLE 95% Quantile	23.19301	
MLE 99% Quantile	58.4042	
MVU Estimate of Median	2.290563	
MVU Estimate of Mean	5.465519	
MVU Estimate of Standard Deviation	8.538597	
MVU Estimate of SE of Mean	2.403452	
95% H-UCL	31.05347	
95% Chebyshev (MVUE) UCL	15.94192	
97.5% Chebyshev (MVUE) UCL	20.47507	
99% Chebyshev (MVUE) UCL	29.37957	
Non-parametric Statisitics		
95% CLT UCL	7.96242	
95% Adjusted-CLT UCL	8.691811	
95% Modified-t UCL	8.367356	
95% Jackknife UCL	8.253585	
95% Chebyshev (Mean, Sd) UCL	12.67723	
97.5% Chebyshev (Mean, Sd) UCL	15.95373	
99% Chebyshev (Mean, Sd) UCL	22.3898	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	7.755499	
95% Bootstrap-t UCL	9.791871	
95% Hall's Bootstrap UCL	8.935062	
95% Percentile Bootstrap UCL	8.054545	
95% BCA Bootstrap UCL	8.419091	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	10.69928	95% Approximate Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-HB01-cf-121304.xls	
Variable:	Arsenic	
Raw Statistics		
Number of Observations	11	
Number of Missing Data	0	
Number of Valid Observations	11	
Number of Distinct Observations	11	
Minimum	7.4	
Maximum	651	
Mean	203.4091	
Standard Deviation	190.8814	
Variance	36435.72	
Coefficient of Variation	0.938412	
Skewness	1.23635	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.872465	
Shapiro-Wilk 5% Critical Value	0.85	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	307.7215	
Gamma Statistics		
k hat	0.895188	
k star (bias corrected)	0.711652	
Theta hat	227.2249	
Theta star	285.8266	
nu hat	19.69414	
nu star	15.65635	
5% Approximate Chi Square Value	7.719059	
Adjusted Level of Significance	0.02783	
Adjusted Chi Square Value	6.829528	
Anderson-Darling Test Statistic	0.367379	
Anderson-Darling 5% Critical Value	0.756149	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.191575	
Kolmogrov-Smirnov 5% Critical Value	0.263453	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	412.5689	
95% Adjusted Gamma UCL	466.305	
Lognormal Statistics		
Minimum of log data	2.00148	
Maximum of log data	6.47851	
Mean of log data	4.661726	
Standard Deviation of log data	1.467271	
Variance of log data	2.152885	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.887674	
Shapiro-Wilk 5% Critical Value	0.85	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	310.4951	
MLE Standard Deviation	856.5198	
MLE Coefficient of Variation	2.758562	
MLE Skewness	29.26741	
MLE Median	105.8185	
MLE 80% Quantile	365.6109	
MLE 90% Quantile	697.2675	
MLE 95% Quantile	1182.501	
MLE 99% Quantile	3211.838	
MVU Estimate of Median	95.87582	
MVU Estimate of Mean	263.1134	
MVU Estimate of Standard Deviation	453.5412	
MVU Estimate of SE of Mean	125.3305	
95% H-UCL	1967.51	
95% Chebyshev (MVUE) UCL	809.4164	
97.5% Chebyshev (MVUE) UCL	1045.802	
99% Chebyshev (MVUE) UCL	1510.136	
Non-parametric Statisitics		
95% CLT UCL	298.0752	
95% Adjusted-CLT UCL	320.9993	
95% Modified-t UCL	311.2972	
95% Jackknife UCL	307.7215	
95% Chebyshev (Mean, Sd) UCL	454.2764	
97.5% Chebyshev (Mean, Sd) UCL	562.827	
99% Chebyshev (Mean, Sd) UCL	776.0534	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	293.7201	
95% Bootstrap-t UCL	339.6864	
95% Hall's Bootstrap UCL	365.8823	
95% Percentile Bootstrap UCL	296.7273	
95% BCA Bootstrap UCL	314.8	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	307.7215	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-HB01-cf-121304.xls	
Variable:	Cadmium	
Raw Statistics		
Number of Observations	11	
Number of Missing Data	0	
Number of Valid Observations	11	
Number of Distinct Observations	10	
Minimum	0.23	
Maximum	35.2	
Mean	10.95727	
Standard Deviation	10.78009	
Variance	116.2103	
Coefficient of Variation	0.983829	
Skewness	1.292922	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.86688	
Shapiro-Wilk 5% Critical Value	0.85	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	16.84835	
Gamma Statistics		
k hat	0.931548	
k star (bias corrected)	0.738096	
Theta hat	11.76243	
Theta star	14.84533	
nu hat	20.49406	
nu star	16.23811	
5% Approximate Chi Square Value	8.12915	
Adjusted Level of Significance	0.02783	
Adjusted Chi Square Value	7.212527	
Anderson-Darling Test Statistic	0.184823	
Anderson-Darling 5% Critical Value	0.754554	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.121248	
Kolmogrov-Smirnov 5% Critical Value	0.263081	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	21.88733	
95% Adjusted Gamma UCL	24.66894	
Lognormal Statistics		
Minimum of log data	-1.469676	
Maximum of log data	3.561046	
Mean of log data	1.769093	
Standard Deviation of log data	1.421542	
Variance of log data	2.020783	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.921367	
Shapiro-Wilk 5% Critical Value	0.85	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	16.1107	
MLE Standard Deviation	41.2139	
MLE Coefficient of Variation	2.558169	
MLE Skewness	24.41574	
MLE Median	5.865528	
MLE 80% Quantile	19.49769	
MLE 90% Quantile	36.44391	
MLE 95% Quantile	60.79635	
MLE 99% Quantile	160.0682	
MVU Estimate of Median	5.346933	
MVU Estimate of Mean	13.83807	
MVU Estimate of Standard Deviation	22.92258	
MVU Estimate of SE of Mean	6.384447	
95% H-UCL	92.14446	
95% Chebyshev (MVUE) UCL	41.66723	
97.5% Chebyshev (MVUE) UCL	53.70893	
99% Chebyshev (MVUE) UCL	77.36251	
Non-parametric Statisitics		
95% CLT UCL	16.30357	
95% Adjusted-CLT UCL	17.65746	
95% Modified-t UCL	17.05953	
95% Jackknife UCL	16.84835	
95% Chebyshev (Mean, Sd) UCL	25.12508	
97.5% Chebyshev (Mean, Sd) UCL	31.25551	
99% Chebyshev (Mean, Sd) UCL	43.29753	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	16.14831	
95% Bootstrap-t UCL	19.32052	
95% Hall's Bootstrap UCL	22.34097	
95% Percentile Bootstrap UCL	16.20909	
95% BCA Bootstrap UCL	17.37273	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	16.84835	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-HB01-cf-121304.xls	
Variable:	Copper	
Raw Statistics		
Number of Observations	11	
Number of Missing Data	0	
Number of Valid Observations	11	
Number of Distinct Observations	11	
Minimum	22.6	
Maximum	2000	
Mean	744.6818	
Standard Deviation	724.9497	
Variance	525552.1	
Coefficient of Variation	0.973503	
Skewness	0.696634	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.877996	
Shapiro-Wilk 5% Critical Value	0.85	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	1140.851	
Gamma Statistics		
k hat	0.737183	
k star (bias corrected)	0.596739	
Theta hat	1010.172	
Theta star	1247.918	
nu hat	16.21803	
nu star	13.12826	
5% Approximate Chi Square Value	5.977975	
Adjusted Level of Significance	0.02783	
Adjusted Chi Square Value	5.212049	
Anderson-Darling Test Statistic	0.423227	
Anderson-Darling 5% Critical Value	0.763472	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.183918	
Kolmogrov-Smirnov 5% Critical Value	0.265151	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	1635.4	
95% Adjusted Gamma UCL	1875.727	
Lognormal Statistics		
Minimum of log data	3.11795	
Maximum of log data	7.600902	
Mean of log data	5.798994	
Standard Deviation of log data	1.624563	
Variance of log data	2.639206	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.888141	
Shapiro-Wilk 5% Critical Value	0.85	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	1234.716	
MLE Standard Deviation	4452.189	
MLE Coefficient of Variation	3.60584	
MLE Skewness	57.70093	
MLE Median	329.9673	
MLE 80% Quantile	1302.121	
MLE 90% Quantile	2661.266	
MLE 95% Quantile	4776.198	
MLE 99% Quantile	14439.57	
MVU Estimate of Median	292.3063	
MVU Estimate of Mean	992.3433	
MVU Estimate of Standard Deviation	1948.972	
MVU Estimate of SE of Mean	522.6288	
95% H-UCL	11399.26	
95% Chebyshev (MVUE) UCL	3270.429	
97.5% Chebyshev (MVUE) UCL	4256.159	
99% Chebyshev (MVUE) UCL	6192.434	
Non-parametric Statisitics		
95% CLT UCL	1104.215	
95% Adjusted-CLT UCL	1153.272	
95% Modified-t UCL	1148.502	
95% Jackknife UCL	1140.851	
95% Chebyshev (Mean, Sd) UCL	1697.452	
97.5% Chebyshev (Mean, Sd) UCL	2109.717	
99% Chebyshev (Mean, Sd) UCL	2919.531	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1082.269	
95% Bootstrap-t UCL	1211.152	
95% Hall's Bootstrap UCL	1134.851	
95% Percentile Bootstrap UCL	1081.318	
95% BCA Bootstrap UCL	1102.618	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	1140.851	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-HB01-cf-121304.xls	
Variable:	Lead	
Raw Statistics		
Number of Observations	11	
Number of Missing Data	0	
Number of Valid Observations	11	
Number of Distinct Observations	11	
Minimum	10.9	
Maximum	672	
Mean	254.0909	
Standard Deviation	254.8663	
Variance	64956.85	
Coefficient of Variation	1.003052	
Skewness	0.665628	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.842698	
Shapiro-Wilk 5% Critical Value	0.85	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	393.3696	
Gamma Statistics		
k hat	0.739128	
k star (bias corrected)	0.598154	
Theta hat	343.7712	
Theta star	424.792	
nu hat	16.26082	
nu star	13.15938	
5% Approximate Chi Square Value	5.998954	
Adjusted Level of Significance	0.02783	
Adjusted Chi Square Value	5.231443	
Anderson-Darling Test Statistic	0.47822	
Anderson-Darling 5% Critical Value	0.763328	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.176333	
Kolmogrov-Smirnov 5% Critical Value	0.265119	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	557.377	
95% Adjusted Gamma UCL	639.1504	
Lognormal Statistics		
Minimum of log data	2.388763	
Maximum of log data	6.510258	
Mean of log data	4.726162	
Standard Deviation of log data	1.577503	
Variance of log data	2.488515	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.884745	
Shapiro-Wilk 5% Critical Value	0.85	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	391.6702	
MLE Standard Deviation	1301.582	
MLE Coefficient of Variation	3.323159	
MLE Skewness	46.66839	
MLE Median	112.8616	
MLE 80% Quantile	428.0125	
MLE 90% Quantile	856.8421	
MLE 95% Quantile	1511.949	
MLE 99% Quantile	4426.808	
MVU Estimate of Median	100.6811	
MVU Estimate of Mean	320.1581	
MVU Estimate of Standard Deviation	605.3082	
MVU Estimate of SE of Mean	163.8608	
95% H-UCL	3218.308	
95% Chebyshev (MVUE) UCL	1034.411	
97.5% Chebyshev (MVUE) UCL	1343.468	
99% Chebyshev (MVUE) UCL	1950.552	
Non-parametric Statisitics		
95% CLT UCL	380.4898	
95% Adjusted-CLT UCL	396.9689	
95% Modified-t UCL	395.94	
95% Jackknife UCL	393.3696	
95% Chebyshev (Mean, Sd) UCL	589.0509	
97.5% Chebyshev (Mean, Sd) UCL	733.9883	
99% Chebyshev (Mean, Sd) UCL	1018.69	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	372.8122	
95% Bootstrap-t UCL	412.3486	
95% Hall's Bootstrap UCL	369.137	
95% Percentile Bootstrap UCL	380.4	
95% BCA Bootstrap UCL	392.0727	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	557.377	95% Approximate Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-HB01-cf-121304.xls	
Variable:	Manganese	
Raw Statistics		
Number of Observations	11	
Number of Missing Data	0	
Number of Valid Observations	11	
Number of Distinct Observations	11	
Minimum	34.3	
Maximum	358	
Mean	173.7182	
Standard Deviation	92.50201	
Variance	8556.622	
Coefficient of Variation	0.532483	
Skewness	0.485833	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.976926	
Shapiro-Wilk 5% Critical Value	0.85	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	224.2685	
Gamma Statistics		
k hat	3.224963	
k star (bias corrected)	2.406034	
Theta hat	53.86672	
Theta star	72.20106	
nu hat	70.94918	
nu star	52.93274	
5% Approximate Chi Square Value	37.21656	
Adjusted Level of Significance	0.02783	
Adjusted Chi Square Value	35.07799	
Anderson-Darling Test Statistic	0.196161	
Anderson-Darling 5% Critical Value	0.733315	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.161815	
Kolmogrov-Smirnov 5% Critical Value	0.256875	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	247.0776	
95% Adjusted Gamma UCL	262.141	
Lognormal Statistics		
Minimum of log data	3.535145	
Maximum of log data	5.880533	
Mean of log data	4.994455	
Standard Deviation of log data	0.655956	
Variance of log data	0.430279	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.936089	
Shapiro-Wilk 5% Critical Value	0.85	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	183.0198	
MLE Standard Deviation	134.2031	
MLE Coefficient of Variation	0.733271	
MLE Skewness	2.594081	
MLE Median	147.5925	
MLE 80% Quantile	256.9132	
MLE 90% Quantile	342.8726	
MLE 95% Quantile	434.1991	
MLE 99% Quantile	678.7205	
MVU Estimate of Median	144.7293	
MVU Estimate of Mean	178.9242	
MVU Estimate of Standard Deviation	121.9691	
MVU Estimate of SE of Mean	36.56368	
95% H-UCL	301.3216	
95% Chebyshev (MVUE) UCL	338.3016	
97.5% Chebyshev (MVUE) UCL	407.2643	
99% Chebyshev (MVUE) UCL	542.7282	
Non-parametric Statisitics		
95% CLT UCL	219.5938	
95% Adjusted-CLT UCL	223.9592	
95% Modified-t UCL	224.9494	
95% Jackknife UCL	224.2685	
95% Chebyshev (Mean, Sd) UCL	295.2896	
97.5% Chebyshev (Mean, Sd) UCL	347.8937	
99% Chebyshev (Mean, Sd) UCL	451.2242	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	216.975	
95% Bootstrap-t UCL	226.9135	
95% Hall's Bootstrap UCL	232.8834	
95% Percentile Bootstrap UCL	218.8182	
95% BCA Bootstrap UCL	221.8182	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	224.2685	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-HB01-cf-121304.xls	
Variable:	Mercury	
Raw Statistics		
Number of Observations	9	
Number of Missing Data	0	
Number of Valid Observations	9	
Number of Distinct Observations	8	
Minimum	0.06	
Maximum	2.7	
Mean	1.165	
Standard Deviation	0.935782	
Variance	0.875688	
Coefficient of Variation	0.803246	
Skewness	0.571812	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.924182	
Shapiro-Wilk 5% Critical Value	0.829	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	1.745044	
Gamma Statistics		
k hat	1.135624	
k star (bias corrected)	0.831157	
Theta hat	1.025868	
Theta star	1.401661	
nu hat	20.44123	
nu star	14.96082	
5% Approximate Chi Square Value	7.233115	
Adjusted Level of Significance	0.02308	
Adjusted Chi Square Value	6.135732	
Anderson-Darling Test Statistic	0.312095	
Anderson-Darling 5% Critical Value	0.740999	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.167702	
Kolmogrov-Smirnov 5% Critical Value	0.286108	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	2.409661	
95% Adjusted Gamma UCL	2.840632	
Lognormal Statistics		
Minimum of log data	-2.813411	
Maximum of log data	0.993252	
Mean of log data	-0.348305	
Standard Deviation of log data	1.295264	
Variance of log data	1.677708	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.877977	
Shapiro-Wilk 5% Critical Value	0.829	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	1.633214	
MLE Standard Deviation	3.407619	
MLE Coefficient of Variation	2.08645	
MLE Skewness	15.34224	
MLE Median	0.705884	
MLE 80% Quantile	2.108957	
MLE 90% Quantile	3.728886	
MLE 95% Quantile	5.944131	
MLE 99% Quantile	14.36047	
MVU Estimate of Median	0.642494	
MVU Estimate of Mean	1.418213	
MVU Estimate of Standard Deviation	2.003723	
MVU Estimate of SE of Mean	0.635692	
95% H-UCL	10.26179	
95% Chebyshev (MVUE) UCL	4.189132	
97.5% Chebyshev (MVUE) UCL	5.388111	
99% Chebyshev (MVUE) UCL	7.743273	
Non-parametric Statisitics		
95% CLT UCL	1.678075	
95% Adjusted-CLT UCL	1.741603	
95% Modified-t UCL	1.754953	
95% Jackknife UCL	1.745044	
95% Chebyshev (Mean, Sd) UCL	2.524659	
97.5% Chebyshev (Mean, Sd) UCL	3.112985	
99% Chebyshev (Mean, Sd) UCL	4.268637	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1.661143	
95% Bootstrap-t UCL	1.911547	
95% Hall's Bootstrap UCL	1.916013	
95% Percentile Bootstrap UCL	1.657222	
95% BCA Bootstrap UCL	1.664444	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	1.745044	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-HB01-cf-121304.xls	
Variable:	Thallium	
Raw Statistics		
Number of Observations	11	
Number of Missing Data	0	
Number of Valid Observations	11	
Number of Distinct Observations	9	
Minimum	0.42	
Maximum	9.1	
Mean	1.924091	
Standard Deviation	2.998831	
Variance	8.992989	
Coefficient of Variation	1.55857	
Skewness	1.991629	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.583108	
Shapiro-Wilk 5% Critical Value	0.85	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	3.562885	
Gamma Statistics		
k hat	0.740844	
k star (bias corrected)	0.599402	
Theta hat	2.59716	
Theta star	3.210019	
nu hat	16.29857	
nu star	13.18684	
5% Approximate Chi Square Value	6.017477	
Adjusted Level of Significance	0.02783	
Adjusted Chi Square Value	5.248568	
Anderson-Darling Test Statistic	2.081685	
Anderson-Darling 5% Critical Value	0.7632	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.432308	
Kolmogrov-Smirnov 5% Critical Value	0.265091	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	4.216498	
95% Adjusted Gamma UCL	4.834209	
Lognormal Statistics		
Minimum of log data	-0.867501	
Maximum of log data	2.208274	
Mean of log data	-0.15494	
Standard Deviation of log data	1.177445	
Variance of log data	1.386377	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.648557	
Shapiro-Wilk 5% Critical Value	0.85	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	1.713003	
MLE Standard Deviation	2.967172	
MLE Coefficient of Variation	1.732146	
MLE Skewness	10.39345	
MLE Median	0.856466	
MLE 80% Quantile	2.316369	
MLE 90% Quantile	3.888707	
MLE 95% Quantile	5.941472	
MLE 99% Quantile	13.24734	
MVU Estimate of Median	0.80389	
MVU Estimate of Mean	1.561413	
MVU Estimate of Standard Deviation	2.055053	
MVU Estimate of SE of Mean	0.592895	
95% H-UCL	5.991266	
95% Chebyshev (MVUE) UCL	4.145785	
97.5% Chebyshev (MVUE) UCL	5.264044	
99% Chebyshev (MVUE) UCL	7.460649	
Non-parametric Statisitics		
95% CLT UCL	3.411337	
95% Adjusted-CLT UCL	3.991498	
95% Modified-t UCL	3.653378	
95% Jackknife UCL	3.562885	
95% Chebyshev (Mean, Sd) UCL	5.865327	
97.5% Chebyshev (Mean, Sd) UCL	7.570704	
99% Chebyshev (Mean, Sd) UCL	10.92058	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	3.357994	
95% Bootstrap-t UCL	10.47082	
95% Hall's Bootstrap UCL	14.39329	
95% Percentile Bootstrap UCL	3.397273	
95% BCA Bootstrap UCL	3.982273	
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	10.92058	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	YES	Cosider using 95% or 97.5% Chebyshev (Mean, Sd) UCL

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-HB01-cf-121304.xls	
Variable:	Vanadium	
Raw Statistics		
Number of Observations	11	
Number of Missing Data	0	
Number of Valid Observations	11	
Number of Distinct Observations	11	
Minimum	5.4	
Maximum	43.7	
Mean	19.50909	
Standard Deviation	12.06146	
Variance	145.4789	
Coefficient of Variation	0.618248	
Skewness	1.102147	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.87728	
Shapiro-Wilk 5% Critical Value	0.85	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	26.10041	
Gamma Statistics		
k hat	3.033201	
k star (bias corrected)	2.266571	
Theta hat	6.431848	
Theta star	8.607316	
nu hat	66.73043	
nu star	49.86455	
5% Approximate Chi Square Value	34.64845	
Adjusted Level of Significance	0.02783	
Adjusted Chi Square Value	32.59087	
Anderson-Darling Test Statistic	0.300485	
Anderson-Darling 5% Critical Value	0.73349	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.155196	
Kolmogrov-Smirnov 5% Critical Value	0.256973	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	28.07664	
95% Adjusted Gamma UCL	29.84923	
Lognormal Statistics		
Minimum of log data	1.686399	
Maximum of log data	3.777348	
Mean of log data	2.797074	
Standard Deviation of log data	0.632766	
Variance of log data	0.400393	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.95953	
Shapiro-Wilk 5% Critical Value	0.85	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	20.0308	
MLE Standard Deviation	14.05601	
MLE Coefficient of Variation	0.70172	
MLE Skewness	2.450695	
MLE Median	16.39661	
MLE 80% Quantile	27.98761	
MLE 90% Quantile	36.97267	
MLE 95% Quantile	46.43135	
MLE 99% Quantile	71.44219	
MVU Estimate of Median	16.10045	
MVU Estimate of Mean	19.61712	
MVU Estimate of Standard Deviation	12.86717	
MVU Estimate of SE of Mean	3.860067	
95% H-UCL	32.17351	
95% Chebyshev (MVUE) UCL	36.44276	
97.5% Chebyshev (MVUE) UCL	43.72323	
99% Chebyshev (MVUE) UCL	58.0243	
Non-parametric Statisitics		
95% CLT UCL	25.49088	
95% Adjusted-CLT UCL	26.78218	
95% Modified-t UCL	26.30183	
95% Jackknife UCL	26.10041	
95% Chebyshev (Mean, Sd) UCL	35.36096	
97.5% Chebyshev (Mean, Sd) UCL	42.22008	
99% Chebyshev (Mean, Sd) UCL	55.69348	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	25.31146	
95% Bootstrap-t UCL	30.38417	
95% Hall's Bootstrap UCL	63.53936	
95% Percentile Bootstrap UCL	25.65455	
95% BCA Bootstrap UCL	26.06364	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	26.10041	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-HB01-cf-121304.xls	
Variable:	Zinc	
Raw Statistics		
Number of Observations	11	
Number of Missing Data	0	
Number of Valid Observations	11	
Number of Distinct Observations	10	
Minimum	83.9	
Maximum	12900	
Mean	2533.627	
Standard Deviation	3691.281	
Variance	13625559	
Coefficient of Variation	1.456916	
Skewness	2.590288	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.65982	
Shapiro-Wilk 5% Critical Value	0.85	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	4550.83	
Gamma Statistics		
k hat	0.685499	
k star (bias corrected)	0.559151	
Theta hat	3696.033	
Theta star	4531.205	
nu hat	15.08098	
nu star	12.30132	
5% Approximate Chi Square Value	5.425124	
Adjusted Level of Significance	0.02783	
Adjusted Chi Square Value	4.701975	
Anderson-Darling Test Statistic	0.282629	
Anderson-Darling 5% Critical Value	0.767311	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.131967	
Kolmogrov-Smirnov 5% Critical Value	0.266003	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	5744.93	
95% Adjusted Gamma UCL	6628.483	
Lognormal Statistics		
Minimum of log data	4.429626	
Maximum of log data	9.464983	
Mean of log data	6.953206	
Standard Deviation of log data	1.536869	
Variance of log data	2.361966	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.957629	
Shapiro-Wilk 5% Critical Value	0.85	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	3409.049	
MLE Standard Deviation	10569.04	
MLE Coefficient of Variation	3.100289	
MLE Skewness	39.10021	
MLE Median	1046.499	
MLE 80% Quantile	3834.751	
MLE 90% Quantile	7540.79	
MLE 95% Quantile	13112.94	
MLE 99% Quantile	37345.31	
MVU Estimate of Median	939.0444	
MVU Estimate of Mean	2825.5	
MVU Estimate of Standard Deviation	5165.956	
MVU Estimate of SE of Mean	1409.479	
95% H-UCL	25401.07	
95% Chebyshev (MVUE) UCL	8969.278	
97.5% Chebyshev (MVUE) UCL	11627.69	
99% Chebyshev (MVUE) UCL	16849.64	
Non-parametric Statisitics		
95% CLT UCL	4364.289	
95% Adjusted-CLT UCL	5293.069	
95% Modified-t UCL	4695.701	
95% Jackknife UCL	4550.83	
95% Chebyshev (Mean, Sd) UCL	7384.922	
97.5% Chebyshev (Mean, Sd) UCL	9484.081	
99% Chebyshev (Mean, Sd) UCL	13607.47	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	4273.497	
95% Bootstrap-t UCL	7579.848	
95% Hall's Bootstrap UCL	10905.95	
95% Percentile Bootstrap UCL	4646.809	
95% BCA Bootstrap UCL	5154.818	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	5744.93	95% Approximate Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Antimony
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	7	Shapiro-Wilk Test Statisitic	0.906286
Number of Unique Samples	7	Shapiro-Wilk 5% Critical Value	0.803
Minimum	0.99	Data are normal at 5% significance level	
Maximum	10.5		
Mean	6.798571	95% UCL (Assuming Normal Distribution)	
Median	7.9	Student's-t UCL	9.05188
Standard Deviation	3.068009		
Variance	9.412681	Gamma Distribution Test	
Coefficient of Variation	0.451273	A-D Test Statistic	0.812183
Skewness	-1.168654	A-D 5% Critical Value	0.712509
		K-S Test Statistic	0.292741
Gamma Statistics		K-S 5% Critical Value	0.313879
k hat	2.885439	Data follow approximate gamma distibution	
k star (bias corrected)	1.74406	at 5% significance level	
Theta hat	2.356166		
Theta star	3.898129	95% UCLs (Assuming Gamma Distribution)	
nu hat	40.39614	Approximate Gamma UCL	11.71953
nu star	24.41684	Adjusted Gamma UCL	13.97916
Approx.Chi Square Value (.05)	14.16436		
Adjusted Level of Significance	0.01584	Lognormal Distribution Test	
Adjusted Chi Square Value	11.87479	Shapiro-Wilk Test Statisitic	0.709974
		Shapiro-Wilk 5% Critical Value	0.803
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-0.01005		
Maximum of log data	2.351375	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	1.733534	95% H-UCL	22.05358
Standard Deviation of log data	0.803243	95% Chebyshev (MVUE) UCL	17.25217
Variance of log data	0.645199	97.5% Chebyshev (MVUE) UCL	21.51631
		99% Chebyshev (MVUE) UCL	29.89238
		95% Non-parametric UCLs	
		CLT UCL	8.705941
		Adj-CLT UCL (Adjusted for skewness)	8.158642
		Mod-t UCL (Adjusted for skewness)	8.966512
		Jackknife UCL	9.05188
		Standard Bootstrap UCL	8.553858
		Bootstrap-t UCL	8.603529
RECOMMENDATION		Hall's Bootstrap UCL	8.242082
Data are normal (0.05)		Percentile Bootstrap UCL	8.371429
		BCA Bootstrap UCL	8.885714
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	11.85314
		97.5% Chebyshev (Mean, Sd) UCL	14.04026
		99% Chebyshev (Mean, Sd) UCL	18.33643

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Arsenic
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	11	Shapiro-Wilk Test Statisitic	0.873936
Number of Unique Samples	11	Shapiro-Wilk 5% Critical Value	0.85
Minimum	23.2	Data are normal at 5% significance level	
Maximum	1220		
Mean	536.6545	95% UCL (Assuming Normal Distribution)	
Median	447	Student's-t UCL	781.4635
Standard Deviation	447.9762		
Variance	200682.7	Gamma Distribution Test	
Coefficient of Variation	0.834757	A-D Test Statistic	0.253272
Skewness	0.632145	A-D 5% Critical Value	0.748382
		K-S Test Statistic	0.152558
Gamma Statistics		K-S 5% Critical Value	0.261475
k hat	1.169403	Data follow gamma distribution	
k star (bias corrected)	0.911081	at 5% significance level	
Theta hat	458.9133		
Theta star	589.0306	95% UCLs (Assuming Gamma Distribution)	
nu hat	25.72686	Approximate Gamma UCL	988.4819
nu star	20.04378	Adjusted Gamma UCL	1097.797
Approx.Chi Square Value (.05)	10.88192		
Adjusted Level of Significance	0.02783	Lognormal Distribution Test	
Adjusted Chi Square Value	9.798334	Shapiro-Wilk Test Statisitic	0.912592
		Shapiro-Wilk 5% Critical Value	0.85
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	3.144152		
Maximum of log data	7.106606	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	5.800336	95% H-UCL	2641.352
Standard Deviation of log data	1.221007	95% Chebyshev (MVUE) UCL	1710.217
Variance of log data	1.490859	97.5% Chebyshev (MVUE) UCL	2178.101
		99% Chebyshev (MVUE) UCL	3097.168
		95% Non-parametric UCLs	
		CLT UCL	758.8248
		Adj-CLT UCL (Adjusted for skewness)	786.3328
		Mod-t UCL (Adjusted for skewness)	785.7542
		Jackknife UCL	781.4635
		Standard Bootstrap UCL	748.1125
		Bootstrap-t UCL	833.1618
RECOMMENDATION		Hall's Bootstrap UCL	735.6956
Data are normal (0.05)		Percentile Bootstrap UCL	767.6545
		BCA Bootstrap UCL	854.9273
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	1125.411
		97.5% Chebyshev (Mean, Sd) UCL	1380.166
		99% Chebyshev (Mean, Sd) UCL	1880.583

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Cadmium
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	11	Shapiro-Wilk Test Statisitic	0.929944
Number of Unique Samples	11	Shapiro-Wilk 5% Critical Value	0.85
Minimum	0.63	Data are normal at 5% significance level	
Maximum	29.6		
Mean	12.65273	95% UCL (Assuming Normal Distribution)	
Median	12	Student's-t UCL	17.86494
Standard Deviation	9.537834		
Variance	90.97028	Gamma Distribution Test	
Coefficient of Variation	0.753816	A-D Test Statistic	0.181896
Skewness	0.685171	A-D 5% Critical Value	0.743701
		K-S Test Statistic	0.133057
Gamma Statistics		K-S 5% Critical Value	0.260139
k hat	1.41974	Data follow gamma distribution	
k star (bias corrected)	1.093145	at 5% significance level	
Theta hat	8.912		
Theta star	11.57462	95% UCLs (Assuming Gamma Distribution)	
nu hat	31.23429	Approximate Gamma UCL	21.91589
nu star	24.04918	Adjusted Gamma UCL	24.07206
Approx.Chi Square Value (.05)	13.88434		
Adjusted Level of Significance	0.02783	Lognormal Distribution Test	
Adjusted Chi Square Value	12.6407	Shapiro-Wilk Test Statisitic	0.9015
		Shapiro-Wilk 5% Critical Value	0.85
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	-0.462035		
Maximum of log data	3.387774	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	2.146065	95% H-UCL	49.29663
Standard Deviation of log data	1.111254	95% Chebyshev (MVUE) UCL	37.43296
Variance of log data	1.234885	97.5% Chebyshev (MVUE) UCL	47.29652
		99% Chebyshev (MVUE) UCL	66.67157
		95% Non-parametric UCLs	
		CLT UCL	17.38294
		Adj-CLT UCL (Adjusted for skewness)	18.01774
		Mod-t UCL (Adjusted for skewness)	17.96396
		Jackknife UCL	17.86494
		Standard Bootstrap UCL	17.29317
		Bootstrap-t UCL	19.18659
RECOMMENDATION		Hall's Bootstrap UCL	19.38669
Data are normal (0.05)		Percentile Bootstrap UCL	17.34091
		BCA Bootstrap UCL	19.66818
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	25.1879
		97.5% Chebyshev (Mean, Sd) UCL	30.61188
		99% Chebyshev (Mean, Sd) UCL	41.26623

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Copper
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	11	Shapiro-Wilk Test Statisitic	0.960422
Number of Unique Samples	11	Shapiro-Wilk 5% Critical Value	0.85
Minimum	27.8	Data are normal at 5% significance level	
Maximum	809		
Mean	351.6182	95% UCL (Assuming Normal Distribution)	
Median	327	Student's-t UCL	477.7172
Standard Deviation	230.7488		
Variance	53245	Gamma Distribution Test	
Coefficient of Variation	0.656248	A-D Test Statistic	0.21157
Skewness	0.670912	A-D 5% Critical Value	0.739477
		K-S Test Statistic	0.122873
Gamma Statistics		K-S 5% Critical Value	0.258717
k hat	1.913759	Data follow gamma distribution	
k star (bias corrected)	1.452431	at 5% significance level	
Theta hat	183.7317		
Theta star	242.0895	95% UCLs (Assuming Gamma Distribution)	
nu hat	42.10269	Approximate Gamma UCL	560.8441
nu star	31.95348	Adjusted Gamma UCL	607.0684
Approx.Chi Square Value (.05)	20.03306		
Adjusted Level of Significance	0.02783	Lognormal Distribution Test	
Adjusted Chi Square Value	18.50767	Shapiro-Wilk Test Statisitic	0.890372
		Shapiro-Wilk 5% Critical Value	0.85
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	3.325036		
Maximum of log data	6.695799	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	5.579083	95% H-UCL	949.2084
Standard Deviation of log data	0.929313	95% Chebyshev (MVUE) UCL	886.6534
Variance of log data	0.863623	97.5% Chebyshev (MVUE) UCL	1102.644
		99% Chebyshev (MVUE) UCL	1526.917
		95% Non-parametric UCLs	
		CLT UCL	466.0562
		Adj-CLT UCL (Adjusted for skewness)	481.0943
		Mod-t UCL (Adjusted for skewness)	480.0629
		Jackknife UCL	477.7172
		Standard Bootstrap UCL	458.12
		Bootstrap-t UCL	501.5602
RECOMMENDATION		Hall's Bootstrap UCL	517.2548
Data are normal (0.05)		Percentile Bootstrap UCL	462
		BCA Bootstrap UCL	518.4545
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	654.8815
		97.5% Chebyshev (Mean, Sd) UCL	786.1038
		99% Chebyshev (Mean, Sd) UCL	1043.865

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Lead
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	11	Shapiro-Wilk Test Statisitic	0.954912
Number of Unique Samples	11	Shapiro-Wilk 5% Critical Value	0.85
Minimum	31.3	Data are normal at 5% significance level	
Maximum	426		
Mean	213.6818	95% UCL (Assuming Normal Distribution)	
Median	200	Student's-t UCL	285.2867
Standard Deviation	131.0299		
Variance	17168.84	Gamma Distribution Test	
Coefficient of Variation	0.613201	A-D Test Statistic	0.331025
Skewness	0.124579	A-D 5% Critical Value	0.73806
		K-S Test Statistic	0.156186
Gamma Statistics		K-S 5% Critical Value	0.25827
k hat	2.157653	Data follow gamma distribution	
k star (bias corrected)	1.629808	at 5% significance level	
Theta hat	99.03437		
Theta star	131.1086	95% UCLs (Assuming Gamma Distribution)	
nu hat	47.46837	Approximate Gamma UCL	330.9547
nu star	35.85578	Adjusted Gamma UCL	356.3835
Approx.Chi Square Value (.05)	23.15039		
Adjusted Level of Significance	0.02783	Lognormal Distribution Test	
Adjusted Chi Square Value	21.49855	Shapiro-Wilk Test Statisitic	0.907053
		Shapiro-Wilk 5% Critical Value	0.85
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	3.443618		
Maximum of log data	6.054439	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	5.115206	95% H-UCL	477.6063
Standard Deviation of log data	0.831116	95% Chebyshev (MVUE) UCL	484.9827
Variance of log data	0.690753	97.5% Chebyshev (MVUE) UCL	596.9575
		99% Chebyshev (MVUE) UCL	816.9103
		95% Non-parametric UCLs	
		CLT UCL	278.6651
		Adj-CLT UCL (Adjusted for skewness)	280.2507
		Mod-t UCL (Adjusted for skewness)	285.5341
		Jackknife UCL	285.2867
		Standard Bootstrap UCL	274.9205
		Bootstrap-t UCL	288.8303
RECOMMENDATION		Hall's Bootstrap UCL	278.8185
Data are normal (0.05)		Percentile Bootstrap UCL	275
		BCA Bootstrap UCL	263.2364
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	385.8889
		97.5% Chebyshev (Mean, Sd) UCL	460.403
		99% Chebyshev (Mean, Sd) UCL	606.7716

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Manganese
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	11	Shapiro-Wilk Test Statisitic	0.614869
Number of Unique Samples	11	Shapiro-Wilk 5% Critical Value	0.85
Minimum	101	Data not normal at 5% significance level	
Maximum	3900		
Mean	805.4545	95% UCL (Assuming Normal Distribution)	
Median	413	Student's-t UCL	1396.532
Standard Deviation	1081.613		
Variance	1169886	Gamma Distribution Test	
Coefficient of Variation	1.34286	A-D Test Statistic	0.620078
Skewness	2.774326	A-D 5% Critical Value	0.749596
		K-S Test Statistic	0.238167
Gamma Statistics		K-S 5% Critical Value	0.261822
k hat	1.104492	Data follow gamma distribution	
k star (bias corrected)	0.863873	at 5% significance level	
Theta hat	729.2532		
Theta star	932.3759	95% UCLs (Assuming Gamma Distribution)	
nu hat	24.29883	Approximate Gamma UCL	1512.669
nu star	19.00521	Adjusted Gamma UCL	1685.865
Approx.Chi Square Value (.05)	10.11975		
Adjusted Level of Significance	0.02783	Lognormal Distribution Test	
Adjusted Chi Square Value	9.080105	Shapiro-Wilk Test Statisitic	0.958806
		Shapiro-Wilk 5% Critical Value	0.85
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	4.615121		
Maximum of log data	8.268732	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	6.174686	95% H-UCL	2073.901
Standard Deviation of log data	1.004275	95% Chebyshev (MVUE) UCL	1793.678
Variance of log data	1.008569	97.5% Chebyshev (MVUE) UCL	2246.277
		99% Chebyshev (MVUE) UCL	3135.32
		95% Non-parametric UCLs	
		CLT UCL	1341.872
		Adj-CLT UCL (Adjusted for skewness)	1633.357
		Mod-t UCL (Adjusted for skewness)	1441.997
		Jackknife UCL	1396.532
		Standard Bootstrap UCL	1305.719
		Bootstrap-t UCL	2803.692
RECOMMENDATION		Hall's Bootstrap UCL	3611.29
Data follow gamma distribution (0.05)		Percentile Bootstrap UCL	1400.545
		BCA Bootstrap UCL	1806.818
Use Approximate Gamma UCL		95% Chebyshev (Mean, Sd) UCL	2226.972
		97.5% Chebyshev (Mean, Sd) UCL	2842.064
		99% Chebyshev (Mean, Sd) UCL	4050.292

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Mercury
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	11	Shapiro-Wilk Test Statisitic	0.948673
Number of Unique Samples	11	Shapiro-Wilk 5% Critical Value	0.85
Minimum	0.07	Data are normal at 5% significance level	
Maximum	1.55		
Mean	0.695455	95% UCL (Assuming Normal Distribution)	
Median	0.54	Student's-t UCL	0.954422
Standard Deviation	0.473885		
Variance	0.224567	Gamma Distribution Test	
Coefficient of Variation	0.681404	A-D Test Statistic	0.15726
Skewness	0.554354	A-D 5% Critical Value	0.739658
		K-S Test Statistic	0.118714
Gamma Statistics		K-S 5% Critical Value	0.258783
k hat	1.886325	Data follow gamma distribution	
k star (bias corrected)	1.432479	at 5% significance level	
Theta hat	0.368682		
Theta star	0.48549	95% UCLs (Assuming Gamma Distribution)	
nu hat	41.49915	Approximate Gamma UCL	1.11336
nu star	31.51454	Adjusted Gamma UCL	1.205904
Approx.Chi Square Value (.05)	19.68538		
Adjusted Level of Significance	0.02783	Lognormal Distribution Test	
Adjusted Chi Square Value	18.17468	Shapiro-Wilk Test Statisitic	0.932837
		Shapiro-Wilk 5% Critical Value	0.85
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	-2.65926		
Maximum of log data	0.438255	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-0.651087	95% H-UCL	1.748354
Standard Deviation of log data	0.900939	95% Chebyshev (MVUE) UCL	1.676319
Variance of log data	0.811691	97.5% Chebyshev (MVUE) UCL	2.078778
		99% Chebyshev (MVUE) UCL	2.86933
		95% Non-parametric UCLs	
		CLT UCL	0.930474
		Adj-CLT UCL (Adjusted for skewness)	0.955992
		Mod-t UCL (Adjusted for skewness)	0.958403
		Jackknife UCL	0.954422
		Standard Bootstrap UCL	0.912155
		Bootstrap-t UCL	0.984177
RECOMMENDATION		Hall's Bootstrap UCL	0.978851
Data are normal (0.05)		Percentile Bootstrap UCL	0.937273
		BCA Bootstrap UCL	0.88
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	1.318262
		97.5% Chebyshev (Mean, Sd) UCL	1.587751
		99% Chebyshev (Mean, Sd) UCL	2.11711

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Thallium
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	7	Shapiro-Wilk Test Statisitic	0.93163
Number of Unique Samples	7	Shapiro-Wilk 5% Critical Value	0.803
Minimum	0.375	Data are normal at 5% significance level	
Maximum	17.8		
Mean	10.06786	95% UCL (Assuming Normal Distribution)	
Median	8.6	Student's-t UCL	14.94223
Standard Deviation	6.636746		
Variance	44.0464	Gamma Distribution Test	
Coefficient of Variation	0.659201	A-D Test Statistic	0.499814
Skewness	-0.178954	A-D 5% Critical Value	0.724096
		K-S Test Statistic	0.220286
Gamma Statistics		K-S 5% Critical Value	0.318192
k hat	1.271898	Data follow gamma distribution	
k star (bias corrected)	0.822037	at 5% significance level	
Theta hat	7.915617		
Theta star	12.24745	95% UCLs (Assuming Gamma Distribution)	
nu hat	17.80657	Approximate Gamma UCL	23.62616
nu star	11.50852	Adjusted Gamma UCL	31.42197
Approx.Chi Square Value (.05)	4.904145		
Adjusted Level of Significance	0.01584	Lognormal Distribution Test	
Adjusted Chi Square Value	3.687423	Shapiro-Wilk Test Statisitic	0.770097
		Shapiro-Wilk 5% Critical Value	0.803
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-0.980829		
Maximum of log data	2.879198	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	1.86729	95% H-UCL	223.4085
Standard Deviation of log data	1.355252	95% Chebyshev (MVUE) UCL	42.71595
Variance of log data	1.836709	97.5% Chebyshev (MVUE) UCL	55.43153
		99% Chebyshev (MVUE) UCL	80.40881
		95% Non-parametric UCLs	
		CLT UCL	14.1939
		Adj-CLT UCL (Adjusted for skewness)	14.01261
		Mod-t UCL (Adjusted for skewness)	14.91396
		Jackknife UCL	14.94223
		Standard Bootstrap UCL	13.81686
		Bootstrap-t UCL	14.65222
RECOMMENDATION		Hall's Bootstrap UCL	13.95561
Data are normal (0.05)		Percentile Bootstrap UCL	13.8
		BCA Bootstrap UCL	15.12857
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	21.00196
		97.5% Chebyshev (Mean, Sd) UCL	25.73315
		99% Chebyshev (Mean, Sd) UCL	35.02666

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Vanadium
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	11	Shapiro-Wilk Test Statisitic	0.926017
Number of Unique Samples	11	Shapiro-Wilk 5% Critical Value	0.85
Minimum	9.9	Data are normal at 5% significance level	
Maximum	84.2		
Mean	41.47273	95% UCL (Assuming Normal Distribution)	
Median	47.9	Student's-t UCL	53.85524
Standard Deviation	22.65878		
Variance	513.4202	Gamma Distribution Test	
Coefficient of Variation	0.546354	A-D Test Statistic	0.609321
Skewness	0.1758	A-D 5% Critical Value	0.734134
		K-S Test Statistic	0.290919
Gamma Statistics		K-S 5% Critical Value	0.257163
k hat	2.886128	Data follow approximate gamma distibution	
k star (bias corrected)	2.159608	at 5% significance level	
Theta hat	14.36968		
Theta star	19.20382	95% UCLs (Assuming Gamma Distribution)	
nu hat	63.49482	Approximate Gamma UCL	60.2772
nu star	47.51138	Adjusted Gamma UCL	64.1924
Approx.Chi Square Value (.05)	32.68942		
Adjusted Level of Significance	0.02783	Lognormal Distribution Test	
Adjusted Chi Square Value	30.69564	Shapiro-Wilk Test Statisitic	0.879396
		Shapiro-Wilk 5% Critical Value	0.85
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	2.292535		
Maximum of log data	4.433195	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	3.541903	95% H-UCL	75.4945
Standard Deviation of log data	0.694395	95% Chebyshev (MVUE) UCL	83.33837
Variance of log data	0.482184	97.5% Chebyshev (MVUE) UCL	100.8665
		99% Chebyshev (MVUE) UCL	135.2971
		95% Non-parametric UCLs	
		CLT UCL	52.71017
		Adj-CLT UCL (Adjusted for skewness)	53.09711
		Mod-t UCL (Adjusted for skewness)	53.9156
		Jackknife UCL	53.85524
		Standard Bootstrap UCL	52.1079
		Bootstrap-t UCL	54.80419
RECOMMENDATION		Hall's Bootstrap UCL	53.44273
Data are normal (0.05)		Percentile Bootstrap UCL	52.28182
		BCA Bootstrap UCL	49.85455
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	71.25219
		97.5% Chebyshev (Mean, Sd) UCL	84.13779
		99% Chebyshev (Mean, Sd) UCL	109.4491

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Zinc
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	11	Shapiro-Wilk Test Statisitic	0.82447
Number of Unique Samples	10	Shapiro-Wilk 5% Critical Value	0.85
Minimum	126	Data not normal at 5% significance level	
Maximum	7325		
Mean	2444.273	95% UCL (Assuming Normal Distribution)	
Median	1740	Student's-t UCL	3679.552
Standard Deviation	2260.438		
Variance	5109582	Gamma Distribution Test	
Coefficient of Variation	0.92479	A-D Test Statistic	0.243249
Skewness	1.444739	A-D 5% Critical Value	0.746924
		K-S Test Statistic	0.176994
Gamma Statistics		K-S 5% Critical Value	0.261059
k hat	1.247376	Data follow gamma distribution	
k star (bias corrected)	0.967789	at 5% significance level	
Theta hat	1959.531		
Theta star	2525.626	95% UCLs (Assuming Gamma Distribution)	
nu hat	27.44228	Approximate Gamma UCL	4407.727
nu star	21.29136	Adjusted Gamma UCL	4876.49
Approx.Chi Square Value (.05)	11.80697		
Adjusted Level of Significance	0.02783	Lognormal Distribution Test	
Adjusted Chi Square Value	10.672	Shapiro-Wilk Test Statisitic	0.935029
		Shapiro-Wilk 5% Critical Value	0.85
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	4.836282		
Maximum of log data	8.899048	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	7.349861	95% H-UCL	9578.842
Standard Deviation of log data	1.134153	95% Chebyshev (MVUE) UCL	7051.222
Variance of log data	1.286303	97.5% Chebyshev (MVUE) UCL	8924.811
		99% Chebyshev (MVUE) UCL	12605.12
		95% Non-parametric UCLs	
		CLT UCL	3565.319
		Adj-CLT UCL (Adjusted for skewness)	3882.546
		Mod-t UCL (Adjusted for skewness)	3729.033
		Jackknife UCL	3679.552
		Standard Bootstrap UCL	3511.582
		Bootstrap-t UCL	4992.794
RECOMMENDATION		Hall's Bootstrap UCL	11161.63
Data follow gamma distribution (0.05)		Percentile Bootstrap UCL	3573.091
		BCA Bootstrap UCL	4080
Use Approximate Gamma UCL		95% Chebyshev (Mean, Sd) UCL	5415.071
		97.5% Chebyshev (Mean, Sd) UCL	6700.538
		99% Chebyshev (Mean, Sd) UCL	9225.588

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Antimony
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	7	Shapiro-Wilk Test Statisitic	0.907131
Number of Unique Samples	7	Shapiro-Wilk 5% Critical Value	0.803
Minimum	1.7	Data are normal at 5% significance level	
Maximum	8.1		
Mean	5.15	95% UCL (Assuming Normal Distribution)	
Median	5.8	Student's-t UCL	7.005978
Standard Deviation	2.527021		
Variance	6.385833	Gamma Distribution Test	
Coefficient of Variation	0.490684	A-D Test Statistic	0.540608
Skewness	-0.484057	A-D 5% Critical Value	0.710724
		K-S Test Statistic	0.228666
Gamma Statistics		K-S 5% Critical Value	0.31323
k hat	3.583502	Data follow gamma distribution	
k star (bias corrected)	2.142954	at 5% significance level	
Theta hat	1.437142		
Theta star	2.403225	95% UCLs (Assuming Gamma Distribution)	
nu hat	50.16903	Approximate Gamma UCL	8.355402
nu star	30.00135	Adjusted Gamma UCL	9.762796
Approx.Chi Square Value (.05)	18.49187		
Adjusted Level of Significance	0.01584	Lognormal Distribution Test	
Adjusted Chi Square Value	15.8261	Shapiro-Wilk Test Statisitic	0.83199
		Shapiro-Wilk 5% Critical Value	0.803
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	0.530628		
Maximum of log data	2.091864	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	1.493028	95% H-UCL	11.15361
Standard Deviation of log data	0.636659	95% Chebyshev (MVUE) UCL	10.84469
Variance of log data	0.405334	97.5% Chebyshev (MVUE) UCL	13.25433
		99% Chebyshev (MVUE) UCL	17.98762
		95% Non-parametric UCLs	
		CLT UCL	6.721039
		Adj-CLT UCL (Adjusted for skewness)	6.53432
		Mod-t UCL (Adjusted for skewness)	6.976853
		Jackknife UCL	7.005978
		Standard Bootstrap UCL	6.631823
		Bootstrap-t UCL	6.765798
RECOMMENDATION		Hall's Bootstrap UCL	6.340364
Data are normal (0.05)		Percentile Bootstrap UCL	6.614286
		BCA Bootstrap UCL	6.207143
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	9.313289
		97.5% Chebyshev (Mean, Sd) UCL	11.11475
		99% Chebyshev (Mean, Sd) UCL	14.65336

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Arsenic
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	10	Shapiro-Wilk Test Statisitic	0.961484
Number of Unique Samples	10	Shapiro-Wilk 5% Critical Value	0.842
Minimum	39.9	Data are normal at 5% significance level	
Maximum	533		
Mean	244.8	95% UCL (Assuming Normal Distribution)	
Median	250.75	Student's-t UCL	328.7427
Standard Deviation	144.8083		
Variance	20969.45	Gamma Distribution Test	
Coefficient of Variation	0.591537	A-D Test Statistic	0.283349
Skewness	0.515774	A-D 5% Critical Value	0.733906
		K-S Test Statistic	0.160667
Gamma Statistics		K-S 5% Critical Value	0.26914
k hat	2.49236	Data follow gamma distribution	
k star (bias corrected)	1.811319	at 5% significance level	
Theta hat	98.22015		
Theta star	135.1501	95% UCLs (Assuming Gamma Distribution)	
nu hat	49.84721	Approximate Gamma UCL	378.196
nu star	36.22638	Adjusted Gamma UCL	409.1074
Approx.Chi Square Value (.05)	23.44873		
Adjusted Level of Significance	0.0267	Lognormal Distribution Test	
Adjusted Chi Square Value	21.67699	Shapiro-Wilk Test Statisitic	0.915858
		Shapiro-Wilk 5% Critical Value	0.842
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	3.686376		
Maximum of log data	6.278521	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	5.286615	95% H-UCL	526.9085
Standard Deviation of log data	0.771169	95% Chebyshev (MVUE) UCL	539.3602
Variance of log data	0.594701	97.5% Chebyshev (MVUE) UCL	661.6513
		99% Chebyshev (MVUE) UCL	901.8684
		95% Non-parametric UCLs	
		CLT UCL	320.1218
		Adj-CLT UCL (Adjusted for skewness)	328.1024
		Mod-t UCL (Adjusted for skewness)	329.9875
		Jackknife UCL	328.7427
		Standard Bootstrap UCL	316.7051
		Bootstrap-t UCL	334.3126
RECOMMENDATION		Hall's Bootstrap UCL	342.2869
Data are normal (0.05)		Percentile Bootstrap UCL	320.24
		BCA Bootstrap UCL	304.26
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	444.4045
		97.5% Chebyshev (Mean, Sd) UCL	530.7735
		99% Chebyshev (Mean, Sd) UCL	700.4287

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Cadmium
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	10	Shapiro-Wilk Test Statisitic	0.944322
Number of Unique Samples	10	Shapiro-Wilk 5% Critical Value	0.842
Minimum	3.2	Data are normal at 5% significance level	
Maximum	15.5		
Mean	8.84	95% UCL (Assuming Normal Distribution)	
Median	8.6	Student's-t UCL	11.29196
Standard Deviation	4.229841		
Variance	17.89156	Gamma Distribution Test	
Coefficient of Variation	0.478489	A-D Test Statistic	0.21722
Skewness	0.34715	A-D 5% Critical Value	0.729417
		K-S Test Statistic	0.130634
Gamma Statistics		K-S 5% Critical Value	0.267641
k hat	4.457765	Data follow gamma distribution	
k star (bias corrected)	3.187102	at 5% significance level	
Theta hat	1.983057		
Theta star	2.77368	95% UCLs (Assuming Gamma Distribution)	
nu hat	89.1553	Approximate Gamma UCL	12.15145
nu star	63.74204	Adjusted Gamma UCL	12.86287
Approx.Chi Square Value (.05)	46.37139		
Adjusted Level of Significance	0.0267	Lognormal Distribution Test	
Adjusted Chi Square Value	43.80667	Shapiro-Wilk Test Statisitic	0.950962
		Shapiro-Wilk 5% Critical Value	0.842
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	1.163151		
Maximum of log data	2.74084	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	2.06295	95% H-UCL	13.47938
Standard Deviation of log data	0.528721	95% Chebyshev (MVUE) UCL	15.5342
Variance of log data	0.279546	97.5% Chebyshev (MVUE) UCL	18.39984
		99% Chebyshev (MVUE) UCL	24.02884
		95% Non-parametric UCLs	
		CLT UCL	11.04015
		Adj-CLT UCL (Adjusted for skewness)	11.19704
		Mod-t UCL (Adjusted for skewness)	11.31643
		Jackknife UCL	11.29196
		Standard Bootstrap UCL	10.9157
		Bootstrap-t UCL	11.61276
RECOMMENDATION		Hall's Bootstrap UCL	11.56626
Data are normal (0.05)		Percentile Bootstrap UCL	10.99
		BCA Bootstrap UCL	10.57
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	14.67043
		97.5% Chebyshev (Mean, Sd) UCL	17.19327
		99% Chebyshev (Mean, Sd) UCL	22.14888

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Copper
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	10	Shapiro-Wilk Test Statisitic	0.924913
Number of Unique Samples	10	Shapiro-Wilk 5% Critical Value	0.842
Minimum	96.5	Data are normal at 5% significance level	
Maximum	586		
Mean	274.1	95% UCL (Assuming Normal Distribution)	
Median	242.5	Student's-t UCL	363.6433
Standard Deviation	154.4698		
Variance	23860.93	Gamma Distribution Test	
Coefficient of Variation	0.563553	A-D Test Statistic	0.168862
Skewness	0.944552	A-D 5% Critical Value	0.730275
		K-S Test Statistic	0.125367
Gamma Statistics		K-S 5% Critical Value	0.26802
k hat	3.68269	Data follow gamma distribution	
k star (bias corrected)	2.64455	at 5% significance level	
Theta hat	74.42928		
Theta star	103.6471	95% UCLs (Assuming Gamma Distribution)	
nu hat	73.65381	Approximate Gamma UCL	389.9093
nu star	52.891	Adjusted Gamma UCL	415.3494
Approx.Chi Square Value (.05)	37.18153		
Adjusted Level of Significance	0.0267	Lognormal Distribution Test	
Adjusted Chi Square Value	34.90416	Shapiro-Wilk Test Statisitic	0.985546
		Shapiro-Wilk 5% Critical Value	0.842
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	4.569543		
Maximum of log data	6.37332	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	5.471622	95% H-UCL	432.5752
Standard Deviation of log data	0.566645	95% Chebyshev (MVUE) UCL	493.3166
Variance of log data	0.321087	97.5% Chebyshev (MVUE) UCL	588.0799
		99% Chebyshev (MVUE) UCL	774.2241
		95% Non-parametric UCLs	
		CLT UCL	354.4472
		Adj-CLT UCL (Adjusted for skewness)	370.0374
		Mod-t UCL (Adjusted for skewness)	366.075
		Jackknife UCL	363.6433
		Standard Bootstrap UCL	348.9501
		Bootstrap-t UCL	397.9163
RECOMMENDATION		Hall's Bootstrap UCL	400.0025
Data are normal (0.05)		Percentile Bootstrap UCL	354.1
		BCA Bootstrap UCL	388.1
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	487.022
		97.5% Chebyshev (Mean, Sd) UCL	579.1535
		99% Chebyshev (Mean, Sd) UCL	760.128

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Manganese
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	10	Shapiro-Wilk Test Statisitic	0.827552
Number of Unique Samples	10	Shapiro-Wilk 5% Critical Value	0.842
Minimum	109	Data not normal at 5% significance level	
Maximum	2780		
Mean	1008.3	95% UCL (Assuming Normal Distribution)	
Median	714.5	Student's-t UCL	1600.491
Standard Deviation	1021.58		
Variance	1043626	Gamma Distribution Test	
Coefficient of Variation	1.013171	A-D Test Statistic	0.618339
Skewness	0.861832	A-D 5% Critical Value	0.751579
		K-S Test Statistic	0.230674
Gamma Statistics		K-S 5% Critical Value	0.274598
k hat	0.904925	Data follow gamma distribution	
k star (bias corrected)	0.700114	at 5% significance level	
Theta hat	1114.236		
Theta star	1440.194	95% UCLs (Assuming Gamma Distribution)	
nu hat	18.09849	Approximate Gamma UCL	2148.356
nu star	14.00228	Adjusted Gamma UCL	2472.383
Approx.Chi Square Value (.05)	6.571768		
Adjusted Level of Significance	0.0267	Lognormal Distribution Test	
Adjusted Chi Square Value	5.710481	Shapiro-Wilk Test Statisitic	0.862194
		Shapiro-Wilk 5% Critical Value	0.842
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	4.691348		
Maximum of log data	7.930206	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	6.270427	95% H-UCL	6263.455
Standard Deviation of log data	1.300581	95% Chebyshev (MVUE) UCL	3130.435
Variance of log data	1.69151	97.5% Chebyshev (MVUE) UCL	4017.141
		99% Chebyshev (MVUE) UCL	5758.904
		95% Non-parametric UCLs	
		CLT UCL	1539.673
		Adj-CLT UCL (Adjusted for skewness)	1633.749
		Mod-t UCL (Adjusted for skewness)	1615.165
		Jackknife UCL	1600.491
		Standard Bootstrap UCL	1515.094
		Bootstrap-t UCL	1793.527
RECOMMENDATION		Hall's Bootstrap UCL	1757.931
Data follow gamma distribution (0.05)		Percentile Bootstrap UCL	1552.5
		BCA Bootstrap UCL	1443.8
Use Approximate Gamma UCL		95% Chebyshev (Mean, Sd) UCL	2416.451
		97.5% Chebyshev (Mean, Sd) UCL	3025.759
		99% Chebyshev (Mean, Sd) UCL	4222.627

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Mercury
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	9	Shapiro-Wilk Test Statisitic	0.810843
Number of Unique Samples	9	Shapiro-Wilk 5% Critical Value	0.829
Minimum	0.12	Data not normal at 5% significance level	
Maximum	1.7		
Mean	0.691111	95% UCL (Assuming Normal Distribution)	
Median	0.45	Student's-t UCL	1.079266
Standard Deviation	0.626208		
Variance	0.392136	Gamma Distribution Test	
Coefficient of Variation	0.906088	A-D Test Statistic	0.515906
Skewness	0.820081	A-D 5% Critical Value	0.736987
		K-S Test Statistic	0.207883
Gamma Statistics		K-S 5% Critical Value	0.284822
k hat	1.355839	Data follow gamma distribution	
k star (bias corrected)	0.977967	at 5% significance level	
Theta hat	0.509729		
Theta star	0.706681	95% UCLs (Assuming Gamma Distribution)	
nu hat	24.40511	Approximate Gamma UCL	1.336396
nu star	17.60341	Adjusted Gamma UCL	1.55016
Approx.Chi Square Value (.05)	9.103524		
Adjusted Level of Significance	0.02308	Lognormal Distribution Test	
Adjusted Chi Square Value	7.848166	Shapiro-Wilk Test Statisitic	0.911735
		Shapiro-Wilk 5% Critical Value	0.829
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	-2.120264		
Maximum of log data	0.530628	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-0.781532	95% H-UCL	2.352212
Standard Deviation of log data	0.9898	95% Chebyshev (MVUE) UCL	1.730804
Variance of log data	0.979704	97.5% Chebyshev (MVUE) UCL	2.178873
		99% Chebyshev (MVUE) UCL	3.059017
		95% Non-parametric UCLs	
		CLT UCL	1.034451
		Adj-CLT UCL (Adjusted for skewness)	1.095421
		Mod-t UCL (Adjusted for skewness)	1.088776
		Jackknife UCL	1.079266
		Standard Bootstrap UCL	1.008738
		Bootstrap-t UCL	1.188993
RECOMMENDATION		Hall's Bootstrap UCL	0.959649
Data follow gamma distribution (0.05)		Percentile Bootstrap UCL	1.027778
		BCA Bootstrap UCL	1.201111
Use Approximate Gamma UCL		95% Chebyshev (Mean, Sd) UCL	1.60097
		97.5% Chebyshev (Mean, Sd) UCL	1.994666
		99% Chebyshev (Mean, Sd) UCL	2.768007

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Thallium
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	7	Shapiro-Wilk Test Statisitic	0.927197
Number of Unique Samples	7	Shapiro-Wilk 5% Critical Value	0.803
Minimum	0.3	Data are normal at 5% significance level	
Maximum	6.5		
Mean	2.65	95% UCL (Assuming Normal Distribution)	
Median	2.2	Student's-t UCL	4.130033
Standard Deviation	2.015151		
Variance	4.060833	Gamma Distribution Test	
Coefficient of Variation	0.760434	A-D Test Statistic	0.173031
Skewness	1.175315	A-D 5% Critical Value	0.71851
		K-S Test Statistic	0.130359
Gamma Statistics		K-S 5% Critical Value	0.316192
k hat	1.715324	Data follow gamma distribution	
k star (bias corrected)	1.075423	at 5% significance level	
Theta hat	1.544898		
Theta star	2.464147	95% UCLs (Assuming Gamma Distribution)	
nu hat	24.01453	Approximate Gamma UCL	5.466052
nu star	15.05592	Adjusted Gamma UCL	6.940976
Approx.Chi Square Value (.05)	7.29927		
Adjusted Level of Significance	0.01584	Lognormal Distribution Test	
Adjusted Chi Square Value	5.748211	Shapiro-Wilk Test Statisitic	0.93454
		Shapiro-Wilk 5% Critical Value	0.803
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	-1.203973		
Maximum of log data	1.871802	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	0.655591	95% H-UCL	13.33925
Standard Deviation of log data	0.979464	95% Chebyshev (MVUE) UCL	7.47152
Variance of log data	0.959349	97.5% Chebyshev (MVUE) UCL	9.470842
		99% Chebyshev (MVUE) UCL	13.39812
		95% Non-parametric UCLs	
		CLT UCL	3.902812
		Adj-CLT UCL (Adjusted for skewness)	4.264342
		Mod-t UCL (Adjusted for skewness)	4.186425
		Jackknife UCL	4.130033
		Standard Bootstrap UCL	3.806151
		Bootstrap-t UCL	4.84397
RECOMMENDATION		Hall's Bootstrap UCL	10.71883
Data are normal (0.05)		Percentile Bootstrap UCL	3.9
		BCA Bootstrap UCL	3.7
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	5.969979
		97.5% Chebyshev (Mean, Sd) UCL	7.406537
		99% Chebyshev (Mean, Sd) UCL	10.22838

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Vanadium
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	10	Shapiro-Wilk Test Statisitic	0.783544
Number of Unique Samples	10	Shapiro-Wilk 5% Critical Value	0.842
Minimum	23.1	Data not normal at 5% significance level	
Maximum	69.1		
Mean	34.115	95% UCL (Assuming Normal Distribution)	
Median	27.95	Student's-t UCL	42.51013
Standard Deviation	14.48233		
Variance	209.7378	Gamma Distribution Test	
Coefficient of Variation	0.424515	A-D Test Statistic	0.650825
Skewness	1.792576	A-D 5% Critical Value	0.726941
		K-S Test Statistic	0.21263
Gamma Statistics		K-S 5% Critical Value	0.266973
k hat	7.857179	Data follow gamma distribution	
k star (bias corrected)	5.566692	at 5% significance level	
Theta hat	4.341889		
Theta star	6.128415	95% UCLs (Assuming Gamma Distribution)	
nu hat	157.1436	Approximate Gamma UCL	43.17402
nu star	111.3338	Adjusted Gamma UCL	45.01809
Approx.Chi Square Value (.05)	87.97314		
Adjusted Level of Significance	0.0267	Lognormal Distribution Test	
Adjusted Chi Square Value	84.3695	Shapiro-Wilk Test Statisitic	0.862734
		Shapiro-Wilk 5% Critical Value	0.842
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	3.139833		
Maximum of log data	4.235555	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	3.464753	95% H-UCL	43.63173
Standard Deviation of log data	0.360983	95% Chebyshev (MVUE) UCL	50.91884
Variance of log data	0.130309	97.5% Chebyshev (MVUE) UCL	58.28777
		99% Chebyshev (MVUE) UCL	72.76261
		95% Non-parametric UCLs	
		CLT UCL	41.64796
		Adj-CLT UCL (Adjusted for skewness)	44.42189
		Mod-t UCL (Adjusted for skewness)	42.94281
		Jackknife UCL	42.51013
		Standard Bootstrap UCL	41.38247
		Bootstrap-t UCL	49.85909
RECOMMENDATION		Hall's Bootstrap UCL	69.90411
Data follow gamma distribution (0.05)		Percentile Bootstrap UCL	41.605
		BCA Bootstrap UCL	47.36
Use Approximate Gamma UCL		95% Chebyshev (Mean, Sd) UCL	54.07751
		97.5% Chebyshev (Mean, Sd) UCL	62.7153
		99% Chebyshev (Mean, Sd) UCL	79.68258

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Zinc
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	10	Shapiro-Wilk Test Statisitic	0.95557
Number of Unique Samples	9	Shapiro-Wilk 5% Critical Value	0.842
Minimum	200	Data are normal at 5% significance level	
Maximum	3520		
Mean	1569.9	95% UCL (Assuming Normal Distribution)	
Median	1380	Student's-t UCL	2117.107
Standard Deviation	943.9786		
Variance	891095.7	Gamma Distribution Test	
Coefficient of Variation	0.601299	A-D Test Statistic	0.276636
Skewness	0.78796	A-D 5% Critical Value	0.734103
		K-S Test Statistic	0.190905
Gamma Statistics		K-S 5% Critical Value	0.269219
k hat	2.434365	Data follow gamma distribution	
k star (bias corrected)	1.770722	at 5% significance level	
Theta hat	644.8911		
Theta star	886.5876	95% UCLs (Assuming Gamma Distribution)	
nu hat	48.68729	Approximate Gamma UCL	2438.944
nu star	35.41444	Adjusted Gamma UCL	2641.05
Approx.Chi Square Value (.05)	22.79558		
Adjusted Level of Significance	0.0267	Lognormal Distribution Test	
Adjusted Chi Square Value	21.05115	Shapiro-Wilk Test Statisitic	0.894721
		Shapiro-Wilk 5% Critical Value	0.842
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	5.298317		
Maximum of log data	8.166216	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	7.139534	95% H-UCL	3561.981
Standard Deviation of log data	0.798119	95% Chebyshev (MVUE) UCL	3570.543
Variance of log data	0.636993	97.5% Chebyshev (MVUE) UCL	4393.963
		99% Chebyshev (MVUE) UCL	6011.411
		95% Non-parametric UCLs	
		CLT UCL	2060.909
		Adj-CLT UCL (Adjusted for skewness)	2140.387
		Mod-t UCL (Adjusted for skewness)	2129.504
		Jackknife UCL	2117.107
		Standard Bootstrap UCL	2038.78
		Bootstrap-t UCL	2251.739
RECOMMENDATION		Hall's Bootstrap UCL	2513.513
Data are normal (0.05)		Percentile Bootstrap UCL	2065
		BCA Bootstrap UCL	2255.9
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	2871.085
		97.5% Chebyshev (Mean, Sd) UCL	3434.108
		99% Chebyshev (Mean, Sd) UCL	4540.059

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-SC01-f-121304.xls	
Variable:	Arsenic	
Raw Statistics		
Number of Observations	4	
Number of Missing Data	0	
Number of Valid Observations	4	
Number of Distinct Observations	3	
Minimum	10	
Maximum	150	
Mean	48.25	
Standard Deviation	68.10959	
Variance	4638.917	
Coefficient of Variation	1.411598	
Skewness	1.952603	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.69558	
Shapiro-Wilk 5% Critical Value	0.748	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	128.3933	
Gamma Statistics		
k hat	0.854575	
k star (bias corrected)	0.38031	
Theta hat	56.46084	
Theta star	126.8701	
nu hat	6.836597	
nu star	3.042483	
5% Approximate Chi Square Value	0.384934	
Adjusted Level of Significance	N/A	
Adjusted Chi Square Value	N/A	
Anderson-Darling Test Statistic	0.600305	
Anderson-Darling 5% Critical Value	0.668756	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.340797	
Kolmogrov-Smirnov 5% Critical Value	0.403928	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	381.3632	
95% Adjusted Gamma UCL	N/A	
Lognormal Statistics		
Minimum of log data	2.302585	
Maximum of log data	5.010635	
Mean of log data	3.187825	
Standard Deviation of log data	1.277064	
Variance of log data	1.630892	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.818081	
Shapiro-Wilk 5% Critical Value	0.748	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	54.77702	
MLE Standard Deviation	111.029	
MLE Coefficient of Variation	2.026926	
MLE Skewness	14.40826	
MLE Median	24.23566	
MLE 80% Quantile	71.30338	
MLE 90% Quantile	125.0673	
MLE 95% Quantile	198.0649	
MLE 99% Quantile	472.6122	
MVU Estimate of Median	19.58845	
MVU Estimate of Mean	42.02743	
MVU Estimate of Standard Deviation	48.32586	
MVU Estimate of SE of Mean	23.83654	
95% H-UCL	245405.9	
95% Chebyshev (MVUE) UCL	145.9285	
97.5% Chebyshev (MVUE) UCL	190.8866	
99% Chebyshev (MVUE) UCL	279.198	
Non-parametric Statisitics		
95% CLT UCL	104.2652	
95% Adjusted-CLT UCL	139.7909	
95% Modified-t UCL	133.9346	
95% Jackknife UCL	128.3933	
95% Chebyshev (Mean, Sd) UCL	196.6914	
97.5% Chebyshev (Mean, Sd) UCL	260.9221	
99% Chebyshev (Mean, Sd) UCL	387.0909	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	GAMMA	
1st Recommended UCL	381.3632	95% Approximate Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-SC01-f-121304.xls	
Variable:	Cadmium	
Raw Statistics		
Number of Observations	4	
Number of Missing Data	0	
Number of Valid Observations	4	
Number of Distinct Observations	2	
Minimum	0.7	
Maximum	4.8	
Mean	1.725	
Standard Deviation	2.05	
Variance	4.2025	
Coefficient of Variation	1.188406	
Skewness	2	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.629658	
Shapiro-Wilk 5% Critical Value	0.748	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	4.137197	
Gamma Statistics		
k hat	1.33084	
k star (bias corrected)	0.499377	
Theta hat	1.296174	
Theta star	3.454306	
nu hat	10.64672	
nu star	3.995013	
5% Approximate Chi Square Value	0.719436	
Adjusted Level of Significance	N/A	
Adjusted Chi Square Value	N/A	
Anderson-Darling Test Statistic	0.962899	
Anderson-Darling 5% Critical Value	0.663804	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.474837	
Kolmogrov-Smirnov 5% Critical Value	0.400491	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	9.578888	
95% Adjusted Gamma UCL	N/A	
Lognormal Statistics		
Minimum of log data	-0.356675	
Maximum of log data	1.568616	
Mean of log data	0.124648	
Standard Deviation of log data	0.962645	
Variance of log data	0.926686	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.629658	
Shapiro-Wilk 5% Critical Value	0.748	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	1.800368	
MLE Standard Deviation	2.224109	
MLE Coefficient of Variation	1.235364	
MLE Skewness	5.591411	
MLE Median	1.132749	
MLE 80% Quantile	2.555079	
MLE 90% Quantile	3.902616	
MLE 95% Quantile	5.519016	
MLE 99% Quantile	10.63086	
MVU Estimate of Median	1.006022	
MVU Estimate of Mean	1.569523	
MVU Estimate of Standard Deviation	1.417978	
MVU Estimate of SE of Mean	0.705286	
95% H-UCL	220.7147	
95% Chebyshev (MVUE) UCL	4.643796	
97.5% Chebyshev (MVUE) UCL	5.974036	
99% Chebyshev (MVUE) UCL	8.587035	
Non-parametric Statisitics		
95% CLT UCL	3.410975	
95% Adjusted-CLT UCL	4.506202	
95% Modified-t UCL	4.308031	
95% Jackknife UCL	4.137197	
95% Chebyshev (Mean, Sd) UCL	6.192871	
97.5% Chebyshev (Mean, Sd) UCL	8.126123	
99% Chebyshev (Mean, Sd) UCL	11.92362	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/A	Not enough distinct data error
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	6.192871	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-SC01-f-121304.xls	
Variable:	Manganese	
Raw Statistics		
Number of Observations	4	
Number of Missing Data	0	
Number of Valid Observations	4	
Number of Distinct Observations	4	
Minimum	46	
Maximum	270	
Mean	108.5	
Standard Deviation	107.8533	
Variance	11632.33	
Coefficient of Variation	0.99404	
Skewness	1.979076	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.684938	
Shapiro-Wilk 5% Critical Value	0.748	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	235.409	
Gamma Statistics		
k hat	1.864631	
k star (bias corrected)	0.632824	
Theta hat	58.18846	
Theta star	171.4536	
nu hat	14.91705	
nu star	5.062595	
5% Approximate Chi Square Value	1.180809	
Adjusted Level of Significance	N/A	
Adjusted Chi Square Value	N/A	
Anderson-Darling Test Statistic	0.729805	
Anderson-Darling 5% Critical Value	0.661043	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.427846	
Kolmogrov-Smirnov 5% Critical Value	0.39833	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	465.1823	
95% Adjusted Gamma UCL	N/A	
Lognormal Statistics		
Minimum of log data	3.828641	
Maximum of log data	5.598422	
Mean of log data	4.395247	
Standard Deviation of log data	0.811086	
Variance of log data	0.657861	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.763546	
Shapiro-Wilk 5% Critical Value	0.748	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	112.6378	
MLE Standard Deviation	108.6624	
MLE Coefficient of Variation	0.964706	
MLE Skewness	3.791928	
MLE Median	81.06466	
MLE 80% Quantile	160.8729	
MLE 90% Quantile	229.8651	
MLE 95% Quantile	307.8103	
MLE 99% Quantile	534.7682	
MVU Estimate of Median	74.56104	
MVU Estimate of Mean	102.5965	
MVU Estimate of Standard Deviation	79.45652	
MVU Estimate of SE of Mean	39.61553	
95% H-UCL	3505.039	
95% Chebyshev (MVUE) UCL	275.2765	
97.5% Chebyshev (MVUE) UCL	349.9954	
99% Chebyshev (MVUE) UCL	496.766	
Non-parametric Statisitics		
95% CLT UCL	197.2014	
95% Adjusted-CLT UCL	254.22	
95% Modified-t UCL	244.3027	
95% Jackknife UCL	235.409	
95% Chebyshev (Mean, Sd) UCL	343.5608	
97.5% Chebyshev (Mean, Sd) UCL	445.2718	
99% Chebyshev (Mean, Sd) UCL	645.0634	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	LOGNORMAL	
1st Recommended UCL	3505.039	95% H-UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-SC01-f-121304.xls	
Variable:	Mercury	
Raw Statistics		
Number of Observations	4	
Number of Missing Data	0	
Number of Valid Observations	4	
Number of Distinct Observations	3	
Minimum	0.0305	
Maximum	0.73	
Mean	0.205625	
Standard Deviation	0.349583	
Variance	0.122209	
Coefficient of Variation	1.700102	
Skewness	1.999997	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.630259	
Shapiro-Wilk 5% Critical Value	0.748	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.616973	
Gamma Statistics		
k hat	0.563691	
k star (bias corrected)	0.307589	
Theta hat	0.364783	
Theta star	0.668505	
nu hat	4.509524	
nu star	2.460714	
5% Approximate Chi Square Value	0.232284	
Adjusted Level of Significance	N/A	
Adjusted Chi Square Value	N/A	
Anderson-Darling Test Statistic	0.943253	
Anderson-Darling 5% Critical Value	0.678207	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.478391	
Kolmogrov-Smirnov 5% Critical Value	0.408917	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	2.178298	
95% Adjusted Gamma UCL	N/A	
Lognormal Statistics		
Minimum of log data	-3.490029	
Maximum of log data	-0.314711	
Mean of log data	-2.688069	
Standard Deviation of log data	1.582257	
Variance of log data	2.503538	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.633965	
Shapiro-Wilk 5% Critical Value	0.748	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.237806	
MLE Standard Deviation	0.796763	
MLE Coefficient of Variation	3.350474	
MLE Skewness	47.66275	
MLE Median	0.068012	
MLE 80% Quantile	0.258965	
MLE 90% Quantile	0.519511	
MLE 95% Quantile	0.918278	
MLE 99% Quantile	2.697328	
MVU Estimate of Median	0.048639	
MVU Estimate of Mean	0.152458	
MVU Estimate of Standard Deviation	0.207627	
MVU Estimate of SE of Mean	0.101098	
95% H-UCL	91949.13	
95% Chebyshev (MVUE) UCL	0.593135	
97.5% Chebyshev (MVUE) UCL	0.783817	
99% Chebyshev (MVUE) UCL	1.158373	
Non-parametric Statisitics		
95% CLT UCL	0.493132	
95% Adjusted-CLT UCL	0.679899	
95% Modified-t UCL	0.646105	
95% Jackknife UCL	0.616973	
95% Chebyshev (Mean, Sd) UCL	0.967524	
97.5% Chebyshev (Mean, Sd) UCL	1.297199	
99% Chebyshev (Mean, Sd) UCL	1.944781	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	1.944781	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	YES	Cosider using 95% or 97.5% Chebyshev (Mean, Sd) UCL

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-SC01-f-121304.xls	
Variable:	Vanadium	
Raw Statistics		
Number of Observations	4	
Number of Missing Data	0	
Number of Valid Observations	4	
Number of Distinct Observations	4	
Minimum	4	
Maximum	11	
Mean	7.025	
Standard Deviation	3.398406	
Variance	11.54917	
Coefficient of Variation	0.483759	
Skewness	0.369241	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.883111	
Shapiro-Wilk 5% Critical Value	0.748	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	11.02384	
Gamma Statistics		
k hat	5.584574	
k star (bias corrected)	1.56281	
Theta hat	1.257929	
Theta star	4.495108	
nu hat	44.67659	
nu star	12.50248	
5% Approximate Chi Square Value	5.55876	
Adjusted Level of Significance	N/A	
Adjusted Chi Square Value	N/A	
Anderson-Darling Test Statistic	0.420519	
Anderson-Darling 5% Critical Value	0.658804	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.310374	
Kolmogrov-Smirnov 5% Critical Value	0.395778	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	15.80028	
95% Adjusted Gamma UCL	N/A	
Lognormal Statistics		
Minimum of log data	1.386294	
Maximum of log data	2.397895	
Mean of log data	1.857279	
Standard Deviation of log data	0.499629	
Variance of log data	0.249629	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.875011	
Shapiro-Wilk 5% Critical Value	0.748	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	7.257923	
MLE Standard Deviation	3.864795	
MLE Coefficient of Variation	0.532493	
MLE Skewness	1.748468	
MLE Median	6.406283	
MLE 80% Quantile	9.771457	
MLE 90% Quantile	12.174	
MLE 95% Quantile	14.57297	
MLE 99% Quantile	20.47932	
MVU Estimate of Median	6.208247	
MVU Estimate of Mean	7.023049	
MVU Estimate of Standard Deviation	3.445456	
MVU Estimate of SE of Mean	1.721932	
95% H-UCL	28.30447	
95% Chebyshev (MVUE) UCL	14.52878	
97.5% Chebyshev (MVUE) UCL	17.77651	
99% Chebyshev (MVUE) UCL	24.15606	
Non-parametric Statisitics		
95% CLT UCL	9.819941	
95% Adjusted-CLT UCL	10.15514	
95% Modified-t UCL	11.07613	
95% Jackknife UCL	11.02384	
95% Chebyshev (Mean, Sd) UCL	14.43166	
97.5% Chebyshev (Mean, Sd) UCL	17.63652	
99% Chebyshev (Mean, Sd) UCL	23.93186	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	NORMAL	
1st Recommended UCL	11.02384	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-SC02-f-121304.xls	
Variable:	Arsenic	
Raw Statistics		
Number of Observations	4	
Number of Missing Data	0	
Number of Valid Observations	4	
Number of Distinct Observations	4	
Minimum	27	
Maximum	1600	
Mean	746.5	
Standard Deviation	801.8896	
Variance	643027	
Coefficient of Variation	1.074199	
Skewness	0.146361	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.843574	
Shapiro-Wilk 5% Critical Value	0.748	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	1690.069	
Gamma Statistics		
k hat	0.6084	
k star (bias corrected)	0.318767	
Theta hat	1226.99	
Theta star	2341.839	
nu hat	4.867197	
nu star	2.550133	
5% Approximate Chi Square Value	0.25253	
Adjusted Level of Significance	N/A	
Adjusted Chi Square Value	N/A	
Anderson-Darling Test Statistic	0.432263	
Anderson-Darling 5% Critical Value	0.67631	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.305912	
Kolmogrov-Smirnov 5% Critical Value	0.407975	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	7538.392	
95% Adjusted Gamma UCL	N/A	
Lognormal Statistics		
Minimum of log data	3.295837	
Maximum of log data	7.377759	
Mean of log data	5.601896	
Standard Deviation of log data	1.987249	
Variance of log data	3.949159	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.881519	
Shapiro-Wilk 5% Critical Value	0.748	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	1951.737	
MLE Standard Deviation	13923.38	
MLE Coefficient of Variation	7.133841	
MLE Skewness	384.4547	
MLE Median	270.9395	
MLE 80% Quantile	1452.616	
MLE 90% Quantile	3482.517	
MLE 95% Quantile	7121.832	
MLE 99% Quantile	27563.2	
MVU Estimate of Median	155.6579	
MVU Estimate of Mean	893.2146	
MVU Estimate of Standard Deviation	1434.442	
MVU Estimate of SE of Mean	681.8641	
95% H-UCL	1.22E+12	
95% Chebyshev (MVUE) UCL	3865.391	
97.5% Chebyshev (MVUE) UCL	5151.455	
99% Chebyshev (MVUE) UCL	7677.677	
Non-parametric Statisitics		
95% CLT UCL	1405.996	
95% Adjusted-CLT UCL	1437.347	
95% Modified-t UCL	1694.959	
95% Jackknife UCL	1690.069	
95% Chebyshev (Mean, Sd) UCL	2494.178	
97.5% Chebyshev (Mean, Sd) UCL	3250.4	
99% Chebyshev (Mean, Sd) UCL	4735.851	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	NORMAL	
1st Recommended UCL	1690.069	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-SC02-f-121304.xls	
Variable:	Cadmium	
Raw Statistics		
Number of Observations	4	
Number of Missing Data	0	
Number of Valid Observations	4	
Number of Distinct Observations	4	
Minimum	0.75	
Maximum	34.9	
Mean	14.1125	
Standard Deviation	16.5586	
Variance	274.1873	
Coefficient of Variation	1.173329	
Skewness	0.652185	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.865873	
Shapiro-Wilk 5% Critical Value	0.748	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	33.5967	
Gamma Statistics		
k hat	0.550172	
k star (bias corrected)	0.30421	
Theta hat	25.65107	
Theta star	46.3907	
nu hat	4.401376	
nu star	2.433677	
5% Approximate Chi Square Value	0.22642	
Adjusted Level of Significance	N/A	
Adjusted Chi Square Value	N/A	
Anderson-Darling Test Statistic	0.51308	
Anderson-Darling 5% Critical Value	0.678781	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.33488	
Kolmogrov-Smirnov 5% Critical Value	0.409202	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	151.6884	
95% Adjusted Gamma UCL	N/A	
Lognormal Statistics		
Minimum of log data	-0.287682	
Maximum of log data	3.552487	
Mean of log data	1.509348	
Standard Deviation of log data	2.050577	
Variance of log data	4.204866	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.801022	
Shapiro-Wilk 5% Critical Value	0.748	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	37.03197	
MLE Standard Deviation	300.8756	
MLE Coefficient of Variation	8.124754	
MLE Skewness	560.7025	
MLE Median	4.523782	
MLE 80% Quantile	25.58704	
MLE 90% Quantile	63.07597	
MLE 95% Quantile	131.9664	
MLE 99% Quantile	533.2501	
MVU Estimate of Median	2.494019	
MVU Estimate of Mean	15.90046	
MVU Estimate of Standard Deviation	26.08813	
MVU Estimate of SE of Mean	12.34669	
95% H-UCL	8.54E+10	
95% Chebyshev (MVUE) UCL	69.71844	
97.5% Chebyshev (MVUE) UCL	93.00552	
99% Chebyshev (MVUE) UCL	138.7485	
Non-parametric Statisitics		
95% CLT UCL	27.73074	
95% Adjusted-CLT UCL	30.61553	
95% Modified-t UCL	34.04667	
95% Jackknife UCL	33.5967	
95% Chebyshev (Mean, Sd) UCL	50.20114	
97.5% Chebyshev (Mean, Sd) UCL	65.81672	
99% Chebyshev (Mean, Sd) UCL	96.4905	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	33.5967	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-SC02-f-121304.xls	
Variable:	Copper	
Raw Statistics		
Number of Observations	4	
Number of Missing Data	0	
Number of Valid Observations	4	
Number of Distinct Observations	4	
Minimum	25	
Maximum	605	
Mean	276.25	
Standard Deviation	271.2433	
Variance	73572.92	
Coefficient of Variation	0.981876	
Skewness	0.472575	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.916334	
Shapiro-Wilk 5% Critical Value	0.748	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	595.417	
Gamma Statistics		
k hat	0.94756	
k star (bias corrected)	0.403557	
Theta hat	291.5382	
Theta star	684.5382	
nu hat	7.580483	
nu star	3.228454	
5% Approximate Chi Square Value	0.442995	
Adjusted Level of Significance	N/A	
Adjusted Chi Square Value	N/A	
Anderson-Darling Test Statistic	0.293528	
Anderson-Darling 5% Critical Value	0.667384	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.256086	
Kolmogrov-Smirnov 5% Critical Value	0.402983	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	2013.254	
95% Adjusted Gamma UCL	N/A	
Lognormal Statistics		
Minimum of log data	3.218876	
Maximum of log data	6.405228	
Mean of log data	5.008226	
Standard Deviation of log data	1.459552	
Variance of log data	2.130292	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.935516	
Shapiro-Wilk 5% Critical Value	0.748	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	434.142	
MLE Standard Deviation	1182.376	
MLE Coefficient of Variation	2.723477	
MLE Skewness	28.37135	
MLE Median	149.639	
MLE 80% Quantile	513.6526	
MLE 90% Quantile	976.2806	
MLE 95% Quantile	1651.086	
MLE 99% Quantile	4461.069	
MVU Estimate of Median	112.8569	
MVU Estimate of Mean	301.3253	
MVU Estimate of Standard Deviation	385.6182	
MVU Estimate of SE of Mean	188.8501	
95% H-UCL	24938323	
95% Chebyshev (MVUE) UCL	1124.504	
97.5% Chebyshev (MVUE) UCL	1480.694	
99% Chebyshev (MVUE) UCL	2180.36	
Non-parametric Statisitics		
95% CLT UCL	499.3277	
95% Adjusted-CLT UCL	533.569	
95% Modified-t UCL	600.7579	
95% Jackknife UCL	595.417	
95% Chebyshev (Mean, Sd) UCL	867.411	
97.5% Chebyshev (Mean, Sd) UCL	1123.207	
99% Chebyshev (Mean, Sd) UCL	1625.668	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	595.417	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-SC02-f-121304.xls	
Variable:	Manganese	
Raw Statistics		
Number of Observations	4	
Number of Missing Data	0	
Number of Valid Observations	4	
Number of Distinct Observations	4	
Minimum	65	
Maximum	2300	
Mean	1008.75	
Standard Deviation	1076.479	
Variance	1158806	
Coefficient of Variation	1.067141	
Skewness	0.456737	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.886561	
Shapiro-Wilk 5% Critical Value	0.748	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	2275.423	
Gamma Statistics		
k hat	0.738086	
k star (bias corrected)	0.351188	
Theta hat	1366.711	
Theta star	2872.392	
nu hat	5.904686	
nu star	2.809505	
5% Approximate Chi Square Value	0.318143	
Adjusted Level of Significance	N/A	
Adjusted Chi Square Value	N/A	
Anderson-Darling Test Statistic	0.365373	
Anderson-Darling 5% Critical Value	0.670806	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.270326	
Kolmogrov-Smirnov 5% Critical Value	0.405241	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	8908.209	
95% Adjusted Gamma UCL	N/A	
Lognormal Statistics		
Minimum of log data	4.174387	
Maximum of log data	7.740664	
Mean of log data	6.103635	
Standard Deviation of log data	1.700799	
Variance of log data	2.892719	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.906771	
Shapiro-Wilk 5% Critical Value	0.748	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	1900.732	
MLE Standard Deviation	7846.662	
MLE Coefficient of Variation	4.128232	
MLE Skewness	82.73925	
MLE Median	447.4814	
MLE 80% Quantile	1883.356	
MLE 90% Quantile	3980.498	
MLE 95% Quantile	7342.613	
MLE 99% Quantile	23381.36	
MVU Estimate of Median	302.3489	
MVU Estimate of Mean	1117.694	
MVU Estimate of Standard Deviation	1606.606	
MVU Estimate of SE of Mean	777.4041	
95% H-UCL	5.37E+09	
95% Chebyshev (MVUE) UCL	4506.32	
97.5% Chebyshev (MVUE) UCL	5972.581	
99% Chebyshev (MVUE) UCL	8852.766	
Non-parametric Statisitics		
95% CLT UCL	1894.075	
95% Adjusted-CLT UCL	2025.413	
95% Modified-t UCL	2295.909	
95% Jackknife UCL	2275.423	
95% Chebyshev (Mean, Sd) UCL	3354.881	
97.5% Chebyshev (Mean, Sd) UCL	4370.053	
99% Chebyshev (Mean, Sd) UCL	6364.164	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	2275.423	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-SC02-f-121304.xls	
Variable:	Mercury	
Raw Statistics		
Number of Observations	4	
Number of Missing Data	0	
Number of Valid Observations	4	
Number of Distinct Observations	4	
Minimum	0.095	
Maximum	1.1	
Mean	0.64125	
Standard Deviation	0.427831	
Variance	0.18304	
Coefficient of Variation	0.667183	
Skewness	-0.52355	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.986255	
Shapiro-Wilk 5% Critical Value	0.748	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	1.144671	
Gamma Statistics		
k hat	1.713292	
k star (bias corrected)	0.59499	
Theta hat	0.374279	
Theta star	1.07775	
nu hat	13.70634	
nu star	4.759917	
5% Approximate Chi Square Value	1.04255	
Adjusted Level of Significance	N/A	
Adjusted Chi Square Value	N/A	
Anderson-Darling Test Statistic	0.373612	
Anderson-Darling 5% Critical Value	0.661594	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.27559	
Kolmogrov-Smirnov 5% Critical Value	0.398812	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	2.927723	
95% Adjusted Gamma UCL	N/A	
Lognormal Statistics		
Minimum of log data	-2.353878	
Maximum of log data	0.09531	
Mean of log data	-0.763714	
Standard Deviation of log data	1.09751	
Variance of log data	1.204528	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.847554	
Shapiro-Wilk 5% Critical Value	0.748	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	0.850909	
MLE Standard Deviation	1.3003	
MLE Coefficient of Variation	1.528131	
MLE Skewness	8.152857	
MLE Median	0.465933	
MLE 80% Quantile	1.177839	
MLE 90% Quantile	1.909012	
MLE 95% Quantile	2.834001	
MLE 99% Quantile	5.984026	
MVU Estimate of Median	0.398881	
MVU Estimate of Mean	0.706824	
MVU Estimate of Standard Deviation	0.715792	
MVU Estimate of SE of Mean	0.354963	
95% H-UCL	430.9857	
95% Chebyshev (MVUE) UCL	2.254071	
97.5% Chebyshev (MVUE) UCL	2.923566	
99% Chebyshev (MVUE) UCL	4.238659	
Non-parametric Statisitics		
95% CLT UCL	0.99311	
95% Adjusted-CLT UCL	0.933275	
95% Modified-t UCL	1.135338	
95% Jackknife UCL	1.144671	
95% Chebyshev (Mean, Sd) UCL	1.573687	
97.5% Chebyshev (Mean, Sd) UCL	1.977153	
99% Chebyshev (Mean, Sd) UCL	2.769684	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	NORMAL	
1st Recommended UCL	1.144671	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-SC02-f-121304.xls	
Variable:	Vanadium	
Raw Statistics		
Number of Observations	4	
Number of Missing Data	0	
Number of Valid Observations	4	
Number of Distinct Observations	4	
Minimum	3.8	
Maximum	54.6	
Mean	27.65	
Standard Deviation	24.97432	
Variance	623.7167	
Coefficient of Variation	0.90323	
Skewness	0.14311	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.879981	
Shapiro-Wilk 5% Critical Value	0.748	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	57.03682	
Gamma Statistics		
k hat	1.157026	
k star (bias corrected)	0.455923	
Theta hat	23.89747	
Theta star	60.64617	
nu hat	9.256212	
nu star	3.647386	
5% Approximate Chi Square Value	0.587308	
Adjusted Level of Significance	N/A	
Adjusted Chi Square Value	N/A	
Anderson-Darling Test Statistic	0.38019	
Anderson-Darling 5% Critical Value	0.665278	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.292519	
Kolmogrov-Smirnov 5% Critical Value	0.40152	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	171.7162	
95% Adjusted Gamma UCL	N/A	
Lognormal Statistics		
Minimum of log data	1.335001	
Maximum of log data	4.000034	
Mean of log data	2.82886	
Standard Deviation of log data	1.270722	
Variance of log data	1.614734	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.90172	
Shapiro-Wilk 5% Critical Value	0.748	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	37.94837	
MLE Standard Deviation	76.14822	
MLE Coefficient of Variation	2.006627	
MLE Skewness	14.09966	
MLE Median	16.92615	
MLE 80% Quantile	49.53203	
MLE 90% Quantile	86.63789	
MLE 95% Quantile	136.8927	
MLE 99% Quantile	325.2385	
MVU Estimate of Median	13.71075	
MVU Estimate of Mean	29.20666	
MVU Estimate of Standard Deviation	33.44689	
MVU Estimate of SE of Mean	16.50114	
95% H-UCL	156542.2	
95% Chebyshev (MVUE) UCL	101.1334	
97.5% Chebyshev (MVUE) UCL	132.2562	
99% Chebyshev (MVUE) UCL	193.3909	
Non-parametric Statisitics		
95% CLT UCL	48.18955	
95% Adjusted-CLT UCL	49.14429	
95% Modified-t UCL	57.18574	
95% Jackknife UCL	57.03682	
95% Chebyshev (Mean, Sd) UCL	82.08027	
97.5% Chebyshev (Mean, Sd) UCL	105.6323	
99% Chebyshev (Mean, Sd) UCL	151.8957	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	NORMAL	
1st Recommended UCL	57.03682	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-SC02-f-121304.xls	
Variable:	Zinc	
Raw Statistics		
Number of Observations	4	
Number of Missing Data	0	
Number of Valid Observations	4	
Number of Distinct Observations	4	
Minimum	140	
Maximum	6670	
Mean	2627.5	
Standard Deviation	3021.229	
Variance	9127825	
Coefficient of Variation	1.149849	
Skewness	0.996667	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.891254	
Shapiro-Wilk 5% Critical Value	0.748	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	6182.525	
Gamma Statistics		
k hat	0.698363	
k star (bias corrected)	0.341257	
Theta hat	3762.37	
Theta star	7699.466	
nu hat	5.586905	
nu star	2.730059	
5% Approximate Chi Square Value	0.297012	
Adjusted Level of Significance	N/A	
Adjusted Chi Square Value	N/A	
Anderson-Darling Test Statistic	0.271325	
Anderson-Darling 5% Critical Value	0.672491	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.245166	
Kolmogrov-Smirnov 5% Critical Value	0.406079	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	24151.3	
95% Adjusted Gamma UCL	N/A	
Lognormal Statistics		
Minimum of log data	4.941642	
Maximum of log data	8.805375	
Mean of log data	7.008133	
Standard Deviation of log data	1.756856	
Variance of log data	3.086544	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.950348	
Shapiro-Wilk 5% Critical Value	0.748	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	5174.018	
MLE Standard Deviation	23654.51	
MLE Coefficient of Variation	4.571788	
MLE Skewness	109.2715	
MLE Median	1105.588	
MLE 80% Quantile	4878.907	
MLE 90% Quantile	10569.13	
MLE 95% Quantile	19893.76	
MLE 99% Quantile	65813.51	
MVU Estimate of Median	725.7689	
MVU Estimate of Mean	2910.631	
MVU Estimate of Standard Deviation	4284.234	
MVU Estimate of SE of Mean	2066.442	
95% H-UCL	3.93E+10	
95% Chebyshev (MVUE) UCL	11918.04	
97.5% Chebyshev (MVUE) UCL	15815.55	
99% Chebyshev (MVUE) UCL	23471.46	
Non-parametric Statisitics		
95% CLT UCL	5112.24	
95% Adjusted-CLT UCL	5916.606	
95% Modified-t UCL	6307.99	
95% Jackknife UCL	6182.525	
95% Chebyshev (Mean, Sd) UCL	9212.116	
97.5% Chebyshev (Mean, Sd) UCL	12061.28	
99% Chebyshev (Mean, Sd) UCL	17657.92	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	6182.525	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Arsenic
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	4	Shapiro-Wilk Test Statisitic	0.629658
Number of Unique Samples	2	Shapiro-Wilk 5% Critical Value	0.748
Minimum	10	Data not normal at 5% significance level	
Maximum	54		
Mean	21	95% UCL (Assuming Normal Distribution)	
Median	10	Student's-t UCL	46.887
Standard Deviation	22		
Variance	484	Gamma Distribution Test	
Coefficient of Variation	1.047619	A-D Test Statistic	0.963635
Skewness	2	A-D 5% Critical Value	0.661611
		K-S Test Statistic	0.47362
Gamma Statistics		K-S 5% Critical Value	0.398827
k hat	1.708547	Data do not follow gamma distribution	
k star (bias corrected)	0.593803	at 5% significance level	
Theta hat	12.29114		
Theta star	35.36524	95% UCLs (Assuming Gamma Distribution)	
nu hat	13.66838	Approximate Gamma UCL	96.07892
nu star	4.750428	Adjusted Gamma UCL	N/A
Approx.Chi Square Value (.05)	1.038302		
Adjusted Level of Significance	N/A	Lognormal Distribution Test	
Adjusted Chi Square Value	N/A	Shapiro-Wilk Test Statisitic	0.629658
		Shapiro-Wilk 5% Critical Value	0.748
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	2.302585		
Maximum of log data	3.988984	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	2.724185	95% H-UCL	887.3154
Standard Deviation of log data	0.843199	95% Chebyshev (MVUE) UCL	53.88752
Variance of log data	0.710985	97.5% Chebyshev (MVUE) UCL	68.70382
		99% Chebyshev (MVUE) UCL	97.80758
		95% Non-parametric UCLs	
		CLT UCL	39.09339
		Adj-CLT UCL (Adjusted for skewness)	50.84705
		Mod-t UCL (Adjusted for skewness)	48.72033
		Jackknife UCL	46.887
		Standard Bootstrap UCL	N/R
		Bootstrap-t UCL	N/R
RECOMMENDATION		Hall's Bootstrap UCL	N/A
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	N/R
		BCA Bootstrap UCL	N/R
Use 95% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	68.94789
		97.5% Chebyshev (Mean, Sd) UCL	89.69498
		99% Chebyshev (Mean, Sd) UCL	130.4486
Recommended UCL exceeds the maximum observation			

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-SC04-f-121304.xls	
Variable:	Arsenic	
Raw Statistics		
Number of Observations	4	
Number of Missing Data	0	
Number of Valid Observations	4	
Number of Distinct Observations	4	
Minimum	30	
Maximum	140	
Mean	61.25	
Standard Deviation	52.63316	
Variance	2770.25	
Coefficient of Variation	0.859317	
Skewness	1.969461	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.696744	
Shapiro-Wilk 5% Critical Value	0.748	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	123.1825	
Gamma Statistics		
k hat	2.452819	
k star (bias corrected)	0.779872	
Theta hat	24.97126	
Theta star	78.53858	
nu hat	19.62256	
nu star	6.238972	
5% Approximate Chi Square Value	1.76266	
Adjusted Level of Significance	N/A	
Adjusted Chi Square Value	N/A	
Anderson-Darling Test Statistic	0.705657	
Anderson-Darling 5% Critical Value	0.660034	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.418649	
Kolmogrov-Smirnov 5% Critical Value	0.397293	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	216.7956	
95% Adjusted Gamma UCL	N/A	
Lognormal Statistics		
Minimum of log data	3.401197	
Maximum of log data	4.941642	
Mean of log data	3.89748	
Standard Deviation of log data	0.704713	
Variance of log data	0.49662	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.771361	
Shapiro-Wilk 5% Critical Value	0.748	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	63.16752	
MLE Standard Deviation	50.65856	
MLE Coefficient of Variation	0.801972	
MLE Skewness	2.92171	
MLE Median	49.27812	
MLE 80% Quantile	89.38586	
MLE 90% Quantile	121.8799	
MLE 95% Quantile	157.0765	
MLE 99% Quantile	253.8243	
MVU Estimate of Median	46.27552	
MVU Estimate of Mean	58.98189	
MVU Estimate of Standard Deviation	40.1183	
MVU Estimate of SE of Mean	20.02515	
95% H-UCL	864.6861	
95% Chebyshev (MVUE) UCL	146.2695	
97.5% Chebyshev (MVUE) UCL	184.0389	
99% Chebyshev (MVUE) UCL	258.2296	
Non-parametric Statisitics		
95% CLT UCL	104.5369	
95% Adjusted-CLT UCL	132.2272	
95% Modified-t UCL	127.5016	
95% Jackknife UCL	123.1825	
95% Chebyshev (Mean, Sd) UCL	175.9613	
97.5% Chebyshev (Mean, Sd) UCL	225.597	
99% Chebyshev (Mean, Sd) UCL	323.0967	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	LOGNORMAL	
1st Recommended UCL	864.6861	95% H-UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-SC04-f-121304.xls	
Variable:	Cadmium	
Raw Statistics		
Number of Observations	4	
Number of Missing Data	0	
Number of Valid Observations	4	
Number of Distinct Observations	3	
Minimum	0.7	
Maximum	5.45	
Mean	1.9	
Standard Deviation	2.366784	
Variance	5.601667	
Coefficient of Variation	1.245676	
Skewness	1.999406	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.637299	
Shapiro-Wilk 5% Critical Value	0.748	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	4.684951	
Gamma Statistics		
k hat	1.207313	
k star (bias corrected)	0.468495	
Theta hat	1.573742	
Theta star	4.05554	
nu hat	9.658507	
nu star	3.74796	
5% Approximate Chi Square Value	0.624463	
Adjusted Level of Significance	N/A	
Adjusted Chi Square Value	N/A	
Anderson-Darling Test Statistic	0.916808	
Anderson-Darling 5% Critical Value	0.664852	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.462799	
Kolmogrov-Smirnov 5% Critical Value	0.401223	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	11.4036	
95% Adjusted Gamma UCL	N/A	
Lognormal Statistics		
Minimum of log data	-0.356675	
Maximum of log data	1.695616	
Mean of log data	0.173646	
Standard Deviation of log data	1.015168	
Variance of log data	1.030565	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.653949	
Shapiro-Wilk 5% Critical Value	0.748	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	1.99158	
MLE Standard Deviation	2.673951	
MLE Coefficient of Variation	1.342628	
MLE Skewness	6.448171	
MLE Median	1.189634	
MLE 80% Quantile	2.805165	
MLE 90% Quantile	4.384766	
MLE 95% Quantile	6.319225	
MLE 99% Quantile	12.61549	
MVU Estimate of Median	1.042199	
MVU Estimate of Mean	1.705725	
MVU Estimate of Standard Deviation	1.614671	
MVU Estimate of SE of Mean	0.802265	
95% H-UCL	414.9304	
95% Chebyshev (MVUE) UCL	5.202718	
97.5% Chebyshev (MVUE) UCL	6.715869	
99% Chebyshev (MVUE) UCL	9.688163	
Non-parametric Statisitics		
95% CLT UCL	3.846507	
95% Adjusted-CLT UCL	5.110603	
95% Modified-t UCL	4.882125	
95% Jackknife UCL	4.684951	
95% Chebyshev (Mean, Sd) UCL	7.058286	
97.5% Chebyshev (Mean, Sd) UCL	9.290281	
99% Chebyshev (Mean, Sd) UCL	13.6746	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	13.6746	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	YES	Cosider using 95% or 97.5% Chebyshev (Mean, Sd) UCL

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-SC04-f-121304.xls	
Variable:	Manganese	
Raw Statistics		
Number of Observations	4	
Number of Missing Data	0	
Number of Valid Observations	4	
Number of Distinct Observations	4	
Minimum	61	
Maximum	465	
Mean	173.5	
Standard Deviation	194.9248	
Variance	37995.67	
Coefficient of Variation	1.123486	
Skewness	1.964184	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.697604	
Shapiro-Wilk 5% Critical Value	0.748	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	402.8644	
Gamma Statistics		
k hat	1.447501	
k star (bias corrected)	0.528542	
Theta hat	119.8617	
Theta star	328.2616	
nu hat	11.58001	
nu star	4.228335	
5% Approximate Chi Square Value	0.813612	
Adjusted Level of Significance	N/A	
Adjusted Chi Square Value	N/A	
Anderson-Darling Test Statistic	0.648371	
Anderson-Darling 5% Critical Value	0.662815	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.385791	
Kolmogrov-Smirnov 5% Critical Value	0.399801	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	901.6778	
95% Adjusted Gamma UCL	N/A	
Lognormal Statistics		
Minimum of log data	4.110874	
Maximum of log data	6.142037	
Mean of log data	4.772576	
Standard Deviation of log data	0.93317	
Variance of log data	0.870806	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.80275	
Shapiro-Wilk 5% Critical Value	0.748	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	182.7243	
MLE Standard Deviation	215.3386	
MLE Coefficient of Variation	1.178489	
MLE Skewness	5.172195	
MLE Median	118.2233	
MLE 80% Quantile	260.1099	
MLE 90% Quantile	392.1714	
MLE 95% Quantile	548.7485	
MLE 99% Quantile	1036.007	
MVU Estimate of Median	105.7684	
MVU Estimate of Mean	160.7928	
MVU Estimate of Standard Deviation	141.3156	
MVU Estimate of SE of Mean	70.32695	
95% H-UCL	16843.36	
95% Chebyshev (MVUE) UCL	467.3409	
97.5% Chebyshev (MVUE) UCL	599.9845	
99% Chebyshev (MVUE) UCL	860.5372	
Non-parametric Statisitics		
95% CLT UCL	333.8114	
95% Adjusted-CLT UCL	436.0864	
95% Modified-t UCL	418.8172	
95% Jackknife UCL	402.8644	
95% Chebyshev (Mean, Sd) UCL	598.3287	
97.5% Chebyshev (Mean, Sd) UCL	782.1524	
99% Chebyshev (Mean, Sd) UCL	1143.238	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	GAMMA	
1st Recommended UCL	901.6778	95% Approximate Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-SC04-f-121304.xls	
Variable:	Mercury	
Raw Statistics		
Number of Observations	4	
Number of Missing Data	0	
Number of Valid Observations	4	
Number of Distinct Observations	4	
Minimum	0.028	
Maximum	1.6	
Mean	0.50475	
Standard Deviation	0.739363	
Variance	0.546658	
Coefficient of Variation	1.464811	
Skewness	1.857358	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.758521	
Shapiro-Wilk 5% Critical Value	0.748	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	1.374745	
Gamma Statistics		
k hat	0.619389	
k star (bias corrected)	0.321514	
Theta hat	0.814916	
Theta star	1.569917	
nu hat	4.955112	
nu star	2.572111	
5% Approximate Chi Square Value	0.257702	
Adjusted Level of Significance	N/A	
Adjusted Chi Square Value	N/A	
Anderson-Darling Test Statistic	0.287808	
Anderson-Darling 5% Critical Value	0.675843	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.224731	
Kolmogrov-Smirnov 5% Critical Value	0.407743	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	5.037891	
95% Adjusted Gamma UCL	N/A	
Lognormal Statistics		
Minimum of log data	-3.575551	
Maximum of log data	0.470004	
Mean of log data	-1.676604	
Standard Deviation of log data	1.727824	
Variance of log data	2.985375	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.99165	
Shapiro-Wilk 5% Critical Value	0.748	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	0.832005	
MLE Standard Deviation	3.606904	
MLE Coefficient of Variation	4.335195	
MLE Skewness	94.48087	
MLE Median	0.187008	
MLE 80% Quantile	0.805258	
MLE 90% Quantile	1.722281	
MLE 95% Quantile	3.208059	
MLE 99% Quantile	10.40529	
MVU Estimate of Median	0.124631	
MVU Estimate of Mean	0.479042	
MVU Estimate of Standard Deviation	0.696602	
MVU Estimate of SE of Mean	0.336559	
95% H-UCL	3772358	
95% Chebyshev (MVUE) UCL	1.946067	
97.5% Chebyshev (MVUE) UCL	2.580851	
99% Chebyshev (MVUE) UCL	3.827759	
Non-parametric Statisitics		
95% CLT UCL	1.112822	
95% Adjusted-CLT UCL	1.47966	
95% Modified-t UCL	1.431965	
95% Jackknife UCL	1.374745	
95% Chebyshev (Mean, Sd) UCL	2.116155	
97.5% Chebyshev (Mean, Sd) UCL	2.813412	
99% Chebyshev (Mean, Sd) UCL	4.183037	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	1.374745	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Sed-SC04-f-121304.xls	
Variable:	Vanadium	
Raw Statistics		
Number of Observations	4	
Number of Missing Data	0	
Number of Valid Observations	4	
Number of Distinct Observations	4	
Minimum	4.1	
Maximum	13	
Mean	8.675	
Standard Deviation	3.650913	
Variance	13.32917	
Coefficient of Variation	0.420855	
Skewness	-0.201819	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.976943	
Shapiro-Wilk 5% Critical Value	0.748	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	12.97096	
Gamma Statistics		
k hat	6.443301	
k star (bias corrected)	1.777492	
Theta hat	1.34636	
Theta star	4.880472	
nu hat	51.54641	
nu star	14.21994	
5% Approximate Chi Square Value	6.721048	
Adjusted Level of Significance	N/A	
Adjusted Chi Square Value	N/A	
Anderson-Darling Test Statistic	0.299168	
Anderson-Darling 5% Critical Value	0.658473	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.27025	
Kolmogrov-Smirnov 5% Critical Value	0.395613	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	18.35397	
95% Adjusted Gamma UCL	N/A	
Lognormal Statistics		
Minimum of log data	1.410987	
Maximum of log data	2.564949	
Mean of log data	2.080843	
Standard Deviation of log data	0.484581	
Variance of log data	0.234818	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.927358	
Shapiro-Wilk 5% Critical Value	0.748	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	9.009253	
MLE Standard Deviation	4.634988	
MLE Coefficient of Variation	0.51447	
MLE Skewness	1.679579	
MLE Median	8.011219	
MLE 80% Quantile	12.06506	
MLE 90% Quantile	14.93234	
MLE 95% Quantile	17.77829	
MLE 99% Quantile	24.72902	
MVU Estimate of Median	7.778133	
MVU Estimate of Mean	8.735534	
MVU Estimate of Standard Deviation	4.160909	
MVU Estimate of SE of Mean	2.0796	
95% H-UCL	32.56536	
95% Chebyshev (MVUE) UCL	17.8003	
97.5% Chebyshev (MVUE) UCL	21.72263	
99% Chebyshev (MVUE) UCL	29.4273	
Non-parametric Statisitics		
95% CLT UCL	11.67761	
95% Adjusted-CLT UCL	11.48078	
95% Modified-t UCL	12.94026	
95% Jackknife UCL	12.97096	
95% Chebyshev (Mean, Sd) UCL	16.63198	
97.5% Chebyshev (Mean, Sd) UCL	20.07497	
99% Chebyshev (Mean, Sd) UCL	26.83806	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	12.97096	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-A6-SS-cf-121304.xls	
Variable:	Antimony	
Raw Statistics		
Number of Observations	13	
Number of Missing Data	0	
Number of Valid Observations	13	
Number of Distinct Observations	13	
Minimum	0.18	
Maximum	50.3	
Mean	11.77115	
Standard Deviation	15.38558	
Variance	236.716	
Coefficient of Variation	1.307058	
Skewness	1.448642	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.783619	
Shapiro-Wilk 5% Critical Value	0.866	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	19.37652	
Gamma Statistics		
k hat	0.394502	
k star (bias corrected)	0.354745	
Theta hat	29.83804	
Theta star	33.18204	
nu hat	10.25704	
nu star	9.223364	
5% Approximate Chi Square Value	3.461651	
Adjusted Level of Significance	0.03009	
Adjusted Chi Square Value	2.976743	
Anderson-Darling Test Statistic	1.022069	
Anderson-Darling 5% Critical Value	0.810971	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.291145	
Kolmogrov-Smirnov 5% Critical Value	0.253255	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	31.36354	
95% Adjusted Gamma UCL	36.47262	
Lognormal Statistics		
Minimum of log data	-1.714798	
Maximum of log data	3.918005	
Mean of log data	0.793902	
Standard Deviation of log data	2.369747	
Variance of log data	5.615701	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.787665	
Shapiro-Wilk 5% Critical Value	0.866	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	36.66245	
MLE Standard Deviation	606.5457	
MLE Coefficient of Variation	16.54406	
MLE Skewness	4577.839	
MLE Median	2.212012	
MLE 80% Quantile	16.38455	
MLE 90% Quantile	46.48025	
MLE 95% Quantile	109.086	
MLE 99% Quantile	547.813	
MVU Estimate of Median	1.776164	
MVU Estimate of Mean	20.93617	
MVU Estimate of Standard Deviation	76.92039	
MVU Estimate of SE of Mean	14.85393	
95% H-UCL	1708.365	
95% Chebyshev (MVUE) UCL	85.68294	
97.5% Chebyshev (MVUE) UCL	113.6989	
99% Chebyshev (MVUE) UCL	168.7309	
Non-parametric Statisitics		
95% CLT UCL	18.79006	
95% Adjusted-CLT UCL	20.622	
95% Modified-t UCL	19.66226	
95% Jackknife UCL	19.37652	
95% Chebyshev (Mean, Sd) UCL	30.37141	
97.5% Chebyshev (Mean, Sd) UCL	38.41976	
99% Chebyshev (Mean, Sd) UCL	54.22918	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	18.77721	
95% Bootstrap-t UCL	23.16158	
95% Hall's Bootstrap UCL	21.5975	
95% Percentile Bootstrap UCL	19.045	
95% BCA Bootstrap UCL	20.48308	
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	54.22918	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-A6-SS-cf-121304.xls	
Variable:	Arsenic	
Raw Statistics		
Number of Observations	13	
Number of Missing Data	0	
Number of Valid Observations	13	
Number of Distinct Observations	13	
Minimum	9.2	
Maximum	719	
Mean	276.1308	
Standard Deviation	287.5602	
Variance	82690.85	
Coefficient of Variation	1.041391	
Skewness	0.591064	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.815339	
Shapiro-Wilk 5% Critical Value	0.866	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	418.2768	
Gamma Statistics		
k hat	0.60797	
k star (bias corrected)	0.518951	
Theta hat	454.1851	
Theta star	532.094	
nu hat	15.80721	
nu star	13.49273	
5% Approximate Chi Square Value	6.224457	
Adjusted Level of Significance	0.03009	
Adjusted Chi Square Value	5.535715	
Anderson-Darling Test Statistic	0.782598	
Anderson-Darling 5% Critical Value	0.781468	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.224828	
Kolmogrov-Smirnov 5% Critical Value	0.248108	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	APPROX GAMMA	Data follow approximate gamma distribution at 5% significance level
95% Approximate Gamma UCL	598.5674	
95% Adjusted Gamma UCL	673.0399	
Lognormal Statistics		
Minimum of log data	2.219203	
Maximum of log data	6.577861	
Mean of log data	4.606553	
Standard Deviation of log data	1.796914	
Variance of log data	3.228899	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.8305	
Shapiro-Wilk 5% Critical Value	0.866	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	503.2073	
MLE Standard Deviation	2478.103	
MLE Coefficient of Variation	4.924616	
MLE Skewness	134.2049	
MLE Median	100.1383	
MLE 80% Quantile	457.1195	
MLE 90% Quantile	1007.862	
MLE 95% Quantile	1924.605	
MLE 99% Quantile	6543.151	
MVU Estimate of Median	88.34408	
MVU Estimate of Mean	390.8285	
MVU Estimate of Standard Deviation	935.3012	
MVU Estimate of SE of Mean	216.984	
95% H-UCL	4944.35	
95% Chebyshev (MVUE) UCL	1336.64	
97.5% Chebyshev (MVUE) UCL	1745.893	
99% Chebyshev (MVUE) UCL	2549.792	
Non-parametric Statisitics		
95% CLT UCL	407.3158	
95% Adjusted-CLT UCL	421.2859	
95% Modified-t UCL	420.4559	
95% Jackknife UCL	418.2768	
95% Chebyshev (Mean, Sd) UCL	623.7741	
97.5% Chebyshev (Mean, Sd) UCL	774.1996	
99% Chebyshev (Mean, Sd) UCL	1069.681	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	403.2577	
95% Bootstrap-t UCL	450.5625	
95% Hall's Bootstrap UCL	389.9219	
95% Percentile Bootstrap UCL	404.8692	
95% BCA Bootstrap UCL	405.6923	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	598.5674	95% Approximate Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-A6-SS-cf-121304.xls	
Variable:	Copper	
Raw Statistics		
Number of Observations	13	
Number of Missing Data	0	
Number of Valid Observations	13	
Number of Distinct Observations	13	
Minimum	9.6	
Maximum	611	
Mean	218.9038	
Standard Deviation	220.5354	
Variance	48635.86	
Coefficient of Variation	1.007453	
Skewness	0.74804	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.842664	
Shapiro-Wilk 5% Critical Value	0.866	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	327.9184	
Gamma Statistics		
k hat	0.797885	
k star (bias corrected)	0.66504	
Theta hat	274.3552	
Theta star	329.1591	
nu hat	20.74501	
nu star	17.29103	
5% Approximate Chi Square Value	8.879184	
Adjusted Level of Significance	0.03009	
Adjusted Chi Square Value	8.033065	
Anderson-Darling Test Statistic	0.497133	
Anderson-Darling 5% Critical Value	0.767837	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.193364	
Kolmogrov-Smirnov 5% Critical Value	0.245326	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	426.2862	
95% Adjusted Gamma UCL	471.1867	
Lognormal Statistics		
Minimum of log data	2.261763	
Maximum of log data	6.415097	
Mean of log data	4.644541	
Standard Deviation of log data	1.453774	
Variance of log data	2.11346	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.90483	
Shapiro-Wilk 5% Critical Value	0.866	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	299.2476	
MLE Standard Deviation	807.2383	
MLE Coefficient of Variation	2.69756	
MLE Skewness	27.72236	
MLE Median	104.0157	
MLE 80% Quantile	355.3065	
MLE 90% Quantile	673.6034	
MLE 95% Quantile	1136.831	
MLE 99% Quantile	3059.542	
MVU Estimate of Median	95.84919	
MVU Estimate of Mean	260.1333	
MVU Estimate of Standard Deviation	462.8132	
MVU Estimate of SE of Mean	116.4672	
95% H-UCL	1419.014	
95% Chebyshev (MVUE) UCL	767.8019	
97.5% Chebyshev (MVUE) UCL	987.4706	
99% Chebyshev (MVUE) UCL	1418.967	
Non-parametric Statisitics		
95% CLT UCL	319.5122	
95% Adjusted-CLT UCL	333.0716	
95% Modified-t UCL	330.0334	
95% Jackknife UCL	327.9184	
95% Chebyshev (Mean, Sd) UCL	485.5181	
97.5% Chebyshev (Mean, Sd) UCL	600.8823	
99% Chebyshev (Mean, Sd) UCL	827.493	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	313.6944	
95% Bootstrap-t UCL	347.9257	
95% Hall's Bootstrap UCL	313.8143	
95% Percentile Bootstrap UCL	320.0154	
95% BCA Bootstrap UCL	321.8385	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	426.2862	95% Approximate Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-A6-SS-cf-121304.xls	
Variable:	Lead	
Raw Statistics		
Number of Observations	13	
Number of Missing Data	0	
Number of Valid Observations	13	
Number of Distinct Observations	13	
Minimum	10.3	
Maximum	5200	
Mean	1222.565	
Standard Deviation	1555.264	
Variance	2418845	
Coefficient of Variation	1.272131	
Skewness	1.594992	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.790528	
Shapiro-Wilk 5% Critical Value	0.866	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1991.36	
Gamma Statistics		
k hat	0.437021	
k star (bias corrected)	0.387452	
Theta hat	2797.501	
Theta star	3155.401	
nu hat	11.36253	
nu star	10.07374	
5% Approximate Chi Square Value	3.987057	
Adjusted Level of Significance	0.03009	
Adjusted Chi Square Value	3.458643	
Anderson-Darling Test Statistic	0.686679	
Anderson-Darling 5% Critical Value	0.802499	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.241373	
Kolmogrov-Smirnov 5% Critical Value	0.251866	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	3088.947	
95% Adjusted Gamma UCL	3560.879	
Lognormal Statistics		
Minimum of log data	2.332144	
Maximum of log data	8.556414	
Mean of log data	5.624172	
Standard Deviation of log data	2.321415	
Variance of log data	5.388968	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.839627	
Shapiro-Wilk 5% Critical Value	0.866	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	4099.645	
MLE Standard Deviation	60527.37	
MLE Coefficient of Variation	14.76405	
MLE Skewness	3262.52	
MLE Median	277.0427	
MLE 80% Quantile	1969.958	
MLE 90% Quantile	5470.854	
MLE 95% Quantile	12618.25	
MLE 99% Quantile	61315.2	
MVU Estimate of Median	224.466	
MVU Estimate of Mean	2418.587	
MVU Estimate of Standard Deviation	8591.298	
MVU Estimate of SE of Mean	1688.093	
95% H-UCL	164762.4	
95% Chebyshev (MVUE) UCL	9776.813	
97.5% Chebyshev (MVUE) UCL	12960.72	
99% Chebyshev (MVUE) UCL	19214.9	
Non-parametric Statisitics		
95% CLT UCL	1932.077	
95% Adjusted-CLT UCL	2135.969	
95% Modified-t UCL	2023.163	
95% Jackknife UCL	1991.36	
95% Chebyshev (Mean, Sd) UCL	3102.788	
97.5% Chebyshev (Mean, Sd) UCL	3916.361	
99% Chebyshev (Mean, Sd) UCL	5514.469	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1912.857	
95% Bootstrap-t UCL	2377.07	
95% Hall's Bootstrap UCL	2373.205	
95% Percentile Bootstrap UCL	2005.769	
95% BCA Bootstrap UCL	2155.192	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	3560.879	95% Adjusted Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-A6-SS-cf-121304.xls	
Variable:	Manganese	
Raw Statistics		
Number of Observations	13	
Number of Missing Data	0	
Number of Valid Observations	13	
Number of Distinct Observations	12	
Minimum	54.8	
Maximum	353	
Mean	121.9462	
Standard Deviation	83.7377	
Variance	7012.003	
Coefficient of Variation	0.686678	
Skewness	2.025046	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.764712	
Shapiro-Wilk 5% Critical Value	0.866	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	163.3392	
Gamma Statistics		
k hat	3.228455	
k star (bias corrected)	2.534709	
Theta hat	37.7723	
Theta star	48.11052	
nu hat	83.93982	
nu star	65.90243	
5% Approximate Chi Square Value	48.21853	
Adjusted Level of Significance	0.03009	
Adjusted Chi Square Value	46.06872	
Anderson-Darling Test Statistic	0.595404	
Anderson-Darling 5% Critical Value	0.738727	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.189518	
Kolmogrov-Smirnov 5% Critical Value	0.238102	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	166.6693	
95% Adjusted Gamma UCL	174.447	
Lognormal Statistics		
Minimum of log data	4.00369	
Maximum of log data	5.866468	
Mean of log data	4.640785	
Standard Deviation of log data	0.560678	
Variance of log data	0.31436	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.915572	
Shapiro-Wilk 5% Critical Value	0.866	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	121.2634	
MLE Standard Deviation	73.7	
MLE Coefficient of Variation	0.607768	
MLE Skewness	2.047803	
MLE Median	103.6257	
MLE 80% Quantile	166.4272	
MLE 90% Quantile	212.9923	
MLE 95% Quantile	260.6295	
MLE 99% Quantile	381.8094	
MVU Estimate of Median	102.3792	
MVU Estimate of Mean	119.6302	
MVU Estimate of Standard Deviation	69.46739	
MVU Estimate of SE of Mean	19.19657	
95% H-UCL	172.8612	
95% Chebyshev (MVUE) UCL	203.3061	
97.5% Chebyshev (MVUE) UCL	239.5128	
99% Chebyshev (MVUE) UCL	310.6337	
Non-parametric Statisitics		
95% CLT UCL	160.1473	
95% Adjusted-CLT UCL	174.0851	
95% Modified-t UCL	165.5132	
95% Jackknife UCL	163.3392	
95% Chebyshev (Mean, Sd) UCL	223.1801	
97.5% Chebyshev (Mean, Sd) UCL	266.9841	
99% Chebyshev (Mean, Sd) UCL	353.0286	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	158.9894	
95% Bootstrap-t UCL	204.4209	
95% Hall's Bootstrap UCL	347.9921	
95% Percentile Bootstrap UCL	159.5769	
95% BCA Bootstrap UCL	176.8231	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	166.6693	95% Approximate Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-A6-SS-cf-121304.xls	
Variable:	Mercury	
Raw Statistics		
Number of Observations	13	
Number of Missing Data	0	
Number of Valid Observations	13	
Number of Distinct Observations	12	
Minimum	0.0255	
Maximum	9.6	
Mean	3.394962	
Standard Deviation	3.786356	
Variance	14.33649	
Coefficient of Variation	1.115287	
Skewness	0.776726	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.810226	
Shapiro-Wilk 5% Critical Value	0.866	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	5.266624	
Gamma Statistics		
k hat	0.489509	
k star (bias corrected)	0.427827	
Theta hat	6.935449	
Theta star	7.935359	
nu hat	12.72722	
nu star	11.1235	
5% Approximate Chi Square Value	4.654616	
Adjusted Level of Significance	0.03009	
Adjusted Chi Square Value	4.07467	
Anderson-Darling Test Statistic	0.6738	
Anderson-Darling 5% Critical Value	0.79204	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.236915	
Kolmogrov-Smirnov 5% Critical Value	0.250153	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	8.113207	
95% Adjusted Gamma UCL	9.267957	
Lognormal Statistics		
Minimum of log data	-3.669077	
Maximum of log data	2.261763	
Mean of log data	-0.079583	
Standard Deviation of log data	2.155662	
Variance of log data	4.646877	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.85837	
Shapiro-Wilk 5% Critical Value	0.866	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	9.42962	
MLE Standard Deviation	95.82039	
MLE Coefficient of Variation	10.16164	
MLE Skewness	1079.765	
MLE Median	0.923501	
MLE 80% Quantile	5.708471	
MLE 90% Quantile	14.73819	
MLE 95% Quantile	32.02384	
MLE 99% Quantile	139.0017	
MVU Estimate of Median	0.770542	
MVU Estimate of Mean	6.160093	
MVU Estimate of Standard Deviation	19.43137	
MVU Estimate of SE of Mean	4.042617	
95% H-UCL	233.607	
95% Chebyshev (MVUE) UCL	23.78145	
97.5% Chebyshev (MVUE) UCL	31.40623	
99% Chebyshev (MVUE) UCL	46.38362	
Non-parametric Statisitics		
95% CLT UCL	5.122298	
95% Adjusted-CLT UCL	5.364026	
95% Modified-t UCL	5.304329	
95% Jackknife UCL	5.266624	
95% Chebyshev (Mean, Sd) UCL	7.972443	
97.5% Chebyshev (Mean, Sd) UCL	9.953123	
99% Chebyshev (Mean, Sd) UCL	13.84379	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	5.092149	
95% Bootstrap-t UCL	5.740314	
95% Hall's Bootstrap UCL	4.943596	
95% Percentile Bootstrap UCL	5.131462	
95% BCA Bootstrap UCL	5.294308	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	9.267957	95% Adjusted Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-A6-SS-cf-121304.xls	
Variable:	Thallium	
Raw Statistics		
Number of Observations	13	
Number of Missing Data	0	
Number of Valid Observations	13	
Number of Distinct Observations	13	
Minimum	1.3	
Maximum	42.4	
Mean	13.95385	
Standard Deviation	12.81819	
Variance	164.306	
Coefficient of Variation	0.918613	
Skewness	0.93675	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.884508	
Shapiro-Wilk 5% Critical Value	0.866	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	20.2901	
Gamma Statistics		
k hat	1.079614	
k star (bias corrected)	0.881754	
Theta hat	12.92485	
Theta star	15.8251	
nu hat	28.06996	
nu star	22.92561	
5% Approximate Chi Square Value	13.03294	
Adjusted Level of Significance	0.03009	
Adjusted Chi Square Value	11.98104	
Anderson-Darling Test Statistic	0.456633	
Anderson-Darling 5% Critical Value	0.756274	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.201798	
Kolmogrov-Smirnov 5% Critical Value	0.242696	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	24.54553	
95% Adjusted Gamma UCL	26.70056	
Lognormal Statistics		
Minimum of log data	0.262364	
Maximum of log data	3.747148	
Mean of log data	2.105784	
Standard Deviation of log data	1.178905	
Variance of log data	1.389818	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.913609	
Shapiro-Wilk 5% Critical Value	0.866	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	16.45604	
MLE Standard Deviation	28.56969	
MLE Coefficient of Variation	1.736121	
MLE Skewness	10.44124	
MLE Median	8.21354	
MLE 80% Quantile	22.24148	
MLE 90% Quantile	37.36286	
MLE 95% Quantile	57.11593	
MLE 99% Quantile	127.4747	
MVU Estimate of Median	7.784414	
MVU Estimate of Mean	15.18967	
MVU Estimate of Standard Deviation	20.6066	
MVU Estimate of SE of Mean	5.43326	
95% H-UCL	48.55728	
95% Chebyshev (MVUE) UCL	38.8727	
97.5% Chebyshev (MVUE) UCL	49.12037	
99% Chebyshev (MVUE) UCL	69.24992	
Non-parametric Statisitics		
95% CLT UCL	19.80151	
95% Adjusted-CLT UCL	20.78844	
95% Modified-t UCL	20.44405	
95% Jackknife UCL	20.2901	
95% Chebyshev (Mean, Sd) UCL	29.45028	
97.5% Chebyshev (Mean, Sd) UCL	36.1556	
99% Chebyshev (Mean, Sd) UCL	49.32691	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	19.50793	
95% Bootstrap-t UCL	21.65348	
95% Hall's Bootstrap UCL	21.37268	
95% Percentile Bootstrap UCL	19.77692	
95% BCA Bootstrap UCL	20.53077	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	20.2901	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-A6-SS-cf-121304.xls	
Variable:	Vanadium	
Raw Statistics		
Number of Observations	13	
Number of Missing Data	0	
Number of Valid Observations	13	
Number of Distinct Observations	13	
Minimum	9.2	
Maximum	37.4	
Mean	18.63462	
Standard Deviation	9.011737	
Variance	81.21141	
Coefficient of Variation	0.483602	
Skewness	0.629164	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.892575	
Shapiro-Wilk 5% Critical Value	0.866	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	23.08928	
Gamma Statistics		
k hat	4.692232	
k star (bias corrected)	3.660691	
Theta hat	3.971376	
Theta star	5.090464	
nu hat	121.998	
nu star	95.17797	
5% Approximate Chi Square Value	73.67238	
Adjusted Level of Significance	0.03009	
Adjusted Chi Square Value	70.98042	
Anderson-Darling Test Statistic	0.61252	
Anderson-Darling 5% Critical Value	0.73633	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.217312	
Kolmogrov-Smirnov 5% Critical Value	0.237511	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	24.07422	
95% Adjusted Gamma UCL	24.98724	
Lognormal Statistics		
Minimum of log data	2.219203	
Maximum of log data	3.621671	
Mean of log data	2.814694	
Standard Deviation of log data	0.492997	
Variance of log data	0.243046	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.89137	
Shapiro-Wilk 5% Critical Value	0.866	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	18.84442	
MLE Standard Deviation	9.884391	
MLE Coefficient of Variation	0.524526	
MLE Skewness	1.71789	
MLE Median	16.68806	
MLE 80% Quantile	25.31194	
MLE 90% Quantile	31.44359	
MLE 95% Quantile	37.55003	
MLE 99% Quantile	52.5311	
MVU Estimate of Median	16.53269	
MVU Estimate of Mean	18.65262	
MVU Estimate of Standard Deviation	9.450287	
MVU Estimate of SE of Mean	2.615168	
95% H-UCL	25.43904	
95% Chebyshev (MVUE) UCL	30.05187	
97.5% Chebyshev (MVUE) UCL	34.98433	
99% Chebyshev (MVUE) UCL	44.67321	
Non-parametric Statisitics		
95% CLT UCL	22.74577	
95% Adjusted-CLT UCL	23.2118	
95% Modified-t UCL	23.16197	
95% Jackknife UCL	23.08928	
95% Chebyshev (Mean, Sd) UCL	29.52927	
97.5% Chebyshev (Mean, Sd) UCL	34.2434	
99% Chebyshev (Mean, Sd) UCL	43.50339	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	22.53362	
95% Bootstrap-t UCL	23.81917	
95% Hall's Bootstrap UCL	23.33118	
95% Percentile Bootstrap UCL	22.75385	
95% BCA Bootstrap UCL	22.65385	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	23.08928	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-A6-SS-cf-121304.xls	
Variable:	Chromium VI	
Raw Statistics		
Number of Observations	13	
Number of Missing Data	0	
Number of Valid Observations	13	
Number of Distinct Observations	9	
Minimum	0.2	
Maximum	44.689	
Mean	7.073311	
Standard Deviation	12.24343	
Variance	149.9017	
Coefficient of Variation	1.730934	
Skewness	2.772213	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.615576	
Shapiro-Wilk 5% Critical Value	0.866	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	13.12546	
Gamma Statistics		
k hat	0.442074	
k star (bias corrected)	0.391339	
Theta hat	16.00028	
Theta star	18.07463	
nu hat	11.49393	
nu star	10.17482	
5% Approximate Chi Square Value	4.050464	
Adjusted Level of Significance	0.03009	
Adjusted Chi Square Value	3.516988	
Anderson-Darling Test Statistic	0.724249	
Anderson-Darling 5% Critical Value	0.801492	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.222543	
Kolmogrov-Smirnov 5% Critical Value	0.251701	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	17.76825	
95% Adjusted Gamma UCL	20.46343	
Lognormal Statistics		
Minimum of log data	-1.609438	
Maximum of log data	3.799727	
Mean of log data	0.491446	
Standard Deviation of log data	1.981859	
Variance of log data	3.927764	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.859878	
Shapiro-Wilk 5% Critical Value	0.866	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	11.65025	
MLE Standard Deviation	82.20926	
MLE Coefficient of Variation	7.056437	
MLE Skewness	372.5326	
MLE Median	1.634677	
MLE 80% Quantile	8.724335	
MLE 90% Quantile	20.86627	
MLE 95% Quantile	42.58931	
MLE 99% Quantile	164.2269	
MVU Estimate of Median	1.40313	
MVU Estimate of Mean	8.340519	
MVU Estimate of Standard Deviation	23.09688	
MVU Estimate of SE of Mean	5.07956	
95% H-UCL	180.6127	
95% Chebyshev (MVUE) UCL	30.48181	
97.5% Chebyshev (MVUE) UCL	40.06236	
99% Chebyshev (MVUE) UCL	58.8815	
Non-parametric Statisitics		
95% CLT UCL	12.65877	
95% Adjusted-CLT UCL	15.44853	
95% Modified-t UCL	13.5606	
95% Jackknife UCL	13.12546	
95% Chebyshev (Mean, Sd) UCL	21.8749	
97.5% Chebyshev (Mean, Sd) UCL	28.27956	
99% Chebyshev (Mean, Sd) UCL	40.86027	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	12.46297	
95% Bootstrap-t UCL	22.04584	
95% Hall's Bootstrap UCL	33.91473	
95% Percentile Bootstrap UCL	12.78326	
95% BCA Bootstrap UCL	15.79121	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	20.46343	95% Adjusted Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-A6-SO-f-121304.xls	
Variable:	Antimony	
Raw Statistics		
Number of Observations	24	
Number of Missing Data	0	
Number of Valid Observations	24	
Number of Distinct Observations	21	
Minimum	0.185	
Maximum	30.95	
Mean	9.183125	
Standard Deviation	10.82485	
Variance	117.1773	
Coefficient of Variation	1.178776	
Skewness	0.83371	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.798897	
Shapiro-Wilk 5% Critical Value	0.916	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	12.97012	
Gamma Statistics		
k hat	0.437971	
k star (bias corrected)	0.411003	
Theta hat	20.96741	
Theta star	22.34322	
nu hat	21.02263	
nu star	19.72813	
5% Approximate Chi Square Value	10.64949	
Adjusted Level of Significance	0.0392	
Adjusted Chi Square Value	10.18103	
Anderson-Darling Test Statistic	1.754886	
Anderson-Darling 5% Critical Value	0.820252	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.240333	
Kolmogrov-Smirnov 5% Critical Value	0.189696	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	17.0117	
95% Adjusted Gamma UCL	17.79446	
Lognormal Statistics		
Minimum of log data	-1.687399	
Maximum of log data	3.432373	
Mean of log data	0.736568	
Standard Deviation of log data	2.140885	
Variance of log data	4.583391	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.801925	
Shapiro-Wilk 5% Critical Value	0.916	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	20.66132	
MLE Standard Deviation	203.3284	
MLE Coefficient of Variation	9.841016	
MLE Skewness	982.5822	
MLE Median	2.088755	
MLE 80% Quantile	12.75108	
MLE 90% Quantile	32.70755	
MLE 95% Quantile	70.69145	
MLE 99% Quantile	303.769	
MVU Estimate of Median	1.897833	
MVU Estimate of Mean	15.99966	
MVU Estimate of Standard Deviation	68.00424	
MVU Estimate of SE of Mean	9.035428	
95% H-UCL	139.3765	
95% Chebyshev (MVUE) UCL	55.38418	
97.5% Chebyshev (MVUE) UCL	72.42589	
99% Chebyshev (MVUE) UCL	105.901	
Non-parametric Statisitics		
95% CLT UCL	12.81761	
95% Adjusted-CLT UCL	13.21941	
95% Modified-t UCL	13.03279	
95% Jackknife UCL	12.97012	
95% Chebyshev (Mean, Sd) UCL	18.8146	
97.5% Chebyshev (Mean, Sd) UCL	22.98215	
99% Chebyshev (Mean, Sd) UCL	31.16849	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	12.72263	
95% Bootstrap-t UCL	13.32598	
95% Hall's Bootstrap UCL	12.96845	
95% Percentile Bootstrap UCL	12.93729	
95% BCA Bootstrap UCL	13.10479	
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	31.16849	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-A6-SO-f-121304.xls	
Variable:	Arsenic	
Raw Statistics		
Number of Observations	24	
Number of Missing Data	0	
Number of Valid Observations	24	
Number of Distinct Observations	24	
Minimum	7.4	
Maximum	744	
Mean	244.4833	
Standard Deviation	258.9007	
Variance	67029.56	
Coefficient of Variation	1.058971	
Skewness	0.71118	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.833719	
Shapiro-Wilk 5% Critical Value	0.916	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	335.0578	
Gamma Statistics		
k hat	0.589711	
k star (bias corrected)	0.543775	
Theta hat	414.5818	
Theta star	449.6041	
nu hat	28.30612	
nu star	26.10118	
5% Approximate Chi Square Value	15.45547	
Adjusted Level of Significance	0.0392	
Adjusted Chi Square Value	14.87945	
Anderson-Darling Test Statistic	1.323977	
Anderson-Darling 5% Critical Value	0.797772	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.214703	
Kolmogrov-Smirnov 5% Critical Value	0.186985	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	412.8833	
95% Adjusted Gamma UCL	428.8669	
Lognormal Statistics		
Minimum of log data	2.00148	
Maximum of log data	6.612041	
Mean of log data	4.448701	
Standard Deviation of log data	1.772929	
Variance of log data	3.143279	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.833293	
Shapiro-Wilk 5% Critical Value	0.916	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	411.7188	
MLE Standard Deviation	1939.005	
MLE Coefficient of Variation	4.709538	
MLE Skewness	118.585	
MLE Median	85.51579	
MLE 80% Quantile	382.5374	
MLE 90% Quantile	834.569	
MLE 95% Quantile	1579.984	
MLE 99% Quantile	5284.509	
MVU Estimate of Median	80.08138	
MVU Estimate of Mean	356.1777	
MVU Estimate of Standard Deviation	1031.64	
MVU Estimate of SE of Mean	162.9542	
95% H-UCL	1599.619	
95% Chebyshev (MVUE) UCL	1066.479	
97.5% Chebyshev (MVUE) UCL	1373.826	
99% Chebyshev (MVUE) UCL	1977.552	
Non-parametric Statisitics		
95% CLT UCL	331.4104	
95% Adjusted-CLT UCL	339.6079	
95% Modified-t UCL	336.3364	
95% Jackknife UCL	335.0578	
95% Chebyshev (Mean, Sd) UCL	474.8419	
97.5% Chebyshev (Mean, Sd) UCL	574.5182	
99% Chebyshev (Mean, Sd) UCL	770.3131	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	329.4845	
95% Bootstrap-t UCL	346.9198	
95% Hall's Bootstrap UCL	340.1209	
95% Percentile Bootstrap UCL	333.2083	
95% BCA Bootstrap UCL	338.6708	
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	770.3131	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	YES	Cosider using 95% or 97.5% Chebyshev (Mean, Sd) UCL

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-A6-SO-f-121304.xls	
Variable:	Copper	
Raw Statistics		
Number of Observations	24	
Number of Missing Data	0	
Number of Valid Observations	24	
Number of Distinct Observations	24	
Minimum	18.5	
Maximum	668	
Mean	194.6458	
Standard Deviation	185.1388	
Variance	34276.37	
Coefficient of Variation	0.951157	
Skewness	1.022765	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.865905	
Shapiro-Wilk 5% Critical Value	0.916	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	259.4152	
Gamma Statistics		
k hat	0.976047	
k star (bias corrected)	0.881819	
Theta hat	199.4226	
Theta star	220.7322	
nu hat	46.85025	
nu star	42.3273	
5% Approximate Chi Square Value	28.40997	
Adjusted Level of Significance	0.0392	
Adjusted Chi Square Value	27.60778	
Anderson-Darling Test Statistic	0.78853	
Anderson-Darling 5% Critical Value	0.772868	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.184786	
Kolmogrov-Smirnov 5% Critical Value	0.183195	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	289.9979	
95% Adjusted Gamma UCL	298.4243	
Lognormal Statistics		
Minimum of log data	2.917771	
Maximum of log data	6.504288	
Mean of log data	4.678104	
Standard Deviation of log data	1.231801	
Variance of log data	1.517333	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.89466	
Shapiro-Wilk 5% Critical Value	0.916	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	229.6993	
MLE Standard Deviation	433.3986	
MLE Coefficient of Variation	1.886809	
MLE Skewness	12.37755	
MLE Median	107.566	
MLE 80% Quantile	304.5929	
MLE 90% Quantile	523.7258	
MLE 95% Quantile	816.0018	
MLE 99% Quantile	1887.999	
MVU Estimate of Median	104.2147	
MVU Estimate of Mean	218.198	
MVU Estimate of Standard Deviation	344.7992	
MVU Estimate of SE of Mean	64.7133	
95% H-UCL	476.457	
95% Chebyshev (MVUE) UCL	500.2767	
97.5% Chebyshev (MVUE) UCL	622.3324	
99% Chebyshev (MVUE) UCL	862.0872	
Non-parametric Statisitics		
95% CLT UCL	256.807	
95% Adjusted-CLT UCL	265.2373	
95% Modified-t UCL	260.7302	
95% Jackknife UCL	259.4152	
95% Chebyshev (Mean, Sd) UCL	359.3743	
97.5% Chebyshev (Mean, Sd) UCL	430.6524	
99% Chebyshev (Mean, Sd) UCL	570.6645	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	255.8241	
95% Bootstrap-t UCL	273.6868	
95% Hall's Bootstrap UCL	264.4888	
95% Percentile Bootstrap UCL	258.1875	
95% BCA Bootstrap UCL	265.7417	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	570.6645	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-A6-SO-f-121304.xls	
Variable:	Lead	
Raw Statistics		
Number of Observations	24	
Number of Missing Data	0	
Number of Valid Observations	24	
Number of Distinct Observations	24	
Minimum	7.8	
Maximum	2780	
Mean	844.6646	
Standard Deviation	926.9304	
Variance	859199.9	
Coefficient of Variation	1.097395	
Skewness	0.873788	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.834792	
Shapiro-Wilk 5% Critical Value	0.916	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1168.944	
Gamma Statistics		
k hat	0.483714	
k star (bias corrected)	0.451027	
Theta hat	1746.207	
Theta star	1872.756	
nu hat	23.21827	
nu star	21.64932	
5% Approximate Chi Square Value	12.07417	
Adjusted Level of Significance	0.0392	
Adjusted Chi Square Value	11.57171	
Anderson-Darling Test Statistic	1.219824	
Anderson-Darling 5% Critical Value	0.809985	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.216043	
Kolmogrov-Smirnov 5% Critical Value	0.188541	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	1514.507	
95% Adjusted Gamma UCL	1580.269	
Lognormal Statistics		
Minimum of log data	2.054124	
Maximum of log data	7.930206	
Mean of log data	5.419018	
Standard Deviation of log data	2.128271	
Variance of log data	4.529537	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.843064	
Shapiro-Wilk 5% Critical Value	0.916	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	2172.833	
MLE Standard Deviation	20808.84	
MLE Coefficient of Variation	9.576828	
MLE Skewness	907.0753	
MLE Median	225.6575	
MLE 80% Quantile	1362.951	
MLE 90% Quantile	3476.727	
MLE 95% Quantile	7480.269	
MLE 99% Quantile	31868.6	
MVU Estimate of Median	205.2633	
MVU Estimate of Mean	1690.296	
MVU Estimate of Standard Deviation	7092.276	
MVU Estimate of SE of Mean	948.5461	
95% H-UCL	14358.66	
95% Chebyshev (MVUE) UCL	5824.913	
97.5% Chebyshev (MVUE) UCL	7613.965	
99% Chebyshev (MVUE) UCL	11128.21	
Non-parametric Statisitics		
95% CLT UCL	1155.885	
95% Adjusted-CLT UCL	1191.945	
95% Modified-t UCL	1174.569	
95% Jackknife UCL	1168.944	
95% Chebyshev (Mean, Sd) UCL	1669.407	
97.5% Chebyshev (Mean, Sd) UCL	2026.274	
99% Chebyshev (Mean, Sd) UCL	2727.269	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1146.449	
95% Bootstrap-t UCL	1224.756	
95% Hall's Bootstrap UCL	1176.162	
95% Percentile Bootstrap UCL	1147.654	
95% BCA Bootstrap UCL	1191.633	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	2727.269	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-A6-SO-f-121304.xls	
Variable:	Manganese	
Raw Statistics		
Number of Observations	24	
Number of Missing Data	0	
Number of Valid Observations	24	
Number of Distinct Observations	24	
Minimum	41	
Maximum	186	
Mean	94.74375	
Standard Deviation	41.99166	
Variance	1763.3	
Coefficient of Variation	0.443213	
Skewness	0.659463	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.907728	
Shapiro-Wilk 5% Critical Value	0.916	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	109.4342	
Gamma Statistics		
k hat	5.552551	
k star (bias corrected)	4.88626	
Theta hat	17.0631	
Theta star	19.38983	
nu hat	266.5225	
nu star	234.5405	
5% Approximate Chi Square Value	200.0816	
Adjusted Level of Significance	0.0392	
Adjusted Chi Square Value	197.8463	
Anderson-Darling Test Statistic	0.600856	
Anderson-Darling 5% Critical Value	0.745967	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.161035	
Kolmogrov-Smirnov 5% Critical Value	0.178248	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	111.0609	
95% Adjusted Gamma UCL	112.3157	
Lognormal Statistics		
Minimum of log data	3.713572	
Maximum of log data	5.225747	
Mean of log data	4.458433	
Standard Deviation of log data	0.440109	
Variance of log data	0.193696	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.950172	
Shapiro-Wilk 5% Critical Value	0.916	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	95.13348	
MLE Standard Deviation	43.98084	
MLE Coefficient of Variation	0.462307	
MLE Skewness	1.485728	
MLE Median	86.35208	
MLE 80% Quantile	125.2517	
MLE 90% Quantile	152.0141	
MLE 95% Quantile	178.112	
MLE 99% Quantile	240.3574	
MVU Estimate of Median	86.00427	
MVU Estimate of Mean	94.71801	
MVU Estimate of Standard Deviation	43.09316	
MVU Estimate of SE of Mean	8.778724	
95% H-UCL	113.4758	
95% Chebyshev (MVUE) UCL	132.9836	
97.5% Chebyshev (MVUE) UCL	149.5411	
99% Chebyshev (MVUE) UCL	182.0652	
Non-parametric Statisitics		
95% CLT UCL	108.8426	
95% Adjusted-CLT UCL	110.0755	
95% Modified-t UCL	109.6265	
95% Jackknife UCL	109.4342	
95% Chebyshev (Mean, Sd) UCL	132.1061	
97.5% Chebyshev (Mean, Sd) UCL	148.2728	
99% Chebyshev (Mean, Sd) UCL	180.0292	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	108.462	
95% Bootstrap-t UCL	110.5522	
95% Hall's Bootstrap UCL	109.4162	
95% Percentile Bootstrap UCL	110.025	
95% BCA Bootstrap UCL	109.725	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	111.0609	95% Approximate Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-A6-SO-f-121304.xls	
Variable:	Mercury	
Raw Statistics		
Number of Observations	24	
Number of Missing Data	0	
Number of Valid Observations	24	
Number of Distinct Observations	23	
Minimum	0.082	
Maximum	11.8	
Mean	2.9755	
Standard Deviation	3.50712	
Variance	12.29989	
Coefficient of Variation	1.178666	
Skewness	1.38436	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.80234	
Shapiro-Wilk 5% Critical Value	0.916	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	4.20244	
Gamma Statistics		
k hat	0.556958	
k star (bias corrected)	0.515116	
Theta hat	5.342412	
Theta star	5.776367	
nu hat	26.73399	
nu star	24.72558	
5% Approximate Chi Square Value	14.40001	
Adjusted Level of Significance	0.0392	
Adjusted Chi Square Value	13.84602	
Anderson-Darling Test Statistic	1.017575	
Anderson-Darling 5% Critical Value	0.800896	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.195	
Kolmogrov-Smirnov 5% Critical Value	0.187403	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	5.109092	
95% Adjusted Gamma UCL	5.313511	
Lognormal Statistics		
Minimum of log data	-2.501036	
Maximum of log data	2.4681	
Mean of log data	-0.031358	
Standard Deviation of log data	1.835173	
Variance of log data	3.367858	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.855061	
Shapiro-Wilk 5% Critical Value	0.916	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	5.220387	
MLE Standard Deviation	27.63174	
MLE Coefficient of Variation	5.293044	
MLE Skewness	164.1707	
MLE Median	0.969129	
MLE 80% Quantile	4.569314	
MLE 90% Quantile	10.24551	
MLE 95% Quantile	19.83605	
MLE 99% Quantile	69.2175	
MVU Estimate of Median	0.903283	
MVU Estimate of Mean	4.445977	
MVU Estimate of Standard Deviation	13.75649	
MVU Estimate of SE of Mean	2.116473	
95% H-UCL	22.10654	
95% Chebyshev (MVUE) UCL	13.67147	
97.5% Chebyshev (MVUE) UCL	17.66334	
99% Chebyshev (MVUE) UCL	25.50461	
Non-parametric Statisitics		
95% CLT UCL	4.153031	
95% Adjusted-CLT UCL	4.369188	
95% Modified-t UCL	4.236156	
95% Jackknife UCL	4.20244	
95% Chebyshev (Mean, Sd) UCL	6.095983	
97.5% Chebyshev (Mean, Sd) UCL	7.446219	
99% Chebyshev (Mean, Sd) UCL	10.09849	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	4.151999	
95% Bootstrap-t UCL	4.568993	
95% Hall's Bootstrap UCL	4.386129	
95% Percentile Bootstrap UCL	4.230333	
95% BCA Bootstrap UCL	4.331708	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	10.09849	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-A6-SO-f-121304.xls	
Variable:	Thallium	
Raw Statistics		
Number of Observations	24	
Number of Missing Data	0	
Number of Valid Observations	24	
Number of Distinct Observations	23	
Minimum	1.05	
Maximum	27.8	
Mean	11.5625	
Standard Deviation	9.137658	
Variance	83.49679	
Coefficient of Variation	0.790284	
Skewness	0.430158	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.883203	
Shapiro-Wilk 5% Critical Value	0.916	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	14.75924	
Gamma Statistics		
k hat	1.319383	
k star (bias corrected)	1.182238	
Theta hat	8.763567	
Theta star	9.780182	
nu hat	63.33037	
nu star	56.74741	
5% Approximate Chi Square Value	40.42945	
Adjusted Level of Significance	0.0392	
Adjusted Chi Square Value	39.46054	
Anderson-Darling Test Statistic	0.849002	
Anderson-Darling 5% Critical Value	0.765264	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.185855	
Kolmogrov-Smirnov 5% Critical Value	0.181841	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	16.2293	
95% Adjusted Gamma UCL	16.6278	
Lognormal Statistics		
Minimum of log data	0.04879	
Maximum of log data	3.325036	
Mean of log data	2.023175	
Standard Deviation of log data	1.036532	
Variance of log data	1.074399	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.904288	
Shapiro-Wilk 5% Critical Value	0.916	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	12.94066	
MLE Standard Deviation	17.96951	
MLE Coefficient of Variation	1.388608	
MLE Skewness	6.843385	
MLE Median	7.562296	
MLE 80% Quantile	18.15679	
MLE 90% Quantile	28.64901	
MLE 95% Quantile	41.60709	
MLE 99% Quantile	84.28037	
MVU Estimate of Median	7.394759	
MVU Estimate of Mean	12.52711	
MVU Estimate of Standard Deviation	15.52795	
MVU Estimate of SE of Mean	3.023644	
95% H-UCL	22.54996	
95% Chebyshev (MVUE) UCL	25.70687	
97.5% Chebyshev (MVUE) UCL	31.40976	
99% Chebyshev (MVUE) UCL	42.61199	
Non-parametric Statisitics		
95% CLT UCL	14.63051	
95% Adjusted-CLT UCL	14.80551	
95% Modified-t UCL	14.78654	
95% Jackknife UCL	14.75924	
95% Chebyshev (Mean, Sd) UCL	19.69279	
97.5% Chebyshev (Mean, Sd) UCL	23.21077	
99% Chebyshev (Mean, Sd) UCL	30.12117	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	14.57154	
95% Bootstrap-t UCL	14.9262	
95% Hall's Bootstrap UCL	14.75153	
95% Percentile Bootstrap UCL	14.59583	
95% BCA Bootstrap UCL	14.67708	
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	30.12117	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	YES	Cosider using 95% or 97.5% Chebyshev (Mean, Sd) UCL

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-A6-SO-f-121304.xls	
Variable:	Vanadium	
Raw Statistics		
Number of Observations	24	
Number of Missing Data	0	
Number of Valid Observations	24	
Number of Distinct Observations	24	
Minimum	6.3	
Maximum	31.2	
Mean	16.35208	
Standard Deviation	7.391056	
Variance	54.62771	
Coefficient of Variation	0.451995	
Skewness	0.406415	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.935771	
Shapiro-Wilk 5% Critical Value	0.916	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	18.93779	
Gamma Statistics		
k hat	4.908818	
k star (bias corrected)	4.322993	
Theta hat	3.331165	
Theta star	3.782584	
nu hat	235.6232	
nu star	207.5037	
5% Approximate Chi Square Value	175.1636	
Adjusted Level of Significance	0.0392	
Adjusted Chi Square Value	173.0765	
Anderson-Darling Test Statistic	0.51369	
Anderson-Darling 5% Critical Value	0.746402	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.139153	
Kolmogrov-Smirnov 5% Critical Value	0.178346	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	19.37113	
95% Adjusted Gamma UCL	19.60472	
Lognormal Statistics		
Minimum of log data	1.84055	
Maximum of log data	3.440418	
Mean of log data	2.689054	
Standard Deviation of log data	0.479883	
Variance of log data	0.230287	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.940427	
Shapiro-Wilk 5% Critical Value	0.916	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	16.51381	
MLE Standard Deviation	8.403595	
MLE Coefficient of Variation	0.508883	
MLE Skewness	1.658429	
MLE Median	14.71774	
MLE 80% Quantile	22.0774	
MLE 90% Quantile	27.2677	
MLE 95% Quantile	32.40979	
MLE 99% Quantile	44.93695	
MVU Estimate of Median	14.64728	
MVU Estimate of Mean	16.42686	
MVU Estimate of Standard Deviation	8.199866	
MVU Estimate of SE of Mean	1.669111	
95% H-UCL	20.07916	
95% Chebyshev (MVUE) UCL	23.70234	
97.5% Chebyshev (MVUE) UCL	26.85045	
99% Chebyshev (MVUE) UCL	33.0343	
Non-parametric Statisitics		
95% CLT UCL	18.83366	
95% Adjusted-CLT UCL	18.9674	
95% Modified-t UCL	18.95865	
95% Jackknife UCL	18.93779	
95% Chebyshev (Mean, Sd) UCL	22.92832	
97.5% Chebyshev (Mean, Sd) UCL	25.77387	
99% Chebyshev (Mean, Sd) UCL	31.36339	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	18.69244	
95% Bootstrap-t UCL	18.90572	
95% Hall's Bootstrap UCL	18.88458	
95% Percentile Bootstrap UCL	18.86042	
95% BCA Bootstrap UCL	18.99167	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	18.93779	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-A6-SO-f-121304.xls	
Variable:	Chromium VI	
Raw Statistics		
Number of Observations	24	
Number of Missing Data	0	
Number of Valid Observations	24	
Number of Distinct Observations	15	
Minimum	0.2	
Maximum	30.18175	
Mean	5.399516	
Standard Deviation	8.670356	
Variance	75.17507	
Coefficient of Variation	1.605765	
Skewness	1.95266	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.6623	
Shapiro-Wilk 5% Critical Value	0.916	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	8.432775	
Gamma Statistics		
k hat	0.456234	
k star (bias corrected)	0.426983	
Theta hat	11.83496	
Theta star	12.64575	
nu hat	21.89924	
nu star	20.49517	
5% Approximate Chi Square Value	11.21547	
Adjusted Level of Significance	0.0392	
Adjusted Chi Square Value	10.73325	
Anderson-Darling Test Statistic	1.41247	
Anderson-Darling 5% Critical Value	0.816153	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.200437	
Kolmogrov-Smirnov 5% Critical Value	0.189235	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	9.867087	
95% Adjusted Gamma UCL	10.31039	
Lognormal Statistics		
Minimum of log data	-1.609438	
Maximum of log data	3.407237	
Mean of log data	0.273965	
Standard Deviation of log data	1.828532	
Variance of log data	3.343531	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.860749	
Shapiro-Wilk 5% Critical Value	0.916	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	6.998743	
MLE Standard Deviation	36.58069	
MLE Coefficient of Variation	5.226751	
MLE Skewness	158.4695	
MLE Median	1.315169	
MLE 80% Quantile	6.166153	
MLE 90% Quantile	13.78567	
MLE 95% Quantile	26.62634	
MLE 99% Quantile	92.49287	
MVU Estimate of Median	1.226437	
MVU Estimate of Mean	5.970826	
MVU Estimate of Standard Deviation	18.34536	
MVU Estimate of SE of Mean	2.83059	
95% H-UCL	29.36209	
95% Chebyshev (MVUE) UCL	18.30908	
97.5% Chebyshev (MVUE) UCL	23.64786	
99% Chebyshev (MVUE) UCL	34.13484	
Non-parametric Statisitics		
95% CLT UCL	8.310626	
95% Adjusted-CLT UCL	9.064385	
95% Modified-t UCL	8.550346	
95% Jackknife UCL	8.432775	
95% Chebyshev (Mean, Sd) UCL	13.11402	
97.5% Chebyshev (Mean, Sd) UCL	16.45209	
99% Chebyshev (Mean, Sd) UCL	23.00909	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	8.278952	
95% Bootstrap-t UCL	9.667971	
95% Hall's Bootstrap UCL	9.202181	
95% Percentile Bootstrap UCL	8.415072	
95% BCA Bootstrap UCL	9.092705	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	23.00909	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-HB04-cf-121304.xls	
Variable:	Arsenic	
Raw Statistics		
Number of Observations	10	
Number of Missing Data	0	
Number of Valid Observations	10	
Number of Distinct Observations	10	
Minimum	9.6	
Maximum	32.9	
Mean	22.245	
Standard Deviation	7.045032	
Variance	49.63247	
Coefficient of Variation	0.316702	
Skewness	-0.089402	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.970199	
Shapiro-Wilk 5% Critical Value	0.842	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	26.32887	
Gamma Statistics		
k hat	9.689392	
k star (bias corrected)	6.849241	
Theta hat	2.29581	
Theta star	3.247805	
nu hat	193.7878	
nu star	136.9848	
5% Approximate Chi Square Value	110.9375	
Adjusted Level of Significance	0.0267	
Adjusted Chi Square Value	106.867	
Anderson-Darling Test Statistic	0.256426	
Anderson-Darling 5% Critical Value	0.725333	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.12695	
Kolmogrov-Smirnov 5% Critical Value	0.26668	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	27.46796	
95% Adjusted Gamma UCL	28.51419	
Lognormal Statistics		
Minimum of log data	2.261763	
Maximum of log data	3.493473	
Mean of log data	3.049628	
Standard Deviation of log data	0.358662	
Variance of log data	0.128638	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.924769	
Shapiro-Wilk 5% Critical Value	0.842	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	22.50971	
MLE Standard Deviation	8.340112	
MLE Coefficient of Variation	0.370512	
MLE Skewness	1.162398	
MLE Median	21.10749	
MLE 80% Quantile	28.57971	
MLE 90% Quantile	33.46528	
MLE 95% Quantile	38.07762	
MLE 99% Quantile	48.61226	
MVU Estimate of Median	20.97208	
MVU Estimate of Mean	22.35867	
MVU Estimate of Standard Deviation	8.102322	
MVU Estimate of SE of Mean	2.560814	
95% H-UCL	28.72961	
95% Chebyshev (MVUE) UCL	33.521	
97.5% Chebyshev (MVUE) UCL	38.35094	
99% Chebyshev (MVUE) UCL	47.83844	
Non-parametric Statisitics		
95% CLT UCL	25.90946	
95% Adjusted-CLT UCL	25.84216	
95% Modified-t UCL	26.31837	
95% Jackknife UCL	26.32887	
95% Chebyshev (Mean, Sd) UCL	31.95591	
97.5% Chebyshev (Mean, Sd) UCL	36.15782	
99% Chebyshev (Mean, Sd) UCL	44.41167	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	25.71655	
95% Bootstrap-t UCL	26.4129	
95% Hall's Bootstrap UCL	26.47669	
95% Percentile Bootstrap UCL	25.815	
95% BCA Bootstrap UCL	25.72	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	26.32887	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-HB04-cf-121304.xls	
Variable:	Thallium	
Raw Statistics		
Number of Observations	10	
Number of Missing Data	0	
Number of Valid Observations	10	
Number of Distinct Observations	8	
Minimum	0.3	
Maximum	0.81	
Mean	0.5755	
Standard Deviation	0.238076	
Variance	0.05668	
Coefficient of Variation	0.413686	
Skewness	-0.423785	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.731982	
Shapiro-Wilk 5% Critical Value	0.842	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.713508	
Gamma Statistics		
k hat	5.471191	
k star (bias corrected)	3.8965	
Theta hat	0.105187	
Theta star	0.147697	
nu hat	109.4238	
nu star	77.93	
5% Approximate Chi Square Value	58.58952	
Adjusted Level of Significance	0.0267	
Adjusted Chi Square Value	55.68355	
Anderson-Darling Test Statistic	1.460319	
Anderson-Darling 5% Critical Value	0.729036	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.330475	
Kolmogrov-Smirnov 5% Critical Value	0.267355	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.765473	
95% Adjusted Gamma UCL	0.805421	
Lognormal Statistics		
Minimum of log data	-1.203973	
Maximum of log data	-0.210721	
Mean of log data	-0.646679	
Standard Deviation of log data	0.477897	
Variance of log data	0.228385	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.704507	
Shapiro-Wilk 5% Critical Value	0.842	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.587144	
MLE Standard Deviation	0.297404	
MLE Coefficient of Variation	0.506527	
MLE Skewness	1.64954	
MLE Median	0.523783	
MLE 80% Quantile	0.784385	
MLE 90% Quantile	0.967944	
MLE 95% Quantile	1.149655	
MLE 99% Quantile	1.59187	
MVU Estimate of Median	0.517829	
MVU Estimate of Mean	0.579931	
MVU Estimate of Standard Deviation	0.282189	
MVU Estimate of SE of Mean	0.089092	
95% H-UCL	0.832173	
95% Chebyshev (MVUE) UCL	0.968275	
97.5% Chebyshev (MVUE) UCL	1.136311	
99% Chebyshev (MVUE) UCL	1.466387	
Non-parametric Statisitics		
95% CLT UCL	0.699335	
95% Adjusted-CLT UCL	0.688554	
95% Modified-t UCL	0.711827	
95% Jackknife UCL	0.713508	
95% Chebyshev (Mean, Sd) UCL	0.903665	
97.5% Chebyshev (Mean, Sd) UCL	1.045663	
99% Chebyshev (Mean, Sd) UCL	1.324589	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.690213	
95% Bootstrap-t UCL	0.696751	
95% Hall's Bootstrap UCL	0.675213	
95% Percentile Bootstrap UCL	0.689	
95% BCA Bootstrap UCL	0.677	
Recommendations		
Human Inspection Recommended?	YES	Users must select one of the recommended UCLS
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.713508	95% Student's-t UCL
2nd Recommended UCL	0.711827	95% Modified-t UCL
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-HB04-cf-121304.xls	
Variable:	Vanadium	
Raw Statistics		
Number of Observations	10	
Number of Missing Data	0	
Number of Valid Observations	10	
Number of Distinct Observations	10	
Minimum	5.5	
Maximum	13	
Mean	9.61	
Standard Deviation	2.405757	
Variance	5.787667	
Coefficient of Variation	0.250339	
Skewness	-0.159756	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.961382	
Shapiro-Wilk 5% Critical Value	0.842	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	11.00457	
Gamma Statistics		
k hat	16.43951	
k star (bias corrected)	11.57433	
Theta hat	0.584567	
Theta star	0.830286	
nu hat	328.7903	
nu star	231.4865	
5% Approximate Chi Square Value	197.2606	
Adjusted Level of Significance	0.0267	
Adjusted Chi Square Value	191.7674	
Anderson-Darling Test Statistic	0.259618	
Anderson-Darling 5% Critical Value	0.724732	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.142922	
Kolmogrov-Smirnov 5% Critical Value	0.266334	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	11.2774	
95% Adjusted Gamma UCL	11.60044	
Lognormal Statistics		
Minimum of log data	1.704748	
Maximum of log data	2.564949	
Mean of log data	2.232081	
Standard Deviation of log data	0.267868	
Variance of log data	0.071753	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.942869	
Shapiro-Wilk 5% Critical Value	0.842	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	9.659657	
MLE Standard Deviation	2.634633	
MLE Coefficient of Variation	0.272746	
MLE Skewness	0.838528	
MLE Median	9.319244	
MLE 80% Quantile	11.68645	
MLE 90% Quantile	13.1483	
MLE 95% Quantile	14.47937	
MLE 99% Quantile	17.37692	
MVU Estimate of Median	9.285858	
MVU Estimate of Mean	9.624158	
MVU Estimate of Standard Deviation	2.593011	
MVU Estimate of SE of Mean	0.819843	
95% H-UCL	11.49099	
95% Chebyshev (MVUE) UCL	13.19777	
97.5% Chebyshev (MVUE) UCL	14.74408	
99% Chebyshev (MVUE) UCL	17.78149	
Non-parametric Statisitics		
95% CLT UCL	10.86135	
95% Adjusted-CLT UCL	10.82028	
95% Modified-t UCL	10.99817	
95% Jackknife UCL	11.00457	
95% Chebyshev (Mean, Sd) UCL	12.92611	
97.5% Chebyshev (Mean, Sd) UCL	14.36099	
99% Chebyshev (Mean, Sd) UCL	17.17954	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	10.82452	
95% Bootstrap-t UCL	10.99333	
95% Hall's Bootstrap UCL	10.76727	
95% Percentile Bootstrap UCL	10.78	
95% BCA Bootstrap UCL	10.84	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	11.00457	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-SO-ground-c-121304.xls	
Variable:	Benzo(a)anthracene	
Raw Statistics		
Number of Observations	20	
Number of Missing Data	0	
Number of Valid Observations	20	
Number of Distinct Observations	14	
Minimum	0.0175	
Maximum	5.8	
Mean	0.367125	
Standard Deviation	1.28342	
Variance	1.647168	
Coefficient of Variation	3.495867	
Skewness	4.419867	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.290114	
Shapiro-Wilk 5% Critical Value	0.905	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.863354	
Gamma Statistics		
k hat	0.353802	
k star (bias corrected)	0.334065	
Theta hat	1.037657	
Theta star	1.098963	
nu hat	14.15207	
nu star	13.36259	
5% Approximate Chi Square Value	6.136259	
Adjusted Level of Significance	0.038	
Adjusted Chi Square Value	5.752036	
Anderson-Darling Test Statistic	3.366545	
Anderson-Darling 5% Critical Value	0.833363	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.304226	
Kolmogrov-Smirnov 5% Critical Value	0.208726	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.799468	
95% Adjusted Gamma UCL	0.852871	
Lognormal Statistics		
Minimum of log data	-4.045554	
Maximum of log data	1.757858	
Mean of log data	-2.899317	
Standard Deviation of log data	1.516354	
Variance of log data	2.29933	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.771817	
Shapiro-Wilk 5% Critical Value	0.905	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.173835	
MLE Standard Deviation	0.520561	
MLE Coefficient of Variation	2.994579	
MLE Skewness	35.83764	
MLE Median	0.055061	
MLE 80% Quantile	0.198295	
MLE 90% Quantile	0.386431	
MLE 95% Quantile	0.667034	
MLE 99% Quantile	1.873341	
MVU Estimate of Median	0.051977	
MVU Estimate of Mean	0.156022	
MVU Estimate of Standard Deviation	0.328103	
MVU Estimate of SE of Mean	0.063351	
95% H-UCL	0.564915	
95% Chebyshev (MVUE) UCL	0.432164	
97.5% Chebyshev (MVUE) UCL	0.551651	
99% Chebyshev (MVUE) UCL	0.786359	
Non-parametric Statisitics		
95% CLT UCL	0.839168	
95% Adjusted-CLT UCL	1.142228	
95% Modified-t UCL	0.910625	
95% Jackknife UCL	0.863354	
95% Chebyshev (Mean, Sd) UCL	1.618048	
97.5% Chebyshev (Mean, Sd) UCL	2.159324	
99% Chebyshev (Mean, Sd) UCL	3.222555	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.825952	
95% Bootstrap-t UCL	6.927979	
95% Hall's Bootstrap UCL	3.722035	
95% Percentile Bootstrap UCL	0.9276	
95% BCA Bootstrap UCL	1.245325	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	3.222555	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-SO-ground-c-121304.xls	
Variable:	Benzo(a)pyrene	
Raw Statistics		
Number of Observations	20	
Number of Missing Data	0	
Number of Valid Observations	20	
Number of Distinct Observations	16	
Minimum	0.0175	
Maximum	7.9	
Mean	0.49315	
Standard Deviation	1.748921	
Variance	3.058725	
Coefficient of Variation	3.546428	
Skewness	4.42625	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.288442	
Shapiro-Wilk 5% Critical Value	0.905	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1.169363	
Gamma Statistics		
k hat	0.334171	
k star (bias corrected)	0.317379	
Theta hat	1.475741	
Theta star	1.553822	
nu hat	13.36684	
nu star	12.69515	
5% Approximate Chi Square Value	5.687273	
Adjusted Level of Significance	0.038	
Adjusted Chi Square Value	5.319585	
Anderson-Darling Test Statistic	3.130681	
Anderson-Darling 5% Critical Value	0.837503	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.286229	
Kolmogrov-Smirnov 5% Critical Value	0.209238	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	1.100811	
95% Adjusted Gamma UCL	1.176899	
Lognormal Statistics		
Minimum of log data	-4.045554	
Maximum of log data	2.066863	
Mean of log data	-2.734436	
Standard Deviation of log data	1.607396	
Variance of log data	2.583723	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.805832	
Shapiro-Wilk 5% Critical Value	0.905	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.236319	
MLE Standard Deviation	0.826992	
MLE Coefficient of Variation	3.49948	
MLE Skewness	53.35434	
MLE Median	0.064931	
MLE 80% Quantile	0.25254	
MLE 90% Quantile	0.512256	
MLE 95% Quantile	0.913685	
MLE 99% Quantile	2.730181	
MVU Estimate of Median	0.060857	
MVU Estimate of Mean	0.20799	
MVU Estimate of Standard Deviation	0.480735	
MVU Estimate of SE of Mean	0.090277	
95% H-UCL	0.871305	
95% Chebyshev (MVUE) UCL	0.601499	
97.5% Chebyshev (MVUE) UCL	0.771771	
99% Chebyshev (MVUE) UCL	1.106237	
Non-parametric Statisitics		
95% CLT UCL	1.136404	
95% Adjusted-CLT UCL	1.549981	
95% Modified-t UCL	1.233873	
95% Jackknife UCL	1.169363	
95% Chebyshev (Mean, Sd) UCL	2.197787	
97.5% Chebyshev (Mean, Sd) UCL	2.935385	
99% Chebyshev (Mean, Sd) UCL	4.384254	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1.120725	
95% Bootstrap-t UCL	8.351703	
95% Hall's Bootstrap UCL	5.374777	
95% Percentile Bootstrap UCL	1.268825	
95% BCA Bootstrap UCL	1.669875	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	4.384254	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-SO-ground-c-121304.xls	
Variable:	Benzo(b)fluoranthene	
Raw Statistics		
Number of Observations	20	
Number of Missing Data	0	
Number of Valid Observations	20	
Number of Distinct Observations	17	
Minimum	0.0175	
Maximum	11	
Mean	0.6962	
Standard Deviation	2.434005	
Variance	5.924378	
Coefficient of Variation	3.496128	
Skewness	4.420057	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.292986	
Shapiro-Wilk 5% Critical Value	0.905	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1.637298	
Gamma Statistics		
k hat	0.331864	
k star (bias corrected)	0.315418	
Theta hat	2.097845	
Theta star	2.20723	
nu hat	13.27457	
nu star	12.61672	
5% Approximate Chi Square Value	5.634899	
Adjusted Level of Significance	0.038	
Adjusted Chi Square Value	5.269181	
Anderson-Darling Test Statistic	2.656557	
Anderson-Darling 5% Critical Value	0.83799	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.277371	
Kolmogrov-Smirnov 5% Critical Value	0.209298	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	1.558814	
95% Adjusted Gamma UCL	1.667007	
Lognormal Statistics		
Minimum of log data	-4.045554	
Maximum of log data	2.397895	
Mean of log data	-2.406013	
Standard Deviation of log data	1.688044	
Variance of log data	2.849492	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.865855	
Shapiro-Wilk 5% Critical Value	0.905	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.374836	
MLE Standard Deviation	1.512359	
MLE Coefficient of Variation	4.034724	
MLE Skewness	77.78546	
MLE Median	0.090174	
MLE 80% Quantile	0.375455	
MLE 90% Quantile	0.789088	
MLE 95% Quantile	1.448921	
MLE 99% Quantile	4.573948	
MVU Estimate of Median	0.083953	
MVU Estimate of Mean	0.323566	
MVU Estimate of Standard Deviation	0.811836	
MVU Estimate of SE of Mean	0.148433	
95% H-UCL	1.555002	
95% Chebyshev (MVUE) UCL	0.970573	
97.5% Chebyshev (MVUE) UCL	1.250533	
99% Chebyshev (MVUE) UCL	1.80046	
Non-parametric Statisitics		
95% CLT UCL	1.591428	
95% Adjusted-CLT UCL	2.166205	
95% Modified-t UCL	1.726951	
95% Jackknife UCL	1.637298	
95% Chebyshev (Mean, Sd) UCL	3.068574	
97.5% Chebyshev (Mean, Sd) UCL	4.095102	
99% Chebyshev (Mean, Sd) UCL	6.111518	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1.549503	
95% Bootstrap-t UCL	10.01523	
95% Hall's Bootstrap UCL	7.514102	
95% Percentile Bootstrap UCL	1.78845	
95% BCA Bootstrap UCL	2.383025	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	6.111518	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File				J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-SO-ground-c-121304.xls							
Variable:				Dibenz(a,h)anthracene							
Raw Statistics											
Number of Observations				20							
Number of Missing Data				0							
Number of Valid Observations				20							
Number of Distinct Observations				10							
Minimum				0.0175							
Maximum				1.3							
Mean				0.088725							
Standard Deviation				0.285599							
Variance				0.081567							
Coefficient of Variation				3.218923							
Skewness				4.446989							
Too Few Distinct Observations?				NO							
Normal Statistics											
Lilliefors Test Statisitic				N/R		Shapiro Wilk method yields a more accurate result					
Lilliefors 5% Critical Value				N/R		Shapiro Wilk method yields a more accurate result					
Shapiro-Wilk Test Statisitic				0.267143							
Shapiro-Wilk 5% Critical Value				0.905							
5% Normality Test Result				NOT NORMAL		Data not normal at 5% significance level					
95% Student's-t UCL				0.199151							
Gamma Statistics											
k hat				0.529736							
k star (bias corrected)				0.483609							
Theta hat				0.167489							
Theta star				0.183465							
nu hat				21.18942							
nu star				19.34434							
5% Approximate Chi Square Value				10.3678							
Adjusted Level of Significance				0.038							
Adjusted Chi Square Value				9.849922							
Anderson-Darling Test Statistic				5.629862							
Anderson-Darling 5% Critical Value				0.799792							
Anderson-Darling 5% Gamma Test Result				NOT AD GAMMA		Data not gamma distributed at 5% significance level					
Kolmogrov-Smirnov Test Statistic				0.449087							
Kolmogrov-Smirnov 5% Critical Value				0.204488							
Kolmogrov-Smirnov 5% Gamma Test Result				NOT KS GAMMA		Data not gamma distributed at 5% significance level					
5% Gamma Test Result				NOT GAMMA		Data not gamma distributed at 5% significance level					
95% Approximate Gamma UCL				0.165544							
95% Adjusted Gamma UCL				0.174248							
Lognormal Statistics											
Minimum of log data				-4.045554							
Maximum of log data				0.262364							
Mean of log data				-3.610644							
Standard Deviation of log data				1.007629							
Variance of log data				1.015317							
Lilliefors Test Statisitic				N/R		Shapiro Wilk method yields a more accurate result					
Lilliefors 5% Critical Value				N/R		Shapiro Wilk method yields a more accurate result					
Shapiro-Wilk Test Statisitic				0.479651							
Shapiro-Wilk 5% Critical Value				0.905							
5% Lognormality Test Result				NOT LOGNORMAL		Data not lognormal at 5% significance level					
MLE Mean				0.044915							
MLE Standard Deviation				0.05959							
MLE Coefficient of Variation				1.326739							
MLE Skewness				6.315593							
MLE Median				0.027034							
MLE 80% Quantile				0.063343							
MLE 90% Quantile				0.098683							
MLE 95% Quantile				0.141835							
MLE 99% Quantile				0.281704							
MVU Estimate of Median				0.026356							
MVU Estimate of Mean				0.043332							
MVU Estimate of Standard Deviation				0.05087							
MVU Estimate of SE of Mean				0.010937							
95% H-UCL				0.082013							
95% Chebyshev (MVUE) UCL				0.091005							
97.5% Chebyshev (MVUE) UCL				0.111634							
99% Chebyshev (MVUE) UCL				0.152154							
Non-parametric Statisitics											
95% CLT UCL				0.193768							
95% Adjusted-CLT UCL				0.261622							
95% Modified-t UCL				0.209734							
95% Jackknife UCL				0.199151							
95% Chebyshev (Mean, Sd) UCL				0.367092							
97.5% Chebyshev (Mean, Sd) UCL				0.487542							
99% Chebyshev (Mean, Sd) UCL				0.724143							
Bootstrap Statistics											
Number of Bootstrap Runs				2000							
95% Standard Bootstrap UCL				0.187541							
95% Bootstrap-t UCL				2.313064							
95% Hall's Bootstrap UCL				1.943664							
95% Percentile Bootstrap UCL				0.214125							
95% BCA Bootstrap UCL				0.2874							
Recommendations											
Human Inspection Recommended?				NO							
Appropriate Distribution				NON-PARAMETRIC							
1st Recommended UCL				0.724143		99% Chebyshev (Mean, Sd) UCL					
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!				NONE							
Alternative UCL				NONE							

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-SO-ground-c-121304.xls	
Variable:	Indeno(1,2,3-cd)pyrene	
Raw Statistics		
Number of Observations	20	
Number of Missing Data	0	
Number of Valid Observations	20	
Number of Distinct Observations	15	
Minimum	0.0175	
Maximum	6	
Mean	0.368575	
Standard Deviation	1.327965	
Variance	1.763491	
Coefficient of Variation	3.602971	
Skewness	4.444866	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.278301	
Shapiro-Wilk 5% Critical Value	0.905	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.882027	
Gamma Statistics		
k hat	0.347978	
k star (bias corrected)	0.329115	
Theta hat	1.059189	
Theta star	1.119897	
nu hat	13.91914	
nu star	13.1646	
5% Approximate Chi Square Value	6.002474	
Adjusted Level of Significance	0.038	
Adjusted Chi Square Value	5.623115	
Anderson-Darling Test Statistic	3.558184	
Anderson-Darling 5% Critical Value	0.834591	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.292062	
Kolmogrov-Smirnov 5% Critical Value	0.208878	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.808357	
95% Adjusted Gamma UCL	0.862892	
Lognormal Statistics		
Minimum of log data	-4.045554	
Maximum of log data	1.791759	
Mean of log data	-2.932345	
Standard Deviation of log data	1.498282	
Variance of log data	2.24485	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.756119	
Shapiro-Wilk 5% Critical Value	0.905	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.163667	
MLE Standard Deviation	0.475452	
MLE Coefficient of Variation	2.904996	
MLE Skewness	33.23025	
MLE Median	0.053272	
MLE 80% Quantile	0.188945	
MLE 90% Quantile	0.365294	
MLE 95% Quantile	0.62646	
MLE 99% Quantile	1.737869	
MVU Estimate of Median	0.050357	
MVU Estimate of Mean	0.147428	
MVU Estimate of Standard Deviation	0.304191	
MVU Estimate of SE of Mean	0.059041	
95% H-UCL	0.51915	
95% Chebyshev (MVUE) UCL	0.404783	
97.5% Chebyshev (MVUE) UCL	0.51614	
99% Chebyshev (MVUE) UCL	0.73488	
Non-parametric Statisitics		
95% CLT UCL	0.857001	
95% Adjusted-CLT UCL	1.172353	
95% Modified-t UCL	0.931216	
95% Jackknife UCL	0.882027	
95% Chebyshev (Mean, Sd) UCL	1.662915	
97.5% Chebyshev (Mean, Sd) UCL	2.222977	
99% Chebyshev (Mean, Sd) UCL	3.32311	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.849753	
95% Bootstrap-t UCL	7.002507	
95% Hall's Bootstrap UCL	3.968526	
95% Percentile Bootstrap UCL	0.953775	
95% BCA Bootstrap UCL	1.27275	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	3.32311	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-SO-ground-c-121304.xls	
Variable:	Phenanthrene	
Raw Statistics		
Number of Observations	20	
Number of Missing Data	0	
Number of Valid Observations	20	
Number of Distinct Observations	14	
Minimum	0.0175	
Maximum	8.1	
Mean	0.541325	
Standard Deviation	1.802839	
Variance	3.250228	
Coefficient of Variation	3.330419	
Skewness	4.294193	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.3202	
Shapiro-Wilk 5% Critical Value	0.905	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1.238385	
Gamma Statistics		
k hat	0.319417	
k star (bias corrected)	0.304838	
Theta hat	1.694727	
Theta star	1.775779	
nu hat	12.77669	
nu star	12.19352	
5% Approximate Chi Square Value	5.353744	
Adjusted Level of Significance	0.038	
Adjusted Chi Square Value	4.99875	
Anderson-Darling Test Statistic	3.158886	
Anderson-Darling 5% Critical Value	0.840615	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.305512	
Kolmogrov-Smirnov 5% Critical Value	0.209623	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	1.232905	
95% Adjusted Gamma UCL	1.320461	
Lognormal Statistics		
Minimum of log data	-4.045554	
Maximum of log data	2.091864	
Mean of log data	-2.75057	
Standard Deviation of log data	1.715026	
Variance of log data	2.941315	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.780676	
Shapiro-Wilk 5% Critical Value	0.905	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.278062	
MLE Standard Deviation	1.177772	
MLE Coefficient of Variation	4.23565	
MLE Skewness	88.6976	
MLE Median	0.063891	
MLE 80% Quantile	0.272158	
MLE 90% Quantile	0.578822	
MLE 95% Quantile	1.073204	
MLE 99% Quantile	3.450714	
MVU Estimate of Median	0.059347	
MVU Estimate of Mean	0.238369	
MVU Estimate of Standard Deviation	0.614531	
MVU Estimate of SE of Mean	0.11131	
95% H-UCL	1.201525	
95% Chebyshev (MVUE) UCL	0.72356	
97.5% Chebyshev (MVUE) UCL	0.933502	
99% Chebyshev (MVUE) UCL	1.345893	
Non-parametric Statisitics		
95% CLT UCL	1.20441	
95% Adjusted-CLT UCL	1.618018	
95% Modified-t UCL	1.3029	
95% Jackknife UCL	1.238385	
95% Chebyshev (Mean, Sd) UCL	2.298515	
97.5% Chebyshev (Mean, Sd) UCL	3.058852	
99% Chebyshev (Mean, Sd) UCL	4.552388	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1.16852	
95% Bootstrap-t UCL	9.106715	
95% Hall's Bootstrap UCL	5.096698	
95% Percentile Bootstrap UCL	1.336225	
95% BCA Bootstrap UCL	2.098525	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	4.552388	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-SO-ground-c-121304.xls	
Variable:	Arsenic	
Raw Statistics		
Number of Observations	20	
Number of Missing Data	0	
Number of Valid Observations	20	
Number of Distinct Observations	20	
Minimum	5.7	
Maximum	192	
Mean	45.5375	
Standard Deviation	57.24451	
Variance	3276.934	
Coefficient of Variation	1.257085	
Skewness	1.826299	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.678876	
Shapiro-Wilk 5% Critical Value	0.905	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	67.67085	
Gamma Statistics		
k hat	0.983723	
k star (bias corrected)	0.869498	
Theta hat	46.29099	
Theta star	52.37219	
nu hat	39.34891	
nu star	34.77991	
5% Approximate Chi Square Value	22.28642	
Adjusted Level of Significance	0.038	
Adjusted Chi Square Value	21.4964	
Anderson-Darling Test Statistic	1.289689	
Anderson-Darling 5% Critical Value	0.768693	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.24518	
Kolmogrov-Smirnov 5% Critical Value	0.199481	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	71.06524	
95% Adjusted Gamma UCL	73.677	
Lognormal Statistics		
Minimum of log data	1.740466	
Maximum of log data	5.257495	
Mean of log data	3.230633	
Standard Deviation of log data	1.05653	
Variance of log data	1.116256	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.920354	
Shapiro-Wilk 5% Critical Value	0.905	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	44.20162	
MLE Standard Deviation	63.33957	
MLE Coefficient of Variation	1.432969	
MLE Skewness	7.241369	
MLE Median	25.29568	
MLE 80% Quantile	61.76899	
MLE 90% Quantile	98.32465	
MLE 95% Quantile	143.8291	
MLE 99% Quantile	295.3387	
MVU Estimate of Median	24.59861	
MVU Estimate of Mean	42.44587	
MVU Estimate of Standard Deviation	53.00561	
MVU Estimate of SE of Mean	11.31828	
95% H-UCL	84.5075	
95% Chebyshev (MVUE) UCL	91.78113	
97.5% Chebyshev (MVUE) UCL	113.1285	
99% Chebyshev (MVUE) UCL	155.0614	
Non-parametric Statisitics		
95% CLT UCL	66.59206	
95% Adjusted-CLT UCL	72.17748	
95% Modified-t UCL	68.54206	
95% Jackknife UCL	67.67085	
95% Chebyshev (Mean, Sd) UCL	101.3326	
97.5% Chebyshev (Mean, Sd) UCL	125.4751	
99% Chebyshev (Mean, Sd) UCL	172.8985	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	65.63001	
95% Bootstrap-t UCL	78.53681	
95% Hall's Bootstrap UCL	68.34703	
95% Percentile Bootstrap UCL	66.9275	
95% BCA Bootstrap UCL	71.255	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	LOGNORMAL	
1st Recommended UCL	91.78113	95% Chebyshev (MVUE) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-SO-ground-c-121304.xls	
Variable:	Manganese	
Raw Statistics		
Number of Observations	20	
Number of Missing Data	0	
Number of Valid Observations	20	
Number of Distinct Observations	20	
Minimum	56.3	
Maximum	384	
Mean	135.1225	
Standard Deviation	72.2841	
Variance	5224.991	
Coefficient of Variation	0.534952	
Skewness	2.161648	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.788417	
Shapiro-Wilk 5% Critical Value	0.905	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	163.0708	
Gamma Statistics		
k hat	4.752179	
k star (bias corrected)	4.072685	
Theta hat	28.4338	
Theta star	33.17774	
nu hat	190.0872	
nu star	162.9074	
5% Approximate Chi Square Value	134.3913	
Adjusted Level of Significance	0.038	
Adjusted Chi Square Value	132.3462	
Anderson-Darling Test Statistic	0.485923	
Anderson-Darling 5% Critical Value	0.745304	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.138029	
Kolmogrov-Smirnov 5% Critical Value	0.194512	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	163.7938	
95% Adjusted Gamma UCL	166.3248	
Lognormal Statistics		
Minimum of log data	4.030695	
Maximum of log data	5.950643	
Mean of log data	4.797293	
Standard Deviation of log data	0.466287	
Variance of log data	0.217424	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.947877	
Shapiro-Wilk 5% Critical Value	0.905	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	135.0986	
MLE Standard Deviation	66.57919	
MLE Coefficient of Variation	0.492819	
MLE Skewness	1.598149	
MLE Median	121.1819	
MLE 80% Quantile	179.703	
MLE 90% Quantile	220.6267	
MLE 95% Quantile	260.9518	
MLE 99% Quantile	358.4816	
MVU Estimate of Median	120.5248	
MVU Estimate of Mean	134.2988	
MVU Estimate of Standard Deviation	64.78954	
MVU Estimate of SE of Mean	14.45381	
95% H-UCL	166.8193	
95% Chebyshev (MVUE) UCL	197.3015	
97.5% Chebyshev (MVUE) UCL	224.5628	
99% Chebyshev (MVUE) UCL	278.1124	
Non-parametric Statisitics		
95% CLT UCL	161.7086	
95% Adjusted-CLT UCL	170.0565	
95% Modified-t UCL	164.3729	
95% Jackknife UCL	163.0708	
95% Chebyshev (Mean, Sd) UCL	205.5763	
97.5% Chebyshev (Mean, Sd) UCL	236.0618	
99% Chebyshev (Mean, Sd) UCL	295.9445	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	161.5677	
95% Bootstrap-t UCL	175.5789	
95% Hall's Bootstrap UCL	286.0031	
95% Percentile Bootstrap UCL	161.19	
95% BCA Bootstrap UCL	171	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	163.7938	95% Approximate Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-SO-ground-c-121304.xls	
Variable:	Mercury	
Raw Statistics		
Number of Observations	20	
Number of Missing Data	0	
Number of Valid Observations	20	
Number of Distinct Observations	19	
Minimum	0.0013	
Maximum	5.8	
Mean	0.865893	
Standard Deviation	1.493473	
Variance	2.230463	
Coefficient of Variation	1.724779	
Skewness	2.346899	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.632352	
Shapiro-Wilk 5% Critical Value	0.905	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1.443338	
Gamma Statistics		
k hat	0.380918	
k star (bias corrected)	0.357113	
Theta hat	2.273174	
Theta star	2.424698	
nu hat	15.23671	
nu star	14.28454	
5% Approximate Chi Square Value	6.765459	
Adjusted Level of Significance	0.038	
Adjusted Chi Square Value	6.359018	
Anderson-Darling Test Statistic	0.583434	
Anderson-Darling 5% Critical Value	0.827644	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.203708	
Kolmogrov-Smirnov 5% Critical Value	0.208018	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	1.828239	
95% Adjusted Gamma UCL	1.945092	
Lognormal Statistics		
Minimum of log data	-6.645391	
Maximum of log data	1.757858	
Mean of log data	-1.885194	
Standard Deviation of log data	2.362369	
Variance of log data	5.58079	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.941275	
Shapiro-Wilk 5% Critical Value	0.905	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	2.472429	
MLE Standard Deviation	40.19358	
MLE Coefficient of Variation	16.25672	
MLE Skewness	4345.112	
MLE Median	0.1518	
MLE 80% Quantile	1.117404	
MLE 90% Quantile	3.159617	
MLE 95% Quantile	7.395738	
MLE 99% Quantile	36.95413	
MVU Estimate of Median	0.131907	
MVU Estimate of Mean	1.657229	
MVU Estimate of Standard Deviation	7.90279	
MVU Estimate of SE of Mean	1.079213	
95% H-UCL	34.333	
95% Chebyshev (MVUE) UCL	6.36141	
97.5% Chebyshev (MVUE) UCL	8.396913	
99% Chebyshev (MVUE) UCL	12.39526	
Non-parametric Statisitics		
95% CLT UCL	1.415193	
95% Adjusted-CLT UCL	1.602452	
95% Modified-t UCL	1.472546	
95% Jackknife UCL	1.443338	
95% Chebyshev (Mean, Sd) UCL	2.32155	
97.5% Chebyshev (Mean, Sd) UCL	2.951415	
99% Chebyshev (Mean, Sd) UCL	4.188661	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1.391137	
95% Bootstrap-t UCL	1.999657	
95% Hall's Bootstrap UCL	1.770876	
95% Percentile Bootstrap UCL	1.428425	
95% BCA Bootstrap UCL	1.686385	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	1.945092	95% Adjusted Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-SO-ground-c-121304.xls	
Variable:	Vanadium	
Raw Statistics		
Number of Observations	20	
Number of Missing Data	0	
Number of Valid Observations	20	
Number of Distinct Observations	19	
Minimum	8.9	
Maximum	41	
Mean	18.565	
Standard Deviation	7.70335	
Variance	59.34161	
Coefficient of Variation	0.414939	
Skewness	1.154345	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.899781	
Shapiro-Wilk 5% Critical Value	0.905	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	21.54347	
Gamma Statistics		
k hat	6.591092	
k star (bias corrected)	5.635762	
Theta hat	2.81668	
Theta star	3.294142	
nu hat	263.6437	
nu star	225.4305	
5% Approximate Chi Square Value	191.6711	
Adjusted Level of Significance	0.038	
Adjusted Chi Square Value	189.2139	
Anderson-Darling Test Statistic	0.346931	
Anderson-Darling 5% Critical Value	0.744151	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.114568	
Kolmogrov-Smirnov 5% Critical Value	0.194273	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	21.83489	
95% Adjusted Gamma UCL	22.11844	
Lognormal Statistics		
Minimum of log data	2.186051	
Maximum of log data	3.713572	
Mean of log data	2.843504	
Standard Deviation of log data	0.405645	
Variance of log data	0.164548	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.954221	
Shapiro-Wilk 5% Critical Value	0.905	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	18.64873	
MLE Standard Deviation	7.8869	
MLE Coefficient of Variation	0.422919	
MLE Skewness	1.3444	
MLE Median	17.17585	
MLE 80% Quantile	24.19811	
MLE 90% Quantile	28.92651	
MLE 95% Quantile	33.47473	
MLE 99% Quantile	44.12538	
MVU Estimate of Median	17.10532	
MVU Estimate of Mean	18.56682	
MVU Estimate of Standard Deviation	7.728586	
MVU Estimate of SE of Mean	1.725825	
95% H-UCL	22.29722	
95% Chebyshev (MVUE) UCL	26.08952	
97.5% Chebyshev (MVUE) UCL	29.3446	
99% Chebyshev (MVUE) UCL	35.73856	
Non-parametric Statisitics		
95% CLT UCL	21.3983	
95% Adjusted-CLT UCL	21.87337	
95% Modified-t UCL	21.61757	
95% Jackknife UCL	21.54347	
95% Chebyshev (Mean, Sd) UCL	26.0733	
97.5% Chebyshev (Mean, Sd) UCL	29.32214	
99% Chebyshev (Mean, Sd) UCL	35.70387	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	21.34413	
95% Bootstrap-t UCL	21.9925	
95% Hall's Bootstrap UCL	22.82562	
95% Percentile Bootstrap UCL	21.47	
95% BCA Bootstrap UCL	21.74	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	21.83489	95% Approximate Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-SO-daycare-c-121304.xls	
Variable:	Benzo(a)anthracene	
Raw Statistics		
Number of Observations	5	
Number of Missing Data	0	
Number of Valid Observations	5	
Number of Distinct Observations	4	
Minimum	0.0175	
Maximum	5.8	
Mean	1.2495	
Standard Deviation	2.544394	
Variance	6.473939	
Coefficient of Variation	2.036329	
Skewness	2.233472	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.571043	
Shapiro-Wilk 5% Critical Value	0.762	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	3.675301	
Gamma Statistics		
k hat	0.36221	
k star (bias corrected)	0.278217	
Theta hat	3.449653	
Theta star	4.491091	
nu hat	3.622104	
nu star	2.782175	
5% Approximate Chi Square Value	0.310775	
Adjusted Level of Significance	0.0086	
Adjusted Chi Square Value	0.116595	
Anderson-Darling Test Statistic	0.817713	
Anderson-Darling 5% Critical Value	0.730388	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.443209	
Kolmogrov-Smirnov 5% Critical Value	0.377331	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	11.18598	
95% Adjusted Gamma UCL	29.81552	
Lognormal Statistics		
Minimum of log data	-4.045554	
Maximum of log data	1.757858	
Mean of log data	-1.623408	
Standard Deviation of log data	2.098188	
Variance of log data	4.402391	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.852079	
Shapiro-Wilk 5% Critical Value	0.762	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	1.78209	
MLE Standard Deviation	16.00371	
MLE Coefficient of Variation	8.980303	
MLE Skewness	751.1651	
MLE Median	0.197225	
MLE 80% Quantile	1.161323	
MLE 90% Quantile	2.923445	
MLE 95% Quantile	6.222116	
MLE 99% Quantile	25.97088	
MVU Estimate of Median	0.122246	
MVU Estimate of Mean	0.82011	
MVU Estimate of Standard Deviation	1.52262	
MVU Estimate of SE of Mean	0.622908	
95% H-UCL	53904.6	
95% Chebyshev (MVUE) UCL	3.535304	
97.5% Chebyshev (MVUE) UCL	4.71017	
99% Chebyshev (MVUE) UCL	7.017968	
Non-parametric Statisitics		
95% CLT UCL	3.121158	
95% Adjusted-CLT UCL	4.335596	
95% Modified-t UCL	3.864728	
95% Jackknife UCL	3.675301	
95% Chebyshev (Mean, Sd) UCL	6.209436	
97.5% Chebyshev (Mean, Sd) UCL	8.355605	
99% Chebyshev (Mean, Sd) UCL	12.57134	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	LOGNORMAL	
1st Recommended UCL	7.017968	99% Chebyshev (MVUE) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-SO-daycare-c-121304.xls	
Variable:	Benzo(a)pyrene	
Raw Statistics		
Number of Observations	5	
Number of Missing Data	0	
Number of Valid Observations	5	
Number of Distinct Observations	5	
Minimum	0.0175	
Maximum	7.9	
Mean	1.6955	
Standard Deviation	3.469226	
Variance	12.03553	
Coefficient of Variation	2.046137	
Skewness	2.233459	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.572166	
Shapiro-Wilk 5% Critical Value	0.762	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	5.003027	
Gamma Statistics		
k hat	0.348139	
k star (bias corrected)	0.272589	
Theta hat	4.87018	
Theta star	6.219988	
nu hat	3.481391	
nu star	2.72589	
5% Approximate Chi Square Value	0.295928	
Adjusted Level of Significance	0.0086	
Adjusted Chi Square Value	0.111517	
Anderson-Darling Test Statistic	0.759088	
Anderson-Darling 5% Critical Value	0.732372	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.428611	
Kolmogrov-Smirnov 5% Critical Value	0.377915	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	15.61783	
95% Adjusted Gamma UCL	41.44419	
Lognormal Statistics		
Minimum of log data	-4.045554	
Maximum of log data	2.066863	
Mean of log data	-1.405219	
Standard Deviation of log data	2.195519	
Variance of log data	4.820304	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.877499	
Shapiro-Wilk 5% Critical Value	0.762	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	2.731725	
MLE Standard Deviation	30.29664	
MLE Coefficient of Variation	11.09066	
MLE Skewness	1397.455	
MLE Median	0.245313	
MLE 80% Quantile	1.568304	
MLE 90% Quantile	4.1207	
MLE 95% Quantile	9.08305	
MLE 99% Quantile	40.51039	
MVU Estimate of Median	0.144609	
MVU Estimate of Mean	1.14149	
MVU Estimate of Standard Deviation	2.198078	
MVU Estimate of SE of Mean	0.889666	
95% H-UCL	217085.8	
95% Chebyshev (MVUE) UCL	5.019455	
97.5% Chebyshev (MVUE) UCL	6.697454	
99% Chebyshev (MVUE) UCL	9.993558	
Non-parametric Statisitics		
95% CLT UCL	4.247465	
95% Adjusted-CLT UCL	5.903315	
95% Modified-t UCL	5.261306	
95% Jackknife UCL	5.003027	
95% Chebyshev (Mean, Sd) UCL	8.458266	
97.5% Chebyshev (Mean, Sd) UCL	11.38452	
99% Chebyshev (Mean, Sd) UCL	17.13258	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	3.948855	
95% Bootstrap-t UCL	280.8723	
95% Hall's Bootstrap UCL	113.4604	
95% Percentile Bootstrap UCL	4.7775	
95% BCA Bootstrap UCL	4.816	
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	LOGNORMAL	
1st Recommended UCL	9.993558	99% Chebyshev (MVUE) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-SO-daycare-c-121304.xls	
Variable:	Benzo(b)fluoranthene	
Raw Statistics		
Number of Observations	5	
Number of Missing Data	0	
Number of Valid Observations	5	
Number of Distinct Observations	5	
Minimum	0.048	
Maximum	11	
Mean	2.3696	
Standard Deviation	4.825544	
Variance	23.28587	
Coefficient of Variation	2.036438	
Skewness	2.233731	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.571437	
Shapiro-Wilk 5% Critical Value	0.762	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	6.970227	
Gamma Statistics		
k hat	0.372435	
k star (bias corrected)	0.282307	
Theta hat	6.362457	
Theta star	8.393692	
nu hat	3.724347	
nu star	2.823072	
5% Approximate Chi Square Value	0.321839	
Adjusted Level of Significance	0.0086	
Adjusted Chi Square Value	0.120469	
Anderson-Darling Test Statistic	0.841243	
Anderson-Darling 5% Critical Value	0.728947	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.439745	
Kolmogrov-Smirnov 5% Critical Value	0.376908	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	20.7854	
95% Adjusted Gamma UCL	55.52931	
Lognormal Statistics		
Minimum of log data	-3.036554	
Maximum of log data	2.397895	
Mean of log data	-0.924651	
Standard Deviation of log data	2.001613	
Variance of log data	4.006453	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.84205	
Shapiro-Wilk 5% Critical Value	0.762	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	2.94049	
MLE Standard Deviation	21.59842	
MLE Coefficient of Variation	7.345177	
MLE Skewness	418.3198	
MLE Median	0.39667	
MLE 80% Quantile	2.152677	
MLE 90% Quantile	5.193572	
MLE 95% Quantile	10.67604	
MLE 99% Quantile	41.725	
MVU Estimate of Median	0.257608	
MVU Estimate of Mean	1.478867	
MVU Estimate of Standard Deviation	2.64234	
MVU Estimate of SE of Mean	1.092015	
95% H-UCL	35614.04	
95% Chebyshev (MVUE) UCL	6.238848	
97.5% Chebyshev (MVUE) UCL	8.298496	
99% Chebyshev (MVUE) UCL	12.34428	
Non-parametric Statisitics		
95% CLT UCL	5.919274	
95% Adjusted-CLT UCL	8.222771	
95% Modified-t UCL	7.329526	
95% Jackknife UCL	6.970227	
95% Chebyshev (Mean, Sd) UCL	11.77632	
97.5% Chebyshev (Mean, Sd) UCL	15.84661	
99% Chebyshev (Mean, Sd) UCL	23.84191	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	5.526589	
95% Bootstrap-t UCL	292.1633	
95% Hall's Bootstrap UCL	137.2448	
95% Percentile Bootstrap UCL	6.6716	
95% BCA Bootstrap UCL	6.71	
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	LOGNORMAL	
1st Recommended UCL	12.34428	99% Chebyshev (MVUE) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-SO-daycare-c-121304.xls	
Variable:	Dibenz(a,h)anthracene	
Raw Statistics		
Number of Observations	5	
Number of Missing Data	0	
Number of Valid Observations	5	
Number of Distinct Observations	5	
Minimum	0.0175	
Maximum	1.3	
Mean	0.2799	
Standard Deviation	0.57035	
Variance	0.325299	
Coefficient of Variation	2.037692	
Skewness	2.234185	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.565945	
Shapiro-Wilk 5% Critical Value	0.762	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.823666	
Gamma Statistics		
k hat	0.39129	
k star (bias corrected)	0.289849	
Theta hat	0.715325	
Theta star	0.965674	
nu hat	3.912904	
nu star	2.898495	
5% Approximate Chi Square Value	0.342831	
Adjusted Level of Significance	0.0086	
Adjusted Chi Square Value	0.128024	
Anderson-Darling Test Statistic	1.042163	
Anderson-Darling 5% Critical Value	0.726288	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.431326	
Kolmogrov-Smirnov 5% Critical Value	0.376126	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	2.366438	
95% Adjusted Gamma UCL	6.336995	
Lognormal Statistics		
Minimum of log data	-4.045554	
Maximum of log data	0.262364	
Mean of log data	-2.961017	
Standard Deviation of log data	1.837787	
Variance of log data	3.377462	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.693152	
Shapiro-Wilk 5% Critical Value	0.762	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.28019	
MLE Standard Deviation	1.490453	
MLE Coefficient of Variation	5.319429	
MLE Skewness	166.4786	
MLE Median	0.051766	
MLE 80% Quantile	0.244611	
MLE 90% Quantile	0.549108	
MLE 95% Quantile	1.064115	
MLE 99% Quantile	3.719824	
MVU Estimate of Median	0.036144	
MVU Estimate of Mean	0.161337	
MVU Estimate of Standard Deviation	0.268601	
MVU Estimate of SE of Mean	0.1128	
95% H-UCL	792.1324	
95% Chebyshev (MVUE) UCL	0.65302	
97.5% Chebyshev (MVUE) UCL	0.865771	
99% Chebyshev (MVUE) UCL	1.28368	
Non-parametric Statisitics		
95% CLT UCL	0.69945	
95% Adjusted-CLT UCL	0.971764	
95% Modified-t UCL	0.866142	
95% Jackknife UCL	0.823666	
95% Chebyshev (Mean, Sd) UCL	1.391717	
97.5% Chebyshev (Mean, Sd) UCL	1.872801	
99% Chebyshev (Mean, Sd) UCL	2.817797	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.646056	
95% Bootstrap-t UCL	137.767	
95% Hall's Bootstrap UCL	87.50471	
95% Percentile Bootstrap UCL	0.7873	
95% BCA Bootstrap UCL	0.7924	
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	2.817797	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	YES	Cosider using 95% or 97.5% Chebyshev (Mean, Sd) UCL

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-SO-daycare-c-121304.xls	
Variable:	Indeno(1,2,3-cd)pyrene	
Raw Statistics		
Number of Observations	5	
Number of Missing Data	0	
Number of Valid Observations	5	
Number of Distinct Observations	5	
Minimum	0.0175	
Maximum	6	
Mean	1.3005	
Standard Deviation	2.627924	
Variance	6.905983	
Coefficient of Variation	2.020703	
Skewness	2.232546	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.576096	
Shapiro-Wilk 5% Critical Value	0.762	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	3.805937	
Gamma Statistics		
k hat	0.367882	
k star (bias corrected)	0.280486	
Theta hat	3.535098	
Theta star	4.636591	
nu hat	3.678823	
nu star	2.804863	
5% Approximate Chi Square Value	0.316885	
Adjusted Level of Significance	0.0086	
Adjusted Chi Square Value	0.118725	
Anderson-Darling Test Statistic	0.738892	
Anderson-Darling 5% Critical Value	0.729589	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.41846	
Kolmogrov-Smirnov 5% Critical Value	0.377096	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	11.5112	
95% Adjusted Gamma UCL	30.72427	
Lognormal Statistics		
Minimum of log data	-4.045554	
Maximum of log data	1.791759	
Mean of log data	-1.550357	
Standard Deviation of log data	2.103329	
Variance of log data	4.423993	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.885915	
Shapiro-Wilk 5% Critical Value	0.762	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	1.937968	
MLE Standard Deviation	17.59487	
MLE Coefficient of Variation	9.07903	
MLE Skewness	775.6104	
MLE Median	0.212172	
MLE 80% Quantile	1.254775	
MLE 90% Quantile	3.165849	
MLE 95% Quantile	6.750521	
MLE 99% Quantile	28.27525	
MVU Estimate of Median	0.131173	
MVU Estimate of Mean	0.887466	
MVU Estimate of Standard Deviation	1.650941	
MVU Estimate of SE of Mean	0.675031	
95% H-UCL	61620.91	
95% Chebyshev (MVUE) UCL	3.829858	
97.5% Chebyshev (MVUE) UCL	5.103033	
99% Chebyshev (MVUE) UCL	7.603939	
Non-parametric Statisitics		
95% CLT UCL	3.233603	
95% Adjusted-CLT UCL	4.487389	
95% Modified-t UCL	4.001503	
95% Jackknife UCL	3.805937	
95% Chebyshev (Mean, Sd) UCL	6.423266	
97.5% Chebyshev (Mean, Sd) UCL	8.639891	
99% Chebyshev (Mean, Sd) UCL	12.99402	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	3.068879	
95% Bootstrap-t UCL	121.0883	
95% Hall's Bootstrap UCL	63.31017	
95% Percentile Bootstrap UCL	3.607	
95% BCA Bootstrap UCL	3.66	
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	LOGNORMAL	
1st Recommended UCL	7.603939	99% Chebyshev (MVUE) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-SO-daycare-c-121304.xls	
Variable:	Phenanthrene	
Raw Statistics		
Number of Observations	5	
Number of Missing Data	0	
Number of Valid Observations	5	
Number of Distinct Observations	4	
Minimum	0.0175	
Maximum	8.1	
Mean	1.7455	
Standard Deviation	3.553419	
Variance	12.62679	
Coefficient of Variation	2.03576	
Skewness	2.232453	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.576438	
Shapiro-Wilk 5% Critical Value	0.762	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	5.133296	
Gamma Statistics		
k hat	0.350442	
k star (bias corrected)	0.27351	
Theta hat	4.980847	
Theta star	6.381844	
nu hat	3.504424	
nu star	2.735103	
5% Approximate Chi Square Value	0.298327	
Adjusted Level of Significance	0.0086	
Adjusted Chi Square Value	0.112328	
Anderson-Darling Test Statistic	0.698103	
Anderson-Darling 5% Critical Value	0.732048	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.40155	
Kolmogrov-Smirnov 5% Critical Value	0.377819	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	APPROX GAMMA	Data follow approximate gamma distribution at 5% significance level
95% Approximate Gamma UCL	16.00296	
95% Adjusted Gamma UCL	42.50151	
Lognormal Statistics		
Minimum of log data	-4.045554	
Maximum of log data	2.091864	
Mean of log data	-1.361387	
Standard Deviation of log data	2.206215	
Variance of log data	4.867386	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.901962	
Shapiro-Wilk 5% Critical Value	0.762	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	2.922108	
MLE Standard Deviation	33.18628	
MLE Coefficient of Variation	11.35696	
MLE Skewness	1498.9	
MLE Median	0.256305	
MLE 80% Quantile	1.653451	
MLE 90% Quantile	4.364917	
MLE 95% Quantile	9.658483	
MLE 99% Quantile	43.39174	
MVU Estimate of Median	0.150228	
MVU Estimate of Mean	1.207639	
MVU Estimate of Standard Deviation	2.334515	
MVU Estimate of SE of Mean	0.943752	
95% H-UCL	258909.8	
95% Chebyshev (MVUE) UCL	5.321359	
97.5% Chebyshev (MVUE) UCL	7.101369	
99% Chebyshev (MVUE) UCL	10.59785	
Non-parametric Statisitics		
95% CLT UCL	4.359398	
95% Adjusted-CLT UCL	6.054669	
95% Modified-t UCL	5.397724	
95% Jackknife UCL	5.133296	
95% Chebyshev (Mean, Sd) UCL	8.672389	
97.5% Chebyshev (Mean, Sd) UCL	11.66966	
99% Chebyshev (Mean, Sd) UCL	17.55722	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	GAMMA	
1st Recommended UCL	42.50151	95% Adjusted Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-SO-daycare-c-121304.xls	
Variable:	Arsenic	
Raw Statistics		
Number of Observations	5	
Number of Missing Data	0	
Number of Valid Observations	5	
Number of Distinct Observations	5	
Minimum	11	
Maximum	64.4	
Mean	26.72	
Standard Deviation	21.54152	
Variance	464.037	
Coefficient of Variation	0.806195	
Skewness	1.993751	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.749533	
Shapiro-Wilk 5% Critical Value	0.762	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	47.25748	
Gamma Statistics		
k hat	2.640276	
k star (bias corrected)	1.189444	
Theta hat	10.12016	
Theta star	22.46428	
nu hat	26.40276	
nu star	11.89444	
5% Approximate Chi Square Value	5.156582	
Adjusted Level of Significance	0.0086	
Adjusted Chi Square Value	3.401711	
Anderson-Darling Test Statistic	0.483735	
Anderson-Darling 5% Critical Value	0.683285	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.300863	
Kolmogrov-Smirnov 5% Critical Value	0.359798	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	61.63372	
95% Adjusted Gamma UCL	93.42925	
Lognormal Statistics		
Minimum of log data	2.397895	
Maximum of log data	4.165114	
Mean of log data	3.084245	
Standard Deviation of log data	0.664487	
Variance of log data	0.441542	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.909966	
Shapiro-Wilk 5% Critical Value	0.762	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	27.24899	
MLE Standard Deviation	20.30194	
MLE Coefficient of Variation	0.745053	
MLE Skewness	2.648741	
MLE Median	21.85097	
MLE 80% Quantile	38.31097	
MLE 90% Quantile	51.32154	
MLE 95% Quantile	65.19128	
MLE 99% Quantile	102.4978	
MVU Estimate of Median	20.90025	
MVU Estimate of Mean	25.94423	
MVU Estimate of Standard Deviation	16.98893	
MVU Estimate of SE of Mean	7.58082	
95% H-UCL	87.8924	
95% Chebyshev (MVUE) UCL	58.98826	
97.5% Chebyshev (MVUE) UCL	73.28643	
99% Chebyshev (MVUE) UCL	101.3724	
Non-parametric Statisitics		
95% CLT UCL	42.56596	
95% Adjusted-CLT UCL	51.74416	
95% Modified-t UCL	48.68909	
95% Jackknife UCL	47.25748	
95% Chebyshev (Mean, Sd) UCL	68.71215	
97.5% Chebyshev (Mean, Sd) UCL	86.88219	
99% Chebyshev (Mean, Sd) UCL	122.5737	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	40.86975	
95% Bootstrap-t UCL	100.7921	
95% Hall's Bootstrap UCL	119.2468	
95% Percentile Bootstrap UCL	44.02	
95% BCA Bootstrap UCL	46.5	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	61.63372	95% Approximate Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-SO-daycare-c-121304.xls	
Variable:	Manganese	
Raw Statistics		
Number of Observations	5	
Number of Missing Data	0	
Number of Valid Observations	5	
Number of Distinct Observations	5	
Minimum	91.5	
Maximum	186	
Mean	158.1	
Standard Deviation	38.04997	
Variance	1447.8	
Coefficient of Variation	0.24067	
Skewness	-2.000121	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.74536	
Shapiro-Wilk 5% Critical Value	0.762	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	194.3765	
Gamma Statistics		
k hat	16.78609	
k star (bias corrected)	6.847769	
Theta hat	9.418513	
Theta star	23.08781	
nu hat	167.8609	
nu star	68.47769	
5% Approximate Chi Square Value	50.42706	
Adjusted Level of Significance	0.0086	
Adjusted Chi Square Value	43.73087	
Anderson-Darling Test Statistic	0.8487	
Anderson-Darling 5% Critical Value	0.678751	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.391831	
Kolmogrov-Smirnov 5% Critical Value	0.357298	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	214.6927	
95% Adjusted Gamma UCL	247.5671	
Lognormal Statistics		
Minimum of log data	4.516339	
Maximum of log data	5.225747	
Mean of log data	5.033146	
Standard Deviation of log data	0.292375	
Variance of log data	0.085483	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.697928	
Shapiro-Wilk 5% Critical Value	0.762	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	160.1142	
MLE Standard Deviation	47.83189	
MLE Coefficient of Variation	0.298736	
MLE Skewness	0.922869	
MLE Median	153.4148	
MLE 80% Quantile	196.4096	
MLE 90% Quantile	223.374	
MLE 95% Quantile	248.1672	
MLE 99% Quantile	302.8416	
MVU Estimate of Median	152.1071	
MVU Estimate of Mean	158.7207	
MVU Estimate of Standard Deviation	46.27397	
MVU Estimate of SE of Mean	20.6924	
95% H-UCL	226.908	
95% Chebyshev (MVUE) UCL	248.9168	
97.5% Chebyshev (MVUE) UCL	287.9447	
99% Chebyshev (MVUE) UCL	364.6075	
Non-parametric Statisitics		
95% CLT UCL	186.0896	
95% Adjusted-CLT UCL	169.8258	
95% Modified-t UCL	191.8397	
95% Jackknife UCL	194.3765	
95% Chebyshev (Mean, Sd) UCL	232.273	
97.5% Chebyshev (Mean, Sd) UCL	264.3678	
99% Chebyshev (Mean, Sd) UCL	327.4117	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	182.9763	
95% Bootstrap-t UCL	182.776	
95% Hall's Bootstrap UCL	172.6279	
95% Percentile Bootstrap UCL	178.8	
95% BCA Bootstrap UCL	176.4	
Recommendations		
Human Inspection Recommended?	YES	Users must select one of the recommended UCLS
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	194.3765	95% Student's-t UCL
2nd Recommended UCL	191.8397	95% Modified-t UCL
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-SO-daycare-c-121304.xls	
Variable:	Mercury	
Raw Statistics		
Number of Observations	5	
Number of Missing Data	0	
Number of Valid Observations	5	
Number of Distinct Observations	5	
Minimum	0.013	
Maximum	2.1	
Mean	0.5351	
Standard Deviation	0.880464	
Variance	0.775216	
Coefficient of Variation	1.645419	
Skewness	2.165294	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.659324	
Shapiro-Wilk 5% Critical Value	0.762	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1.374526	
Gamma Statistics		
k hat	0.546747	
k star (bias corrected)	0.352032	
Theta hat	0.978698	
Theta star	1.520032	
nu hat	5.467469	
nu star	3.520321	
5% Approximate Chi Square Value	0.541697	
Adjusted Level of Significance	0.0086	
Adjusted Chi Square Value	0.210399	
Anderson-Darling Test Statistic	0.365307	
Anderson-Darling 5% Critical Value	0.708583	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.27682	
Kolmogrov-Smirnov 5% Critical Value	0.370694	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	3.477451	
95% Adjusted Gamma UCL	8.953099	
Lognormal Statistics		
Minimum of log data	-4.342806	
Maximum of log data	0.741937	
Mean of log data	-1.771225	
Standard Deviation of log data	1.8295	
Variance of log data	3.347072	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.972217	
Shapiro-Wilk 5% Critical Value	0.762	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	0.906931	
MLE Standard Deviation	4.749008	
MLE Coefficient of Variation	5.236353	
MLE Skewness	159.2867	
MLE Median	0.170124	
MLE 80% Quantile	0.798279	
MLE 90% Quantile	1.785472	
MLE 95% Quantile	3.449754	
MLE 99% Quantile	11.99144	
MVU Estimate of Median	0.119193	
MVU Estimate of Mean	0.525546	
MVU Estimate of Standard Deviation	0.871651	
MVU Estimate of SE of Mean	0.366334	
95% H-UCL	2390.002	
95% Chebyshev (MVUE) UCL	2.122358	
97.5% Chebyshev (MVUE) UCL	2.813299	
99% Chebyshev (MVUE) UCL	4.17052	
Non-parametric Statisitics		
95% CLT UCL	1.18277	
95% Adjusted-CLT UCL	1.590187	
95% Modified-t UCL	1.438074	
95% Jackknife UCL	1.374526	
95% Chebyshev (Mean, Sd) UCL	2.25144	
97.5% Chebyshev (Mean, Sd) UCL	2.994101	
99% Chebyshev (Mean, Sd) UCL	4.452916	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1.107953	
95% Bootstrap-t UCL	6.569628	
95% Hall's Bootstrap UCL	5.197413	
95% Percentile Bootstrap UCL	1.2851	
95% BCA Bootstrap UCL	1.35	
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	GAMMA	
1st Recommended UCL	3.477451	95% Approximate Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Soil-SO-daycare-c-121304.xls	
Variable:	Vanadium	
Raw Statistics		
Number of Observations	5	
Number of Missing Data	0	
Number of Valid Observations	5	
Number of Distinct Observations	5	
Minimum	11.25	
Maximum	22.5	
Mean	17.27	
Standard Deviation	4.098414	
Variance	16.797	
Coefficient of Variation	0.237314	
Skewness	-0.440139	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.97751	
Shapiro-Wilk 5% Critical Value	0.762	
5% Normality Test Result	NORMAL	Data are normal at 5% significance level
95% Student's-t UCL	21.17739	
Gamma Statistics		
k hat	20.29344	
k star (bias corrected)	8.250711	
Theta hat	0.851014	
Theta star	2.093153	
nu hat	202.9344	
nu star	82.50711	
5% Approximate Chi Square Value	62.57039	
Adjusted Level of Significance	0.0086	
Adjusted Chi Square Value	55.03574	
Anderson-Darling Test Statistic	0.267623	
Anderson-Darling 5% Critical Value	0.678686	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.216592	
Kolmogrov-Smirnov 5% Critical Value	0.357157	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	22.77272	
95% Adjusted Gamma UCL	25.89041	
Lognormal Statistics		
Minimum of log data	2.420368	
Maximum of log data	3.113515	
Mean of log data	2.82413	
Standard Deviation of log data	0.256053	
Variance of log data	0.065563	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.940288	
Shapiro-Wilk 5% Critical Value	0.762	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	17.40769	
MLE Standard Deviation	4.531365	
MLE Coefficient of Variation	0.260308	
MLE Skewness	0.798563	
MLE Median	16.84628	
MLE 80% Quantile	20.9156	
MLE 90% Quantile	23.40989	
MLE 95% Quantile	25.67039	
MLE 99% Quantile	30.56056	
MVU Estimate of Median	16.73608	
MVU Estimate of Mean	17.29196	
MVU Estimate of Standard Deviation	4.418002	
MVU Estimate of SE of Mean	1.97568	
95% H-UCL	23.38998	
95% Chebyshev (MVUE) UCL	25.90375	
97.5% Chebyshev (MVUE) UCL	29.63008	
99% Chebyshev (MVUE) UCL	36.94973	
Non-parametric Statisitics		
95% CLT UCL	20.2848	
95% Adjusted-CLT UCL	19.8993	
95% Modified-t UCL	21.11726	
95% Jackknife UCL	21.17739	
95% Chebyshev (Mean, Sd) UCL	25.25928	
97.5% Chebyshev (Mean, Sd) UCL	28.71625	
99% Chebyshev (Mean, Sd) UCL	35.50679	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	19.93346	
95% Bootstrap-t UCL	20.38821	
95% Hall's Bootstrap UCL	20.14532	
95% Percentile Bootstrap UCL	20.04	
95% BCA Bootstrap UCL	19.52	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NORMAL	
1st Recommended UCL	21.17739	95% Student's-t UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Benzo(a)anthracene
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	20	Shapiro-Wilk Test Statisitic	0.290114
Number of Unique Samples	14	Shapiro-Wilk 5% Critical Value	0.905
Minimum	0.0175	Data not normal at 5% significance level	
Maximum	5.8		
Mean	0.367125	95% UCL (Assuming Normal Distribution)	
Median	0.02775	Student's-t UCL	0.863354
Standard Deviation	1.28342		
Variance	1.647168	Gamma Distribution Test	
Coefficient of Variation	3.495867	A-D Test Statistic	3.366545
Skewness	4.419867	A-D 5% Critical Value	0.833363
		K-S Test Statistic	0.304226
Gamma Statistics		K-S 5% Critical Value	0.208726
k hat	0.353802	Data do not follow gamma distribution	
k star (bias corrected)	0.334065	at 5% significance level	
Theta hat	1.037657		
Theta star	1.098963	95% UCLs (Assuming Gamma Distribution)	
nu hat	14.15207	Approximate Gamma UCL	0.799468
nu star	13.36259	Adjusted Gamma UCL	0.852871
Approx.Chi Square Value (.05)	6.136259		
Adjusted Level of Significance	0.038	Lognormal Distribution Test	
Adjusted Chi Square Value	5.752036	Shapiro-Wilk Test Statisitic	0.771817
		Shapiro-Wilk 5% Critical Value	0.905
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-4.045554		
Maximum of log data	1.757858	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-2.899317	95% H-UCL	0.564915
Standard Deviation of log data	1.516354	95% Chebyshev (MVUE) UCL	0.432164
Variance of log data	2.29933	97.5% Chebyshev (MVUE) UCL	0.551651
		99% Chebyshev (MVUE) UCL	0.786359
		95% Non-parametric UCLs	
		CLT UCL	0.839168
		Adj-CLT UCL (Adjusted for skewness)	1.142228
		Mod-t UCL (Adjusted for skewness)	0.910625
		Jackknife UCL	0.863354
		Standard Bootstrap UCL	0.816722
		Bootstrap-t UCL	7.216707
RECOMMENDATION		Hall's Bootstrap UCL	3.773429
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	0.93355
		BCA Bootstrap UCL	1.270275
Use 99% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	1.618048
		97.5% Chebyshev (Mean, Sd) UCL	2.159324
		99% Chebyshev (Mean, Sd) UCL	3.222555

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Benzo(a)pyrene
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	20	Shapiro-Wilk Test Statisitic	0.288442
Number of Unique Samples	16	Shapiro-Wilk 5% Critical Value	0.905
Minimum	0.0175	Data not normal at 5% significance level	
Maximum	7.9		
Mean	0.49315	95% UCL (Assuming Normal Distribution)	
Median	0.0445	Student's-t UCL	1.169363
Standard Deviation	1.748921		
Variance	3.058725	Gamma Distribution Test	
Coefficient of Variation	3.546428	A-D Test Statistic	3.130681
Skewness	4.42625	A-D 5% Critical Value	0.837503
		K-S Test Statistic	0.286229
Gamma Statistics		K-S 5% Critical Value	0.209238
k hat	0.334171	Data do not follow gamma distribution	
k star (bias corrected)	0.317379	at 5% significance level	
Theta hat	1.475741		
Theta star	1.553822	95% UCLs (Assuming Gamma Distribution)	
nu hat	13.36684	Approximate Gamma UCL	1.100811
nu star	12.69515	Adjusted Gamma UCL	1.176899
Approx.Chi Square Value (.05)	5.687273		
Adjusted Level of Significance	0.038	Lognormal Distribution Test	
Adjusted Chi Square Value	5.319585	Shapiro-Wilk Test Statisitic	0.805832
		Shapiro-Wilk 5% Critical Value	0.905
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-4.045554		
Maximum of log data	2.066863	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-2.734436	95% H-UCL	0.871305
Standard Deviation of log data	1.607396	95% Chebyshev (MVUE) UCL	0.601499
Variance of log data	2.583723	97.5% Chebyshev (MVUE) UCL	0.771771
		99% Chebyshev (MVUE) UCL	1.106237
		95% Non-parametric UCLs	
		CLT UCL	1.136404
		Adj-CLT UCL (Adjusted for skewness)	1.549981
		Mod-t UCL (Adjusted for skewness)	1.233873
		Jackknife UCL	1.169363
		Standard Bootstrap UCL	1.120221
		Bootstrap-t UCL	8.618221
RECOMMENDATION		Hall's Bootstrap UCL	5.505081
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	1.26815
		BCA Bootstrap UCL	1.69075
Use 99% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	2.197787
		97.5% Chebyshev (Mean, Sd) UCL	2.935385
		99% Chebyshev (Mean, Sd) UCL	4.384254

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Benzo(b)fluoranthene
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	20	Shapiro-Wilk Test Statisitic	0.292986
Number of Unique Samples	17	Shapiro-Wilk 5% Critical Value	0.905
Minimum	0.0175	Data not normal at 5% significance level	
Maximum	11		
Mean	0.6962	95% UCL (Assuming Normal Distribution)	
Median	0.075	Student's-t UCL	1.637298
Standard Deviation	2.434005		
Variance	5.924378	Gamma Distribution Test	
Coefficient of Variation	3.496128	A-D Test Statistic	2.656557
Skewness	4.420057	A-D 5% Critical Value	0.83799
		K-S Test Statistic	0.277371
Gamma Statistics		K-S 5% Critical Value	0.209298
k hat	0.331864	Data do not follow gamma distribution	
k star (bias corrected)	0.315418	at 5% significance level	
Theta hat	2.097845		
Theta star	2.20723	95% UCLs (Assuming Gamma Distribution)	
nu hat	13.27457	Approximate Gamma UCL	1.558814
nu star	12.61672	Adjusted Gamma UCL	1.667007
Approx.Chi Square Value (.05)	5.634899		
Adjusted Level of Significance	0.038	Lognormal Distribution Test	
Adjusted Chi Square Value	5.269181	Shapiro-Wilk Test Statisitic	0.865855
		Shapiro-Wilk 5% Critical Value	0.905
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-4.045554		
Maximum of log data	2.397895	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-2.406013	95% H-UCL	1.555002
Standard Deviation of log data	1.688044	95% Chebyshev (MVUE) UCL	0.970573
Variance of log data	2.849492	97.5% Chebyshev (MVUE) UCL	1.250533
		99% Chebyshev (MVUE) UCL	1.80046
		95% Non-parametric UCLs	
		CLT UCL	1.591428
		Adj-CLT UCL (Adjusted for skewness)	2.166205
		Mod-t UCL (Adjusted for skewness)	1.726951
		Jackknife UCL	1.637298
		Standard Bootstrap UCL	1.571361
		Bootstrap-t UCL	10.08648
RECOMMENDATION		Hall's Bootstrap UCL	7.162734
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	1.76675
		BCA Bootstrap UCL	2.83045
Use 99% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	3.068574
		97.5% Chebyshev (Mean, Sd) UCL	4.095102
		99% Chebyshev (Mean, Sd) UCL	6.111518

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Dibenz(a,h)anthracene
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	20	Shapiro-Wilk Test Statisitic	0.267143
Number of Unique Samples	10	Shapiro-Wilk 5% Critical Value	0.905
Minimum	0.0175	Data not normal at 5% significance level	
Maximum	1.3		
Mean	0.088725	95% UCL (Assuming Normal Distribution)	
Median	0.01875	Student's-t UCL	0.199151
Standard Deviation	0.285599		
Variance	0.081567	Gamma Distribution Test	
Coefficient of Variation	3.218923	A-D Test Statistic	5.629862
Skewness	4.446989	A-D 5% Critical Value	0.799792
		K-S Test Statistic	0.449087
Gamma Statistics		K-S 5% Critical Value	0.204488
k hat	0.529736	Data do not follow gamma distribution	
k star (bias corrected)	0.483609	at 5% significance level	
Theta hat	0.167489		
Theta star	0.183465	95% UCLs (Assuming Gamma Distribution)	
nu hat	21.18942	Approximate Gamma UCL	0.165544
nu star	19.34434	Adjusted Gamma UCL	0.174248
Approx.Chi Square Value (.05)	10.3678		
Adjusted Level of Significance	0.038	Lognormal Distribution Test	
Adjusted Chi Square Value	9.849922	Shapiro-Wilk Test Statisitic	0.479651
		Shapiro-Wilk 5% Critical Value	0.905
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-4.045554		
Maximum of log data	0.262364	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-3.610644	95% H-UCL	0.082013
Standard Deviation of log data	1.007629	95% Chebyshev (MVUE) UCL	0.091005
Variance of log data	1.015317	97.5% Chebyshev (MVUE) UCL	0.111634
		99% Chebyshev (MVUE) UCL	0.152154
		95% Non-parametric UCLs	
		CLT UCL	0.193768
		Adj-CLT UCL (Adjusted for skewness)	0.261622
		Mod-t UCL (Adjusted for skewness)	0.209734
		Jackknife UCL	0.199151
		Standard Bootstrap UCL	0.193454
		Bootstrap-t UCL	2.844387
RECOMMENDATION		Hall's Bootstrap UCL	1.746606
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	0.2158
		BCA Bootstrap UCL	0.342875
Use 99% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	0.367092
		97.5% Chebyshev (Mean, Sd) UCL	0.487542
		99% Chebyshev (Mean, Sd) UCL	0.724143

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Indeno(1,2,3-cd)pyrene
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	20	Shapiro-Wilk Test Statisitic	0.278301
Number of Unique Samples	15	Shapiro-Wilk 5% Critical Value	0.905
Minimum	0.0175	Data not normal at 5% significance level	
Maximum	6		
Mean	0.368575	95% UCL (Assuming Normal Distribution)	
Median	0.02875	Student's-t UCL	0.882027
Standard Deviation	1.327965		
Variance	1.763491	Gamma Distribution Test	
Coefficient of Variation	3.602971	A-D Test Statistic	3.558184
Skewness	4.444866	A-D 5% Critical Value	0.834591
		K-S Test Statistic	0.292062
Gamma Statistics		K-S 5% Critical Value	0.208878
k hat	0.347978	Data do not follow gamma distribution	
k star (bias corrected)	0.329115	at 5% significance level	
Theta hat	1.059189		
Theta star	1.119897	95% UCLs (Assuming Gamma Distribution)	
nu hat	13.91914	Approximate Gamma UCL	0.808357
nu star	13.1646	Adjusted Gamma UCL	0.862892
Approx.Chi Square Value (.05)	6.002474		
Adjusted Level of Significance	0.038	Lognormal Distribution Test	
Adjusted Chi Square Value	5.623115	Shapiro-Wilk Test Statisitic	0.756119
		Shapiro-Wilk 5% Critical Value	0.905
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-4.045554		
Maximum of log data	1.791759	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-2.932345	95% H-UCL	0.51915
Standard Deviation of log data	1.498282	95% Chebyshev (MVUE) UCL	0.404783
Variance of log data	2.24485	97.5% Chebyshev (MVUE) UCL	0.51614
		99% Chebyshev (MVUE) UCL	0.73488
		95% Non-parametric UCLs	
		CLT UCL	0.857001
		Adj-CLT UCL (Adjusted for skewness)	1.172353
		Mod-t UCL (Adjusted for skewness)	0.931216
		Jackknife UCL	0.882027
		Standard Bootstrap UCL	0.842589
		Bootstrap-t UCL	7.021155
RECOMMENDATION		Hall's Bootstrap UCL	4.195539
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	0.9572
		BCA Bootstrap UCL	1.289825
Use 99% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	1.662915
		97.5% Chebyshev (Mean, Sd) UCL	2.222977
		99% Chebyshev (Mean, Sd) UCL	3.32311

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Phenanthrene
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	20	Shapiro-Wilk Test Statisitic	0.3202
Number of Unique Samples	14	Shapiro-Wilk 5% Critical Value	0.905
Minimum	0.0175	Data not normal at 5% significance level	
Maximum	8.1		
Mean	0.541325	95% UCL (Assuming Normal Distribution)	
Median	0.03275	Student's-t UCL	1.238385
Standard Deviation	1.802839		
Variance	3.250228	Gamma Distribution Test	
Coefficient of Variation	3.330419	A-D Test Statistic	3.158886
Skewness	4.294193	A-D 5% Critical Value	0.840615
		K-S Test Statistic	0.305512
Gamma Statistics		K-S 5% Critical Value	0.209623
k hat	0.319417	Data do not follow gamma distribution	
k star (bias corrected)	0.304838	at 5% significance level	
Theta hat	1.694727		
Theta star	1.775779	95% UCLs (Assuming Gamma Distribution)	
nu hat	12.77669	Approximate Gamma UCL	1.232905
nu star	12.19352	Adjusted Gamma UCL	1.320461
Approx.Chi Square Value (.05)	5.353744		
Adjusted Level of Significance	0.038	Lognormal Distribution Test	
Adjusted Chi Square Value	4.99875	Shapiro-Wilk Test Statisitic	0.780676
		Shapiro-Wilk 5% Critical Value	0.905
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-4.045554		
Maximum of log data	2.091864	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-2.75057	95% H-UCL	1.201525
Standard Deviation of log data	1.715026	95% Chebyshev (MVUE) UCL	0.72356
Variance of log data	2.941315	97.5% Chebyshev (MVUE) UCL	0.933502
		99% Chebyshev (MVUE) UCL	1.345893
		95% Non-parametric UCLs	
		CLT UCL	1.20441
		Adj-CLT UCL (Adjusted for skewness)	1.618018
		Mod-t UCL (Adjusted for skewness)	1.3029
		Jackknife UCL	1.238385
		Standard Bootstrap UCL	1.189633
		Bootstrap-t UCL	9.344426
RECOMMENDATION		Hall's Bootstrap UCL	5.645405
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	1.304975
		BCA Bootstrap UCL	1.864125
Use 99% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	2.298515
		97.5% Chebyshev (Mean, Sd) UCL	3.058852
		99% Chebyshev (Mean, Sd) UCL	4.552388

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Arsenic
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	20	Shapiro-Wilk Test Statisitic	0.678876
Number of Unique Samples	20	Shapiro-Wilk 5% Critical Value	0.905
Minimum	5.7	Data not normal at 5% significance level	
Maximum	192		
Mean	45.5375	95% UCL (Assuming Normal Distribution)	
Median	18.7	Student's-t UCL	67.67085
Standard Deviation	57.24451		
Variance	3276.934	Gamma Distribution Test	
Coefficient of Variation	1.257085	A-D Test Statistic	1.289689
Skewness	1.826299	A-D 5% Critical Value	0.768693
		K-S Test Statistic	0.24518
Gamma Statistics		K-S 5% Critical Value	0.199481
k hat	0.983723	Data do not follow gamma distribution	
k star (bias corrected)	0.869498	at 5% significance level	
Theta hat	46.29099		
Theta star	52.37219	95% UCLs (Assuming Gamma Distribution)	
nu hat	39.34891	Approximate Gamma UCL	71.06524
nu star	34.77991	Adjusted Gamma UCL	73.677
Approx.Chi Square Value (.05)	22.28642		
Adjusted Level of Significance	0.038	Lognormal Distribution Test	
Adjusted Chi Square Value	21.4964	Shapiro-Wilk Test Statisitic	0.920354
		Shapiro-Wilk 5% Critical Value	0.905
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	1.740466		
Maximum of log data	5.257495	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	3.230633	95% H-UCL	84.5075
Standard Deviation of log data	1.05653	95% Chebyshev (MVUE) UCL	91.78113
Variance of log data	1.116256	97.5% Chebyshev (MVUE) UCL	113.1285
		99% Chebyshev (MVUE) UCL	155.0614
		95% Non-parametric UCLs	
		CLT UCL	66.59206
		Adj-CLT UCL (Adjusted for skewness)	72.17748
		Mod-t UCL (Adjusted for skewness)	68.54206
		Jackknife UCL	67.67085
		Standard Bootstrap UCL	66.14342
		Bootstrap-t UCL	82.78101
RECOMMENDATION		Hall's Bootstrap UCL	69.2551
Data are lognormal (0.05)		Percentile Bootstrap UCL	68.2625
		BCA Bootstrap UCL	78.47
Use 95% Chebyshev (MVUE) UCL		95% Chebyshev (Mean, Sd) UCL	101.3326
		97.5% Chebyshev (Mean, Sd) UCL	125.4751
		99% Chebyshev (Mean, Sd) UCL	172.8985

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Manganese
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	20	Shapiro-Wilk Test Statisitic	0.788417
Number of Unique Samples	20	Shapiro-Wilk 5% Critical Value	0.905
Minimum	56.3	Data not normal at 5% significance level	
Maximum	384		
Mean	135.1225	95% UCL (Assuming Normal Distribution)	
Median	131.5	Student's-t UCL	163.0708
Standard Deviation	72.2841		
Variance	5224.991	Gamma Distribution Test	
Coefficient of Variation	0.534952	A-D Test Statistic	0.485923
Skewness	2.161648	A-D 5% Critical Value	0.745304
		K-S Test Statistic	0.138029
Gamma Statistics		K-S 5% Critical Value	0.194512
k hat	4.752179	Data follow gamma distribution	
k star (bias corrected)	4.072685	at 5% significance level	
Theta hat	28.4338		
Theta star	33.17774	95% UCLs (Assuming Gamma Distribution)	
nu hat	190.0872	Approximate Gamma UCL	163.7938
nu star	162.9074	Adjusted Gamma UCL	166.3248
Approx.Chi Square Value (.05)	134.3913		
Adjusted Level of Significance	0.038	Lognormal Distribution Test	
Adjusted Chi Square Value	132.3462	Shapiro-Wilk Test Statisitic	0.947877
		Shapiro-Wilk 5% Critical Value	0.905
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	4.030695		
Maximum of log data	5.950643	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	4.797293	95% H-UCL	166.8193
Standard Deviation of log data	0.466287	95% Chebyshev (MVUE) UCL	197.3015
Variance of log data	0.217424	97.5% Chebyshev (MVUE) UCL	224.5628
		99% Chebyshev (MVUE) UCL	278.1124
		95% Non-parametric UCLs	
		CLT UCL	161.7086
		Adj-CLT UCL (Adjusted for skewness)	170.0565
		Mod-t UCL (Adjusted for skewness)	164.3729
		Jackknife UCL	163.0708
		Standard Bootstrap UCL	160.3275
		Bootstrap-t UCL	175.2129
RECOMMENDATION		Hall's Bootstrap UCL	294.0364
Data follow gamma distribution (0.05)		Percentile Bootstrap UCL	163.48
		BCA Bootstrap UCL	158.255
Use Approximate Gamma UCL		95% Chebyshev (Mean, Sd) UCL	205.5763
		97.5% Chebyshev (Mean, Sd) UCL	236.0618
		99% Chebyshev (Mean, Sd) UCL	295.9445

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Mercury
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	20	Shapiro-Wilk Test Statisitic	0.632352
Number of Unique Samples	19	Shapiro-Wilk 5% Critical Value	0.905
Minimum	0.0013	Data not normal at 5% significance level	
Maximum	5.8		
Mean	0.865893	95% UCL (Assuming Normal Distribution)	
Median	0.205	Student's-t UCL	1.443338
Standard Deviation	1.493473		
Variance	2.230463	Gamma Distribution Test	
Coefficient of Variation	1.724779	A-D Test Statistic	0.583434
Skewness	2.346899	A-D 5% Critical Value	0.827644
		K-S Test Statistic	0.203708
Gamma Statistics		K-S 5% Critical Value	0.208018
k hat	0.380918	Data follow gamma distribution	
k star (bias corrected)	0.357113	at 5% significance level	
Theta hat	2.273174		
Theta star	2.424698	95% UCLs (Assuming Gamma Distribution)	
nu hat	15.23671	Approximate Gamma UCL	1.828239
nu star	14.28454	Adjusted Gamma UCL	1.945092
Approx.Chi Square Value (.05)	6.765459		
Adjusted Level of Significance	0.038	Lognormal Distribution Test	
Adjusted Chi Square Value	6.359018	Shapiro-Wilk Test Statisitic	0.941275
		Shapiro-Wilk 5% Critical Value	0.905
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	-6.645391		
Maximum of log data	1.757858	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-1.885194	95% H-UCL	34.333
Standard Deviation of log data	2.362369	95% Chebyshev (MVUE) UCL	6.36141
Variance of log data	5.58079	97.5% Chebyshev (MVUE) UCL	8.396913
		99% Chebyshev (MVUE) UCL	12.39526
		95% Non-parametric UCLs	
		CLT UCL	1.415193
		Adj-CLT UCL (Adjusted for skewness)	1.602452
		Mod-t UCL (Adjusted for skewness)	1.472546
		Jackknife UCL	1.443338
		Standard Bootstrap UCL	1.40888
		Bootstrap-t UCL	1.857689
RECOMMENDATION		Hall's Bootstrap UCL	1.754707
Data follow gamma distribution (0.05)		Percentile Bootstrap UCL	1.444413
		BCA Bootstrap UCL	1.884678
Use Adjusted Gamma UCL		95% Chebyshev (Mean, Sd) UCL	2.32155
		97.5% Chebyshev (Mean, Sd) UCL	2.951415
		99% Chebyshev (Mean, Sd) UCL	4.188661

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Benzo(a)pyrene
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	13	Shapiro-Wilk Test Statisitic	0.611714
Number of Unique Samples	13	Shapiro-Wilk 5% Critical Value	0.866
Minimum	0.0185	Data not normal at 5% significance level	
Maximum	0.23		
Mean	0.055192	95% UCL (Assuming Normal Distribution)	
Median	0.0245	Student's-t UCL	0.087587
Standard Deviation	0.065534		
Variance	0.004295	Gamma Distribution Test	
Coefficient of Variation	1.187379	A-D Test Statistic	1.842549
Skewness	2.166378	A-D 5% Critical Value	0.752399
		K-S Test Statistic	0.368839
Gamma Statistics		K-S 5% Critical Value	0.241544
k hat	1.353703	Data do not follow gamma distribution	
k star (bias corrected)	1.092592	at 5% significance level	
Theta hat	0.040771		
Theta star	0.050515	95% UCLs (Assuming Gamma Distribution)	
nu hat	35.19629	Approximate Gamma UCL	0.090925
nu star	28.4074	Adjusted Gamma UCL	0.097907
Approx.Chi Square Value (.05)	17.24361		
Adjusted Level of Significance	0.03009	Lognormal Distribution Test	
Adjusted Chi Square Value	16.01389	Shapiro-Wilk Test Statisitic	0.746337
		Shapiro-Wilk 5% Critical Value	0.866
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-3.989985		
Maximum of log data	-1.469676	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-3.309722	95% H-UCL	0.095831
Standard Deviation of log data	0.831638	95% Chebyshev (MVUE) UCL	0.103141
Variance of log data	0.691622	97.5% Chebyshev (MVUE) UCL	0.126172
		99% Chebyshev (MVUE) UCL	0.171412
		95% Non-parametric UCLs	
		CLT UCL	0.085089
		Adj-CLT UCL (Adjusted for skewness)	0.096758
		Mod-t UCL (Adjusted for skewness)	0.089407
		Jackknife UCL	0.087587
		Standard Bootstrap UCL	0.084371
		Bootstrap-t UCL	0.165871
RECOMMENDATION		Hall's Bootstrap UCL	0.210208
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	0.087231
		BCA Bootstrap UCL	0.104038
Use 95% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	0.134419
		97.5% Chebyshev (Mean, Sd) UCL	0.168701
		99% Chebyshev (Mean, Sd) UCL	0.23604

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Antimony
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	14	Shapiro-Wilk Test Statisitic	0.357951
Number of Unique Samples	14	Shapiro-Wilk 5% Critical Value	0.874
Minimum	0.365	Data not normal at 5% significance level	
Maximum	81.4		
Mean	7.171071	95% UCL (Assuming Normal Distribution)	
Median	0.485	Student's-t UCL	17.33634
Standard Deviation	21.47735		
Variance	461.2766	Gamma Distribution Test	
Coefficient of Variation	2.994999	A-D Test Statistic	2.660945
Skewness	3.676409	A-D 5% Critical Value	0.820885
		K-S Test Statistic	0.334826
Gamma Statistics		K-S 5% Critical Value	0.246026
k hat	0.357509	Data do not follow gamma distribution	
k star (bias corrected)	0.328519	at 5% significance level	
Theta hat	20.05845		
Theta star	21.82849	95% UCLs (Assuming Gamma Distribution)	
nu hat	10.01025	Approximate Gamma UCL	19.13903
nu star	9.198527	Adjusted Gamma UCL	22.02573
Approx.Chi Square Value (.05)	3.446534		
Adjusted Level of Significance	0.03122	Lognormal Distribution Test	
Adjusted Chi Square Value	2.994829	Shapiro-Wilk Test Statisitic	0.721001
		Shapiro-Wilk 5% Critical Value	0.874
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-1.007858		
Maximum of log data	4.399375	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	0.095646	95% H-UCL	19.28229
Standard Deviation of log data	1.558	95% Chebyshev (MVUE) UCL	9.63548
Variance of log data	2.427364	97.5% Chebyshev (MVUE) UCL	12.43793
		99% Chebyshev (MVUE) UCL	17.9428
		95% Non-parametric UCLs	
		CLT UCL	16.61264
		Adj-CLT UCL (Adjusted for skewness)	22.63902
		Mod-t UCL (Adjusted for skewness)	18.27633
		Jackknife UCL	17.33634
		Standard Bootstrap UCL	16.31892
		Bootstrap-t UCL	167.7977
RECOMMENDATION		Hall's Bootstrap UCL	131.9937
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	18.41786
		BCA Bootstrap UCL	25.22929
Use 99% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	32.19143
		97.5% Chebyshev (Mean, Sd) UCL	43.01776
		99% Chebyshev (Mean, Sd) UCL	64.28398

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Arsenic
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	14	Shapiro-Wilk Test Statisitic	0.497604
Number of Unique Samples	14	Shapiro-Wilk 5% Critical Value	0.874
Minimum	1.6	Data not normal at 5% significance level	
Maximum	2680		
Mean	358.6286	95% UCL (Assuming Normal Distribution)	
Median	48.4	Student's-t UCL	734.6919
Standard Deviation	794.553		
Variance	631314.5	Gamma Distribution Test	
Coefficient of Variation	2.215532	A-D Test Statistic	1.467736
Skewness	2.568634	A-D 5% Critical Value	0.817342
		K-S Test Statistic	0.293185
Gamma Statistics		K-S 5% Critical Value	0.245462
k hat	0.375792	Data do not follow gamma distribution	
k star (bias corrected)	0.342884	at 5% significance level	
Theta hat	954.3276		
Theta star	1045.918	95% UCLs (Assuming Gamma Distribution)	
nu hat	10.52217	Approximate Gamma UCL	932.3356
nu star	9.600755	Adjusted Gamma UCL	1068.656
Approx.Chi Square Value (.05)	3.692989		
Adjusted Level of Significance	0.03122	Lognormal Distribution Test	
Adjusted Chi Square Value	3.221903	Shapiro-Wilk Test Statisitic	0.930471
		Shapiro-Wilk 5% Critical Value	0.874
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	0.470004		
Maximum of log data	7.893572	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	4.113459	95% H-UCL	4016.1
Standard Deviation of log data	1.90269	95% Chebyshev (MVUE) UCL	991.102
Variance of log data	3.62023	97.5% Chebyshev (MVUE) UCL	1297.762
		99% Chebyshev (MVUE) UCL	1900.135
		95% Non-parametric UCLs	
		CLT UCL	707.9185
		Adj-CLT UCL (Adjusted for skewness)	863.6863
		Mod-t UCL (Adjusted for skewness)	758.9886
		Jackknife UCL	734.6919
		Standard Bootstrap UCL	700.8644
		Bootstrap-t UCL	5266.792
RECOMMENDATION		Hall's Bootstrap UCL	3464.971
Data are lognormal (0.05)		Percentile Bootstrap UCL	730.0857
		BCA Bootstrap UCL	985.5
Use 99% Chebyshev (MVUE) UCL		95% Chebyshev (Mean, Sd) UCL	1284.255
		97.5% Chebyshev (Mean, Sd) UCL	1684.774
		99% Chebyshev (Mean, Sd) UCL	2471.516

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Cadmium
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	14	Shapiro-Wilk Test Statisitic	0.385258
Number of Unique Samples	14	Shapiro-Wilk 5% Critical Value	0.874
Minimum	0.09	Data not normal at 5% significance level	
Maximum	41.2		
Mean	3.900714	95% UCL (Assuming Normal Distribution)	
Median	0.65	Student's-t UCL	9.035941
Standard Deviation	10.84979		
Variance	117.718	Gamma Distribution Test	
Coefficient of Variation	2.781489	A-D Test Statistic	1.775812
Skewness	3.614741	A-D 5% Critical Value	0.815484
		K-S Test Statistic	0.348179
Gamma Statistics		K-S 5% Critical Value	0.245166
k hat	0.385377	Data do not follow gamma distribution	
k star (bias corrected)	0.350416	at 5% significance level	
Theta hat	10.1218		
Theta star	11.13168	95% UCLs (Assuming Gamma Distribution)	
nu hat	10.79057	Approximate Gamma UCL	10.00965
nu star	9.811636	Adjusted Gamma UCL	11.45042
Approx.Chi Square Value (.05)	3.823549		
Adjusted Level of Significance	0.03122	Lognormal Distribution Test	
Adjusted Chi Square Value	3.342443	Shapiro-Wilk Test Statisitic	0.902619
		Shapiro-Wilk 5% Critical Value	0.874
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	-2.407946		
Maximum of log data	3.718438	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-0.356652	95% H-UCL	15.55354
Standard Deviation of log data	1.625332	95% Chebyshev (MVUE) UCL	6.8912
Variance of log data	2.641703	97.5% Chebyshev (MVUE) UCL	8.924277
		99% Chebyshev (MVUE) UCL	12.91786
		95% Non-parametric UCLs	
		CLT UCL	8.670344
		Adj-CLT UCL (Adjusted for skewness)	11.66365
		Mod-t UCL (Adjusted for skewness)	9.502836
		Jackknife UCL	9.035941
		Standard Bootstrap UCL	8.340285
		Bootstrap-t UCL	77.1385
RECOMMENDATION		Hall's Bootstrap UCL	42.5346
Data are lognormal (0.05)		Percentile Bootstrap UCL	9.401429
		BCA Bootstrap UCL	12.89
Use 99% Chebyshev (MVUE) UCL		95% Chebyshev (Mean, Sd) UCL	16.54034
		97.5% Chebyshev (Mean, Sd) UCL	22.00952
		99% Chebyshev (Mean, Sd) UCL	32.75265

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Copper
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	14	Shapiro-Wilk Test Statisitic	0.582239
Number of Unique Samples	14	Shapiro-Wilk 5% Critical Value	0.874
Minimum	2.2	Data not normal at 5% significance level	
Maximum	1600		
Mean	284.3714	95% UCL (Assuming Normal Distribution)	
Median	79.9	Student's-t UCL	519.9446
Standard Deviation	497.723		
Variance	247728.2	Gamma Distribution Test	
Coefficient of Variation	1.750257	A-D Test Statistic	0.635364
Skewness	2.263476	A-D 5% Critical Value	0.792616
		K-S Test Statistic	0.209968
Gamma Statistics		K-S 5% Critical Value	0.241513
k hat	0.507216	Data follow gamma distribution	
k star (bias corrected)	0.446146	at 5% significance level	
Theta hat	560.651		
Theta star	637.3951	95% UCLs (Assuming Gamma Distribution)	
nu hat	14.20206	Approximate Gamma UCL	639.8583
nu star	12.4921	Adjusted Gamma UCL	717.5348
Approx.Chi Square Value (.05)	5.551846		
Adjusted Level of Significance	0.03122	Lognormal Distribution Test	
Adjusted Chi Square Value	4.950833	Shapiro-Wilk Test Statisitic	0.973465
		Shapiro-Wilk 5% Critical Value	0.874
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	0.788457		
Maximum of log data	7.377759	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	4.400768	95% H-UCL	3072.979
Standard Deviation of log data	1.766045	95% Chebyshev (MVUE) UCL	1030.106
Variance of log data	3.118916	97.5% Chebyshev (MVUE) UCL	1342.074
		99% Chebyshev (MVUE) UCL	1954.873
		95% Non-parametric UCLs	
		CLT UCL	503.1733
		Adj-CLT UCL (Adjusted for skewness)	589.157
		Mod-t UCL (Adjusted for skewness)	533.3564
		Jackknife UCL	519.9446
		Standard Bootstrap UCL	504.8427
		Bootstrap-t UCL	1521.312
RECOMMENDATION		Hall's Bootstrap UCL	1816.947
Data follow gamma distribution (0.05)		Percentile Bootstrap UCL	504.7429
		BCA Bootstrap UCL	681.8714
Use Approximate Gamma UCL		95% Chebyshev (Mean, Sd) UCL	864.2012
		97.5% Chebyshev (Mean, Sd) UCL	1115.094
		99% Chebyshev (Mean, Sd) UCL	1607.924

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Lead
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	14	Shapiro-Wilk Test Statisitic	0.493425
Number of Unique Samples	14	Shapiro-Wilk 5% Critical Value	0.874
Minimum	3.9	Data not normal at 5% significance level	
Maximum	1090		
Mean	135.2714	95% UCL (Assuming Normal Distribution)	
Median	31.1	Student's-t UCL	271.8504
Standard Deviation	288.5664		
Variance	83270.56	Gamma Distribution Test	
Coefficient of Variation	2.13324	A-D Test Statistic	0.973009
Skewness	3.22961	A-D 5% Critical Value	0.793109
		K-S Test Statistic	0.251982
Gamma Statistics		K-S 5% Critical Value	0.241601
k hat	0.501781	Data do not follow gamma distribution	
k star (bias corrected)	0.441875	at 5% significance level	
Theta hat	269.5827		
Theta star	306.1302	95% UCLs (Assuming Gamma Distribution)	
nu hat	14.04986	Approximate Gamma UCL	305.8368
nu star	12.37251	Adjusted Gamma UCL	343.2119
Approx.Chi Square Value (.05)	5.472354		
Adjusted Level of Significance	0.03122	Lognormal Distribution Test	
Adjusted Chi Square Value	4.876426	Shapiro-Wilk Test Statisitic	0.960375
		Shapiro-Wilk 5% Critical Value	0.874
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	1.360977		
Maximum of log data	6.993933	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	3.642127	95% H-UCL	654.0534
Standard Deviation of log data	1.551474	95% Chebyshev (MVUE) UCL	330.5205
Variance of log data	2.40707	97.5% Chebyshev (MVUE) UCL	426.5121
		99% Chebyshev (MVUE) UCL	615.0691
		95% Non-parametric UCLs	
		CLT UCL	262.1268
		Adj-CLT UCL (Adjusted for skewness)	333.2561
		Mod-t UCL (Adjusted for skewness)	282.9451
		Jackknife UCL	271.8504
		Standard Bootstrap UCL	255.6045
		Bootstrap-t UCL	957.5376
RECOMMENDATION		Hall's Bootstrap UCL	782.4916
Data are lognormal (0.05)		Percentile Bootstrap UCL	275.5071
		BCA Bootstrap UCL	376.3214
Use 99% Chebyshev (MVUE) UCL		95% Chebyshev (Mean, Sd) UCL	471.4411
		97.5% Chebyshev (Mean, Sd) UCL	616.902
		99% Chebyshev (Mean, Sd) UCL	902.6317

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Manganese
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	14	Shapiro-Wilk Test Statisitic	0.809727
Number of Unique Samples	14	Shapiro-Wilk 5% Critical Value	0.874
Minimum	31.4	Data not normal at 5% significance level	
Maximum	304		
Mean	118.6321	95% UCL (Assuming Normal Distribution)	
Median	89.3	Student's-t UCL	157.302
Standard Deviation	81.70242		
Variance	6675.286	Gamma Distribution Test	
Coefficient of Variation	0.688704	A-D Test Statistic	0.630216
Skewness	1.414052	A-D 5% Critical Value	0.743254
		K-S Test Statistic	0.23273
Gamma Statistics		K-S 5% Critical Value	0.230745
k hat	2.784754	Data follow approximate gamma distibution	
k star (bias corrected)	2.23564	at 5% significance level	
Theta hat	42.60059		
Theta star	53.06407	95% UCLs (Assuming Gamma Distribution)	
nu hat	77.9731	Approximate Gamma UCL	163.5879
nu star	62.59791	Adjusted Gamma UCL	170.8873
Approx.Chi Square Value (.05)	45.39532		
Adjusted Level of Significance	0.03122	Lognormal Distribution Test	
Adjusted Chi Square Value	43.45626	Shapiro-Wilk Test Statisitic	0.948658
		Shapiro-Wilk 5% Critical Value	0.874
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	3.446808		
Maximum of log data	5.717028	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	4.585863	95% H-UCL	176.8416
Standard Deviation of log data	0.628626	95% Chebyshev (MVUE) UCL	207.3168
Variance of log data	0.395171	97.5% Chebyshev (MVUE) UCL	246.1442
		99% Chebyshev (MVUE) UCL	322.4131
		95% Non-parametric UCLs	
		CLT UCL	154.549
		Adj-CLT UCL (Adjusted for skewness)	163.3666
		Mod-t UCL (Adjusted for skewness)	158.6774
		Jackknife UCL	157.302
		Standard Bootstrap UCL	154.7223
		Bootstrap-t UCL	174.2229
RECOMMENDATION		Hall's Bootstrap UCL	165.9598
Assuming gamma distribution (0.05)		Percentile Bootstrap UCL	154.7964
		BCA Bootstrap UCL	172.8929
Use Approximate Gamma UCL		95% Chebyshev (Mean, Sd) UCL	213.8126
		97.5% Chebyshev (Mean, Sd) UCL	254.9972
		99% Chebyshev (Mean, Sd) UCL	335.8965

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Mercury
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	14	Shapiro-Wilk Test Statisitic	0.648851
Number of Unique Samples	14	Shapiro-Wilk 5% Critical Value	0.874
Minimum	0.017	Data not normal at 5% significance level	
Maximum	9.2		
Mean	1.613357	95% UCL (Assuming Normal Distribution)	
Median	0.465	Student's-t UCL	2.844655
Standard Deviation	2.601507		
Variance	6.767838	Gamma Distribution Test	
Coefficient of Variation	1.61248	A-D Test Statistic	0.396389
Skewness	2.370267	A-D 5% Critical Value	0.788707
		K-S Test Statistic	0.178851
Gamma Statistics		K-S 5% Critical Value	0.240816
k hat	0.550364	Data follow gamma distribution	
k star (bias corrected)	0.480048	at 5% significance level	
Theta hat	2.931439		
Theta star	3.360828	95% UCLs (Assuming Gamma Distribution)	
nu hat	15.41018	Approximate Gamma UCL	3.503566
nu star	13.44133	Adjusted Gamma UCL	3.908038
Approx.Chi Square Value (.05)	6.189598		
Adjusted Level of Significance	0.03122	Lognormal Distribution Test	
Adjusted Chi Square Value	5.548991	Shapiro-Wilk Test Statisitic	0.987293
		Shapiro-Wilk 5% Critical Value	0.874
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	-4.074542		
Maximum of log data	2.219203	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-0.65894	95% H-UCL	15.46604
Standard Deviation of log data	1.705719	95% Chebyshev (MVUE) UCL	5.869797
Variance of log data	2.909476	97.5% Chebyshev (MVUE) UCL	7.628608
		99% Chebyshev (MVUE) UCL	11.08345
		95% Non-parametric UCLs	
		CLT UCL	2.756994
		Adj-CLT UCL (Adjusted for skewness)	3.227619
		Mod-t UCL (Adjusted for skewness)	2.918063
		Jackknife UCL	2.844655
		Standard Bootstrap UCL	2.721445
		Bootstrap-t UCL	5.075839
RECOMMENDATION		Hall's Bootstrap UCL	7.717796
Data follow gamma distribution (0.05)		Percentile Bootstrap UCL	2.828357
		BCA Bootstrap UCL	3.487643
Use Approximate Gamma UCL		95% Chebyshev (Mean, Sd) UCL	4.644021
		97.5% Chebyshev (Mean, Sd) UCL	5.955392
		99% Chebyshev (Mean, Sd) UCL	8.531325

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Thallium
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	14	Shapiro-Wilk Test Statisitic	0.468403
Number of Unique Samples	9	Shapiro-Wilk 5% Critical Value	0.874
Minimum	0.46	Data not normal at 5% significance level	
Maximum	6.9		
Mean	1.227857	95% UCL (Assuming Normal Distribution)	
Median	0.6	Student's-t UCL	2.08517
Standard Deviation	1.811345		
Variance	3.280972	Gamma Distribution Test	
Coefficient of Variation	1.475209	A-D Test Statistic	3.161672
Skewness	2.878604	A-D 5% Critical Value	0.756278
		K-S Test Statistic	0.453253
Gamma Statistics		K-S 5% Critical Value	0.234181
k hat	1.197755	Data do not follow gamma distribution	
k star (bias corrected)	0.988712	at 5% significance level	
Theta hat	1.025132		
Theta star	1.241875	95% UCLs (Assuming Gamma Distribution)	
nu hat	33.53714	Approximate Gamma UCL	2.037849
nu star	27.68395	Adjusted Gamma UCL	2.185283
Approx.Chi Square Value (.05)	16.6803		
Adjusted Level of Significance	0.03122	Lognormal Distribution Test	
Adjusted Chi Square Value	15.55493	Shapiro-Wilk Test Statisitic	0.585866
		Shapiro-Wilk 5% Critical Value	0.874
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-0.776529		
Maximum of log data	1.931521	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-0.267067	95% H-UCL	1.855174
Standard Deviation of log data	0.807448	95% Chebyshev (MVUE) UCL	2.060587
Variance of log data	0.651972	97.5% Chebyshev (MVUE) UCL	2.506416
		99% Chebyshev (MVUE) UCL	3.382161
		95% Non-parametric UCLs	
		CLT UCL	2.024135
		Adj-CLT UCL (Adjusted for skewness)	2.422091
		Mod-t UCL (Adjusted for skewness)	2.147243
		Jackknife UCL	2.08517
		Standard Bootstrap UCL	1.997925
		Bootstrap-t UCL	19.29966
RECOMMENDATION		Hall's Bootstrap UCL	8.800152
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	2.100714
		BCA Bootstrap UCL	2.582143
Use 95% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	3.338011
		97.5% Chebyshev (Mean, Sd) UCL	4.251076
		99% Chebyshev (Mean, Sd) UCL	6.044615

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Vanadium
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	14	Shapiro-Wilk Test Statisitic	0.72279
Number of Unique Samples	14	Shapiro-Wilk 5% Critical Value	0.874
Minimum	7.3	Data not normal at 5% significance level	
Maximum	68.8		
Mean	22.625	95% UCL (Assuming Normal Distribution)	
Median	13.65	Student's-t UCL	31.96676
Standard Deviation	19.73744		
Variance	389.5664	Gamma Distribution Test	
Coefficient of Variation	0.872373	A-D Test Statistic	1.057946
Skewness	1.682751	A-D 5% Critical Value	0.745844
		K-S Test Statistic	0.281269
Gamma Statistics		K-S 5% Critical Value	0.231611
k hat	2.025081	Data do not follow gamma distribution	
k star (bias corrected)	1.638754	at 5% significance level	
Theta hat	11.17239		
Theta star	13.80622	95% UCLs (Assuming Gamma Distribution)	
nu hat	56.70228	Approximate Gamma UCL	33.12402
nu star	45.88513	Adjusted Gamma UCL	34.8932
Approx.Chi Square Value (.05)	31.34133		
Adjusted Level of Significance	0.03122	Lognormal Distribution Test	
Adjusted Chi Square Value	29.75224	Shapiro-Wilk Test Statisitic	0.884909
		Shapiro-Wilk 5% Critical Value	0.874
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	1.987874		
Maximum of log data	4.231204	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	2.85228	95% H-UCL	35.31419
Standard Deviation of log data	0.707587	95% Chebyshev (MVUE) UCL	40.66493
Variance of log data	0.500679	97.5% Chebyshev (MVUE) UCL	48.83392
		99% Chebyshev (MVUE) UCL	64.88032
		95% Non-parametric UCLs	
		CLT UCL	31.30169
		Adj-CLT UCL (Adjusted for skewness)	33.8366
		Mod-t UCL (Adjusted for skewness)	32.36216
		Jackknife UCL	31.96676
		Standard Bootstrap UCL	31.04135
		Bootstrap-t UCL	39.05432
RECOMMENDATION		Hall's Bootstrap UCL	35.06253
Data are lognormal (0.05)		Percentile Bootstrap UCL	31.55714
		BCA Bootstrap UCL	36.61071
Use H-UCL		95% Chebyshev (Mean, Sd) UCL	45.61842
		97.5% Chebyshev (Mean, Sd) UCL	55.56769
		99% Chebyshev (Mean, Sd) UCL	75.11111

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\	Variable:	Zinc
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	14	Shapiro-Wilk Test Statisitic	0.429042
Number of Unique Samples	14	Shapiro-Wilk 5% Critical Value	0.874
Minimum	58.2	Data not normal at 5% significance level	
Maximum	7390		
Mean	818.4571	95% UCL (Assuming Normal Distribution)	
Median	191	Student's-t UCL	1741.18
Standard Deviation	1949.545		
Variance	3800725	Gamma Distribution Test	
Coefficient of Variation	2.381975	A-D Test Statistic	1.97859
Skewness	3.412085	A-D 5% Critical Value	0.792161
		K-S Test Statistic	0.361914
Gamma Statistics		K-S 5% Critical Value	0.241432
k hat	0.51224	Data do not follow gamma distribution	
k star (bias corrected)	0.450093	at 5% significance level	
Theta hat	1597.801		
Theta star	1818.417	95% UCLs (Assuming Gamma Distribution)	
nu hat	14.34271	Approximate Gamma UCL	1833.566
nu star	12.60261	Adjusted Gamma UCL	2054.805
Approx.Chi Square Value (.05)	5.625484		
Adjusted Level of Significance	0.03122	Lognormal Distribution Test	
Adjusted Chi Square Value	5.019792	Shapiro-Wilk Test Statisitic	0.837406
		Shapiro-Wilk 5% Critical Value	0.874
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	4.063885		
Maximum of log data	8.907883	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	5.472043	95% H-UCL	2048.438
Standard Deviation of log data	1.336678	95% Chebyshev (MVUE) UCL	1434.87
Variance of log data	1.786708	97.5% Chebyshev (MVUE) UCL	1829.153
		99% Chebyshev (MVUE) UCL	2603.646
		95% Non-parametric UCLs	
		CLT UCL	1675.488
		Adj-CLT UCL (Adjusted for skewness)	2183.186
		Mod-t UCL (Adjusted for skewness)	1820.371
		Jackknife UCL	1741.18
		Standard Bootstrap UCL	1662.382
		Bootstrap-t UCL	13122.68
RECOMMENDATION		Hall's Bootstrap UCL	6820.088
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	1748.643
		BCA Bootstrap UCL	2464.721
Use 99% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	3089.608
		97.5% Chebyshev (Mean, Sd) UCL	4072.337
		99% Chebyshev (Mean, Sd) UCL	6002.717

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Fish-fillet-121304.xls	
Variable:	Arsenic	
Raw Statistics		
Number of Observations	28	
Number of Missing Data	0	
Number of Valid Observations	28	
Number of Distinct Observations	28	
Minimum	0.018	
Maximum	0.51	
Mean	0.157211	
Standard Deviation	0.136561	
Variance	0.018649	
Coefficient of Variation	0.868647	
Skewness	1.651702	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.782356	
Shapiro-Wilk 5% Critical Value	0.924	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.201168	
Gamma Statistics		
k hat	1.744099	
k star (bias corrected)	1.58104	
Theta hat	0.090139	
Theta star	0.099435	
nu hat	97.66952	
nu star	88.53826	
5% Approximate Chi Square Value	67.84073	
Adjusted Level of Significance	0.0404	
Adjusted Chi Square Value	66.72055	
Anderson-Darling Test Statistic	0.573797	
Anderson-Darling 5% Critical Value	0.760365	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.115176	
Kolmogrov-Smirnov 5% Critical Value	0.167969	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	0.205174	
95% Adjusted Gamma UCL	0.208619	
Lognormal Statistics		
Minimum of log data	-4.017384	
Maximum of log data	-0.673345	
Mean of log data	-2.163453	
Standard Deviation of log data	0.808153	
Variance of log data	0.653111	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.977548	
Shapiro-Wilk 5% Critical Value	0.924	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	0.159311	
MLE Standard Deviation	0.152931	
MLE Coefficient of Variation	0.959953	
MLE Skewness	3.764462	
MLE Median	0.114928	
MLE 80% Quantile	0.227509	
MLE 90% Quantile	0.32466	
MLE 95% Quantile	0.434291	
MLE 99% Quantile	0.753	
MVU Estimate of Median	0.113595	
MVU Estimate of Mean	0.15694	
MVU Estimate of Standard Deviation	0.142701	
MVU Estimate of SE of Mean	0.026411	
95% H-UCL	0.225793	
95% Chebyshev (MVUE) UCL	0.272064	
97.5% Chebyshev (MVUE) UCL	0.321877	
99% Chebyshev (MVUE) UCL	0.419727	
Non-parametric Statisitics		
95% CLT UCL	0.19966	
95% Adjusted-CLT UCL	0.208268	
95% Modified-t UCL	0.202511	
95% Jackknife UCL	0.201168	
95% Chebyshev (Mean, Sd) UCL	0.269703	
97.5% Chebyshev (Mean, Sd) UCL	0.318379	
99% Chebyshev (Mean, Sd) UCL	0.413992	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.197955	
95% Bootstrap-t UCL	0.215109	
95% Hall's Bootstrap UCL	0.210687	
95% Percentile Bootstrap UCL	0.199579	
95% BCA Bootstrap UCL	0.209411	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	0.205174	95% Approximate Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Fish-fillet-121304.xls	
Variable:	Chromium	
Raw Statistics		
Number of Observations	28	
Number of Missing Data	0	
Number of Valid Observations	28	
Number of Distinct Observations	2	
Minimum	0.5	
Maximum	0.84	
Mean	0.512143	
Standard Deviation	0.064254	
Variance	0.004129	
Coefficient of Variation	0.125461	
Skewness	5.291503	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.194253	
Shapiro-Wilk 5% Critical Value	0.924	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.532826	
Gamma Statistics		
k hat	91.62159	
k star (bias corrected)	81.8288	
Theta hat	0.00559	
Theta star	0.006259	
nu hat	5130.809	
nu star	4582.413	
5% Approximate Chi Square Value	4426.058	
Adjusted Level of Significance	0.0404	
Adjusted Chi Square Value	4416.594	
Anderson-Darling Test Statistic	10.35149	
Anderson-Darling 5% Critical Value	0.74315	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.541145	
Kolmogrov-Smirnov 5% Critical Value	0.164832	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.530235	
95% Adjusted Gamma UCL	0.531371	
Lognormal Statistics		
Minimum of log data	-0.693147	
Maximum of log data	-0.174353	
Mean of log data	-0.674619	
Standard Deviation of log data	0.098043	
Variance of log data	0.009612	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.194253	
Shapiro-Wilk 5% Critical Value	0.924	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.511804	
MLE Standard Deviation	0.0503	
MLE Coefficient of Variation	0.098279	
MLE Skewness	0.295786	
MLE Median	0.509351	
MLE 80% Quantile	0.553346	
MLE 90% Quantile	0.577739	
MLE 95% Quantile	0.598494	
MLE 99% Quantile	0.639818	
MVU Estimate of Median	0.509263	
MVU Estimate of Mean	0.511716	
MVU Estimate of Standard Deviation	0.050258	
MVU Estimate of SE of Mean	0.009498	
95% H-UCL	N/A	
95% Chebyshev (MVUE) UCL	0.553117	
97.5% Chebyshev (MVUE) UCL	0.571031	
99% Chebyshev (MVUE) UCL	0.606219	
Non-parametric Statisitics		
95% CLT UCL	0.532116	
95% Adjusted-CLT UCL	0.545091	
95% Modified-t UCL	0.534849	
95% Jackknife UCL	0.532826	
95% Chebyshev (Mean, Sd) UCL	0.565072	
97.5% Chebyshev (Mean, Sd) UCL	0.587975	
99% Chebyshev (Mean, Sd) UCL	0.632963	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/A	Not enough distinct data error
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	YES	Users must select one of the recommended UCLS
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.532826	95% Student's-t UCL
2nd Recommended UCL	0.534849	95% Modified-t UCL
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Fish-fillet-121304.xls	
Variable:	Mercury	
Raw Statistics		
Number of Observations	28	
Number of Missing Data	0	
Number of Valid Observations	28	
Number of Distinct Observations	11	
Minimum	0.05	
Maximum	0.36	
Mean	0.128214	
Standard Deviation	0.086283	
Variance	0.007445	
Coefficient of Variation	0.672963	
Skewness	0.907044	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.841475	
Shapiro-Wilk 5% Critical Value	0.924	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.155988	
Gamma Statistics		
k hat	2.386455	
k star (bias corrected)	2.154573	
Theta hat	0.053726	
Theta star	0.059508	
nu hat	133.6415	
nu star	120.6561	
5% Approximate Chi Square Value	96.28625	
Adjusted Level of Significance	0.0404	
Adjusted Chi Square Value	94.94093	
Anderson-Darling Test Statistic	1.851538	
Anderson-Darling 5% Critical Value	0.756308	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.276551	
Kolmogrov-Smirnov 5% Critical Value	0.167181	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.160665	
95% Adjusted Gamma UCL	0.162942	
Lognormal Statistics		
Minimum of log data	-2.995732	
Maximum of log data	-1.021651	
Mean of log data	-2.277962	
Standard Deviation of log data	0.689058	
Variance of log data	0.4748	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.824825	
Shapiro-Wilk 5% Critical Value	0.924	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.129956	
MLE Standard Deviation	0.101307	
MLE Coefficient of Variation	0.779547	
MLE Skewness	2.812366	
MLE Median	0.102493	
MLE 80% Quantile	0.183469	
MLE 90% Quantile	0.248448	
MLE 95% Quantile	0.318395	
MLE 99% Quantile	0.509048	
MVU Estimate of Median	0.101627	
MVU Estimate of Mean	0.12863	
MVU Estimate of Standard Deviation	0.096595	
MVU Estimate of SE of Mean	0.018044	
95% H-UCL	0.17209	
95% Chebyshev (MVUE) UCL	0.20728	
97.5% Chebyshev (MVUE) UCL	0.241312	
99% Chebyshev (MVUE) UCL	0.308162	
Non-parametric Statisitics		
95% CLT UCL	0.155035	
95% Adjusted-CLT UCL	0.158022	
95% Modified-t UCL	0.156454	
95% Jackknife UCL	0.155988	
95% Chebyshev (Mean, Sd) UCL	0.199291	
97.5% Chebyshev (Mean, Sd) UCL	0.230046	
99% Chebyshev (Mean, Sd) UCL	0.290457	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.154865	
95% Bootstrap-t UCL	0.162	
95% Hall's Bootstrap UCL	0.159795	
95% Percentile Bootstrap UCL	0.154643	
95% BCA Bootstrap UCL	0.158214	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.199291	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Fish-fillet-121304.xls	
Variable:	Selenium	
Raw Statistics		
Number of Observations	28	
Number of Missing Data	0	
Number of Valid Observations	28	
Number of Distinct Observations	12	
Minimum	0.25	
Maximum	0.83	
Mean	0.419286	
Standard Deviation	0.197051	
Variance	0.038829	
Coefficient of Variation	0.469968	
Skewness	0.557842	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.778696	
Shapiro-Wilk 5% Critical Value	0.924	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.482715	
Gamma Statistics		
k hat	4.930095	
k star (bias corrected)	4.42568	
Theta hat	0.085046	
Theta star	0.094739	
nu hat	276.0853	
nu star	247.8381	
5% Approximate Chi Square Value	212.382	
Adjusted Level of Significance	0.0404	
Adjusted Chi Square Value	210.3559	
Anderson-Darling Test Statistic	3.21146	
Anderson-Darling 5% Critical Value	0.748612	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.351846	
Kolmogrov-Smirnov 5% Critical Value	0.165905	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.489283	
95% Adjusted Gamma UCL	0.493996	
Lognormal Statistics		
Minimum of log data	-1.386294	
Maximum of log data	-0.18633	
Mean of log data	-0.974035	
Standard Deviation of log data	0.462752	
Variance of log data	0.214139	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.745626	
Shapiro-Wilk 5% Critical Value	0.924	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.420225	
MLE Standard Deviation	0.20535	
MLE Coefficient of Variation	0.488667	
MLE Skewness	1.582691	
MLE Median	0.377556	
MLE 80% Quantile	0.558216	
MLE 90% Quantile	0.684272	
MLE 95% Quantile	0.808311	
MLE 99% Quantile	1.107744	
MVU Estimate of Median	0.376115	
MVU Estimate of Mean	0.418468	
MVU Estimate of Standard Deviation	0.201348	
MVU Estimate of SE of Mean	0.037953	
95% H-UCL	0.498453	
95% Chebyshev (MVUE) UCL	0.583903	
97.5% Chebyshev (MVUE) UCL	0.655487	
99% Chebyshev (MVUE) UCL	0.796099	
Non-parametric Statisitics		
95% CLT UCL	0.480539	
95% Adjusted-CLT UCL	0.484733	
95% Modified-t UCL	0.483369	
95% Jackknife UCL	0.482715	
95% Chebyshev (Mean, Sd) UCL	0.581607	
97.5% Chebyshev (Mean, Sd) UCL	0.651844	
99% Chebyshev (Mean, Sd) UCL	0.78981	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.479816	
95% Bootstrap-t UCL	0.488095	
95% Hall's Bootstrap UCL	0.48067	
95% Percentile Bootstrap UCL	0.483571	
95% BCA Bootstrap UCL	0.488929	
Recommendations		
Human Inspection Recommended?	YES	Users must select one of the recommended UCLS
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.482715	95% Student's-t UCL
2nd Recommended UCL	0.483369	95% Modified-t UCL
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Fish-fillet-121304.xls	
Variable:	Vanadium	
Raw Statistics		
Number of Observations	28	
Number of Missing Data	0	
Number of Valid Observations	28	
Number of Distinct Observations	2	
Minimum	0.16	
Maximum	0.25	
Mean	0.246786	
Standard Deviation	0.017008	
Variance	0.000289	
Coefficient of Variation	0.06892	
Skewness	-5.291503	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.194253	
Shapiro-Wilk 5% Critical Value	0.924	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.252261	
Gamma Statistics		
k hat	166.9269	
k star (bias corrected)	149.0657	
Theta hat	0.001478	
Theta star	0.001656	
nu hat	9347.906	
nu star	8347.678	
5% Approximate Chi Square Value	8136.243	
Adjusted Level of Significance	0.0404	
Adjusted Chi Square Value	8123.391	
Anderson-Darling Test Statistic	10.34893	
Anderson-Darling 5% Critical Value	0.74315	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.540935	
Kolmogrov-Smirnov 5% Critical Value	0.16482	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.253199	
95% Adjusted Gamma UCL	0.253599	
Lognormal Statistics		
Minimum of log data	-1.832581	
Maximum of log data	-1.386294	
Mean of log data	-1.402233	
Standard Deviation of log data	0.08434	
Variance of log data	0.007113	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.194253	
Shapiro-Wilk 5% Critical Value	0.924	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.246924	
MLE Standard Deviation	0.020863	
MLE Coefficient of Variation	0.084491	
MLE Skewness	0.254075	
MLE Median	0.246047	
MLE 80% Quantile	0.264222	
MLE 90% Quantile	0.274211	
MLE 95% Quantile	0.282665	
MLE 99% Quantile	0.299375	
MVU Estimate of Median	0.246016	
MVU Estimate of Mean	0.246892	
MVU Estimate of Standard Deviation	0.02085	
MVU Estimate of SE of Mean	0.00394	
95% H-UCL	N/A	
95% Chebyshev (MVUE) UCL	0.264067	
97.5% Chebyshev (MVUE) UCL	0.271499	
99% Chebyshev (MVUE) UCL	0.286097	
Non-parametric Statisitics		
95% CLT UCL	0.252073	
95% Adjusted-CLT UCL	0.248638	
95% Modified-t UCL	0.251725	
95% Jackknife UCL	0.252261	
95% Chebyshev (Mean, Sd) UCL	0.260796	
97.5% Chebyshev (Mean, Sd) UCL	0.266859	
99% Chebyshev (Mean, Sd) UCL	0.278767	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/A	Not enough distinct data error
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	YES	Users must select one of the recommended UCLS
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.252261	95% Student's-t UCL
2nd Recommended UCL	0.251725	95% Modified-t UCL
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Car Wash-Class A-121404.xls	
Variable:	Methyl tert-Butyl Ether	
Raw Statistics		
Number of Observations	18	
Number of Missing Data	0	
Number of Valid Observations	18	
Number of Distinct Observations	4	
Minimum	0.25	
Maximum	1.7	
Mean	0.363611	
Standard Deviation	0.357663	
Variance	0.127923	
Coefficient of Variation	0.983642	
Skewness	3.539986	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.371535	
Shapiro-Wilk 5% Critical Value	0.897	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.510263	
Gamma Statistics		
k hat	2.728355	
k star (bias corrected)	2.310666	
Theta hat	0.133271	
Theta star	0.157362	
nu hat	98.22077	
nu star	83.18398	
5% Approximate Chi Square Value	63.16051	
Adjusted Level of Significance	0.03574	
Adjusted Chi Square Value	61.48643	
Anderson-Darling Test Statistic	5.250628	
Anderson-Darling 5% Critical Value	0.747633	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.479005	
Kolmogrov-Smirnov 5% Critical Value	0.205373	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.478885	
95% Adjusted Gamma UCL	0.491923	
Lognormal Statistics		
Minimum of log data	-1.386294	
Maximum of log data	0.530628	
Mean of log data	-1.205984	
Standard Deviation of log data	0.51276	
Variance of log data	0.262923	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.41213	
Shapiro-Wilk 5% Critical Value	0.897	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.341461	
MLE Standard Deviation	0.187252	
MLE Coefficient of Variation	0.548386	
MLE Skewness	1.810071	
MLE Median	0.299397	
MLE 80% Quantile	0.461764	
MLE 90% Quantile	0.578633	
MLE 95% Quantile	0.695939	
MLE 99% Quantile	0.986785	
MVU Estimate of Median	0.297218	
MVU Estimate of Mean	0.338705	
MVU Estimate of Standard Deviation	0.180499	
MVU Estimate of SE of Mean	0.042409	
95% H-UCL	0.440132	
95% Chebyshev (MVUE) UCL	0.523564	
97.5% Chebyshev (MVUE) UCL	0.603552	
99% Chebyshev (MVUE) UCL	0.760674	
Non-parametric Statisitics		
95% CLT UCL	0.502276	
95% Adjusted-CLT UCL	0.577435	
95% Modified-t UCL	0.521987	
95% Jackknife UCL	0.510263	
95% Chebyshev (Mean, Sd) UCL	0.731075	
97.5% Chebyshev (Mean, Sd) UCL	0.890077	
99% Chebyshev (Mean, Sd) UCL	1.202406	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.731075	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Car Wash-Class A-121404.xls	
Variable:	Xylene, total	
Raw Statistics		
Number of Observations	18	
Number of Missing Data	0	
Number of Valid Observations	18	
Number of Distinct Observations	10	
Minimum	0.25	
Maximum	3.3	
Mean	0.898333	
Standard Deviation	0.962468	
Variance	0.926344	
Coefficient of Variation	1.071393	
Skewness	1.492241	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.733065	
Shapiro-Wilk 5% Critical Value	0.897	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1.292973	
Gamma Statistics		
k hat	1.185167	
k star (bias corrected)	1.024676	
Theta hat	0.757981	
Theta star	0.8767	
nu hat	42.666	
nu star	36.88833	
5% Approximate Chi Square Value	23.98256	
Adjusted Level of Significance	0.03574	
Adjusted Chi Square Value	22.98515	
Anderson-Darling Test Statistic	1.710034	
Anderson-Darling 5% Critical Value	0.762767	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.293644	
Kolmogrov-Smirnov 5% Critical Value	0.208622	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	1.381755	
95% Adjusted Gamma UCL	1.441714	
Lognormal Statistics		
Minimum of log data	-1.386294	
Maximum of log data	1.193922	
Mean of log data	-0.585101	
Standard Deviation of log data	0.968054	
Variance of log data	0.937129	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.789216	
Shapiro-Wilk 5% Critical Value	0.897	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.889998	
MLE Standard Deviation	1.108983	
MLE Coefficient of Variation	1.246051	
MLE Skewness	5.672826	
MLE Median	0.557049	
MLE 80% Quantile	1.262261	
MLE 90% Quantile	1.932566	
MLE 95% Quantile	2.73833	
MLE 99% Quantile	5.294103	
MVU Estimate of Median	0.542716	
MVU Estimate of Mean	0.8587	
MVU Estimate of Standard Deviation	0.948517	
MVU Estimate of SE of Mean	0.216455	
95% H-UCL	1.64152	
95% Chebyshev (MVUE) UCL	1.802207	
97.5% Chebyshev (MVUE) UCL	2.210463	
99% Chebyshev (MVUE) UCL	3.012403	
Non-parametric Statisitics		
95% CLT UCL	1.271478	
95% Adjusted-CLT UCL	1.356736	
95% Modified-t UCL	1.306272	
95% Jackknife UCL	1.292973	
95% Chebyshev (Mean, Sd) UCL	1.887175	
97.5% Chebyshev (Mean, Sd) UCL	2.315047	
99% Chebyshev (Mean, Sd) UCL	3.15552	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1.26542	
95% Bootstrap-t UCL	1.44047	
95% Hall's Bootstrap UCL	1.354774	
95% Percentile Bootstrap UCL	1.275	
95% BCA Bootstrap UCL	1.373333	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	1.887175	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Car Wash-Study Area-121404.xls	
Variable:	1,1-Dichloroethene	
Raw Statistics		
Number of Observations	153	
Number of Missing Data	0	
Number of Valid Observations	153	
Number of Distinct Observations	17	
Minimum	0.25	
Maximum	8.4	
Mean	0.625458	
Standard Deviation	0.921163	
Variance	0.848541	
Coefficient of Variation	1.472782	
Skewness	5.674386	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.443055	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.748704	
Gamma Statistics		
k hat	1.676196	
k star (bias corrected)	1.647687	
Theta hat	0.373141	
Theta star	0.379597	
nu hat	512.9161	
nu star	504.1922	
5% Approximate Chi Square Value	453.1107	
Adjusted Level of Significance	0.048431	
Adjusted Chi Square Value	452.6553	
Anderson-Darling Test Statistic	20.31347	
Anderson-Darling 5% Critical Value	0.768903	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.394939	
Kolmogrov-Smirnov 5% Critical Value	0.077042	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.695969	
95% Adjusted Gamma UCL	0.696669	
Lognormal Statistics		
Minimum of log data	-1.386294	
Maximum of log data	2.128232	
Mean of log data	-0.796306	
Standard Deviation of log data	0.64758	
Variance of log data	0.41936	
Lilliefors Test Statisitic	0.325606	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.556201	
MLE Standard Deviation	0.401463	
MLE Coefficient of Variation	0.721795	
MLE Skewness	2.541433	
MLE Median	0.450992	
MLE 80% Quantile	0.779501	
MLE 90% Quantile	1.036485	
MLE 95% Quantile	1.308608	
MLE 99% Quantile	2.033922	
MVU Estimate of Median	0.450374	
MVU Estimate of Mean	0.555283	
MVU Estimate of Standard Deviation	0.39819	
MVU Estimate of SE of Mean	0.031795	
95% H-UCL	0.61453	
95% Chebyshev (MVUE) UCL	0.693872	
97.5% Chebyshev (MVUE) UCL	0.75384	
99% Chebyshev (MVUE) UCL	0.871634	
Non-parametric Statisitics		
95% CLT UCL	0.747952	
95% Adjusted-CLT UCL	0.784457	
95% Modified-t UCL	0.754397	
95% Jackknife UCL	0.748704	
95% Chebyshev (Mean, Sd) UCL	0.950072	
97.5% Chebyshev (Mean, Sd) UCL	1.090532	
99% Chebyshev (Mean, Sd) UCL	1.36644	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.746331	
95% Bootstrap-t UCL	0.834108	
95% Hall's Bootstrap UCL	0.84675	
95% Percentile Bootstrap UCL	0.756176	
95% BCA Bootstrap UCL	0.798497	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.950072	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Car Wash-Study Area-121404.xls	
Variable:	1,2,4-Trichlorobenzene	
Raw Statistics		
Number of Observations	67	
Number of Missing Data	0	
Number of Valid Observations	67	
Number of Distinct Observations	5	
Minimum	0.11	
Maximum	5	
Mean	0.33194	
Standard Deviation	0.592205	
Variance	0.350707	
Coefficient of Variation	1.784071	
Skewness	7.70324	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.525173	
Lilliefors 5% Critical Value	0.108242	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.452639	
Gamma Statistics		
k hat	2.264358	
k star (bias corrected)	2.172919	
Theta hat	0.146594	
Theta star	0.152762	
nu hat	303.4239	
nu star	291.1711	
5% Approximate Chi Square Value	252.6391	
Adjusted Level of Significance	0.046418	
Adjusted Chi Square Value	251.8547	
Anderson-Darling Test Statistic	23.05314	
Anderson-Darling 5% Critical Value	0.761757	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.541326	
Kolmogrov-Smirnov 5% Critical Value	0.110116	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.382567	
95% Adjusted Gamma UCL	0.383759	
Lognormal Statistics		
Minimum of log data	-2.207275	
Maximum of log data	1.609438	
Mean of log data	-1.339574	
Standard Deviation of log data	0.435544	
Variance of log data	0.189698	
Lilliefors Test Statisitic	0.512862	
Lilliefors 5% Critical Value	0.108242	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.28802	
MLE Standard Deviation	0.131636	
MLE Coefficient of Variation	0.457039	
MLE Skewness	1.466586	
MLE Median	0.261957	
MLE 80% Quantile	0.3785	
MLE 90% Quantile	0.458452	
MLE 95% Quantile	0.536277	
MLE 99% Quantile	0.721445	
MVU Estimate of Median	0.261587	
MVU Estimate of Mean	0.287576	
MVU Estimate of Standard Deviation	0.13065	
MVU Estimate of SE of Mean	0.015922	
95% H-UCL	0.317485	
95% Chebyshev (MVUE) UCL	0.356978	
97.5% Chebyshev (MVUE) UCL	0.387008	
99% Chebyshev (MVUE) UCL	0.445997	
Non-parametric Statisitics		
95% CLT UCL	0.450944	
95% Adjusted-CLT UCL	0.523697	
95% Modified-t UCL	0.463987	
95% Jackknife UCL	0.452639	
95% Chebyshev (Mean, Sd) UCL	0.647304	
97.5% Chebyshev (Mean, Sd) UCL	0.783762	
99% Chebyshev (Mean, Sd) UCL	1.051807	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.452205	
95% Bootstrap-t UCL	2.793489	
95% Hall's Bootstrap UCL	3.817593	
95% Percentile Bootstrap UCL	0.471642	
95% BCA Bootstrap UCL	0.561642	
Recommendations		
Human Inspection Recommended?	YES	Users must select one of the recommended UCLS
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.452639	95% Student's-t UCL
2nd Recommended UCL	0.463987	95% Modified-t UCL
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Car Wash-Study Area-121404.xls	
Variable:	1,2-Dichlorobenzene	
Raw Statistics		
Number of Observations	149	
Number of Missing Data	0	
Number of Valid Observations	149	
Number of Distinct Observations	14	
Minimum	0.25	
Maximum	11	
Mean	0.678322	
Standard Deviation	1.331968	
Variance	1.774138	
Coefficient of Variation	1.963621	
Skewness	6.047056	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.425734	
Lilliefors 5% Critical Value	0.072584	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.858938	
Gamma Statistics		
k hat	1.257162	
k star (bias corrected)	1.236324	
Theta hat	0.539566	
Theta star	0.548661	
nu hat	374.6342	
nu star	368.4245	
5% Approximate Chi Square Value	324.9317	
Adjusted Level of Significance	0.048389	
Adjusted Chi Square Value	324.5369	
Anderson-Darling Test Statistic	21.85811	
Anderson-Darling 5% Critical Value	0.776808	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.379849	
Kolmogrov-Smirnov 5% Critical Value	0.078648	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.769117	
95% Adjusted Gamma UCL	0.770053	
Lognormal Statistics		
Minimum of log data	-1.386294	
Maximum of log data	2.397895	
Mean of log data	-0.835902	
Standard Deviation of log data	0.705789	
Variance of log data	0.498138	
Lilliefors Test Statisitic	0.292339	
Lilliefors 5% Critical Value	0.072584	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.556086	
MLE Standard Deviation	0.44683	
MLE Coefficient of Variation	0.803526	
MLE Skewness	2.92938	
MLE Median	0.433483	
MLE 80% Quantile	0.787013	
MLE 90% Quantile	1.073621	
MLE 95% Quantile	1.384198	
MLE 99% Quantile	2.238405	
MVU Estimate of Median	0.432759	
MVU Estimate of Mean	0.554931	
MVU Estimate of Standard Deviation	0.442247	
MVU Estimate of SE of Mean	0.035613	
95% H-UCL	0.622297	
95% Chebyshev (MVUE) UCL	0.710167	
97.5% Chebyshev (MVUE) UCL	0.777337	
99% Chebyshev (MVUE) UCL	0.909281	
Non-parametric Statisitics		
95% CLT UCL	0.857807	
95% Adjusted-CLT UCL	0.915568	
95% Modified-t UCL	0.867947	
95% Jackknife UCL	0.858938	
95% Chebyshev (Mean, Sd) UCL	1.153961	
97.5% Chebyshev (Mean, Sd) UCL	1.35977	
99% Chebyshev (Mean, Sd) UCL	1.764043	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.85799	
95% Bootstrap-t UCL	1.003487	
95% Hall's Bootstrap UCL	1.079098	
95% Percentile Bootstrap UCL	0.872148	
95% BCA Bootstrap UCL	0.917785	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	1.153961	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Car Wash-Study Area-121404.xls	
Variable:	1,2-Dichloroethane	
Raw Statistics		
Number of Observations	153	
Number of Missing Data	0	
Number of Valid Observations	153	
Number of Distinct Observations	9	
Minimum	0.17	
Maximum	48	
Mean	0.767451	
Standard Deviation	3.86999	
Variance	14.97682	
Coefficient of Variation	5.042655	
Skewness	12.12716	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.481797	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1.285232	
Gamma Statistics		
k hat	0.905441	
k star (bias corrected)	0.892045	
Theta hat	0.847599	
Theta star	0.860328	
nu hat	277.065	
nu star	272.9657	
5% Approximate Chi Square Value	235.696	
Adjusted Level of Significance	0.048431	
Adjusted Chi Square Value	235.3698	
Anderson-Darling Test Statistic	1.8E+308	
Anderson-Darling 5% Critical Value	0.788082	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.460808	
Kolmogrov-Smirnov 5% Critical Value	0.078302	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.888805	
95% Adjusted Gamma UCL	0.890037	
Lognormal Statistics		
Minimum of log data	-1.771957	
Maximum of log data	3.871201	
Mean of log data	-0.909861	
Standard Deviation of log data	0.613374	
Variance of log data	0.376228	
Lilliefors Test Statisitic	0.316175	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.485903	
MLE Standard Deviation	0.328399	
MLE Coefficient of Variation	0.675854	
MLE Skewness	2.336278	
MLE Median	0.40258	
MLE 80% Quantile	0.676002	
MLE 90% Quantile	0.885436	
MLE 95% Quantile	1.10422	
MLE 99% Quantile	1.676733	
MVU Estimate of Median	0.402086	
MVU Estimate of Mean	0.485196	
MVU Estimate of Standard Deviation	0.32604	
MVU Estimate of SE of Mean	0.026094	
95% H-UCL	0.533468	
95% Chebyshev (MVUE) UCL	0.598937	
97.5% Chebyshev (MVUE) UCL	0.648152	
99% Chebyshev (MVUE) UCL	0.744827	
Non-parametric Statisitics		
95% CLT UCL	1.282077	
95% Adjusted-CLT UCL	1.609838	
95% Modified-t UCL	1.336356	
95% Jackknife UCL	1.285232	
95% Chebyshev (Mean, Sd) UCL	2.13122	
97.5% Chebyshev (Mean, Sd) UCL	2.721325	
99% Chebyshev (Mean, Sd) UCL	3.88047	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1.279868	
95% Bootstrap-t UCL	6.779884	
95% Hall's Bootstrap UCL	3.411576	
95% Percentile Bootstrap UCL	1.388366	
95% BCA Bootstrap UCL	1.959739	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	2.13122	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Car Wash-Study Area-121404.xls	
Variable:	1,4-Dichlorobenzene	
Raw Statistics		
Number of Observations	149	
Number of Missing Data	0	
Number of Valid Observations	149	
Number of Distinct Observations	13	
Minimum	0.125	
Maximum	6	
Mean	0.56557	
Standard Deviation	0.796316	
Variance	0.634118	
Coefficient of Variation	1.407986	
Skewness	4.763891	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.445564	
Lilliefors 5% Critical Value	0.072584	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.673551	
Gamma Statistics		
k hat	1.720395	
k star (bias corrected)	1.69023	
Theta hat	0.328745	
Theta star	0.334612	
nu hat	512.6776	
nu star	503.6886	
5% Approximate Chi Square Value	452.6332	
Adjusted Level of Significance	0.048389	
Adjusted Chi Square Value	452.1656	
Anderson-Darling Test Statistic	19.57122	
Anderson-Darling 5% Critical Value	0.768415	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.372676	
Kolmogrov-Smirnov 5% Critical Value	0.078054	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.629365	
95% Adjusted Gamma UCL	0.630016	
Lognormal Statistics		
Minimum of log data	-2.079442	
Maximum of log data	1.791759	
Mean of log data	-0.887873	
Standard Deviation of log data	0.634923	
Variance of log data	0.403127	
Lilliefors Test Statisitic	0.292291	
Lilliefors 5% Critical Value	0.072584	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.503431	
MLE Standard Deviation	0.35473	
MLE Coefficient of Variation	0.704626	
MLE Skewness	2.463721	
MLE Median	0.41153	
MLE 80% Quantile	0.703728	
MLE 90% Quantile	0.930534	
MLE 95% Quantile	1.169499	
MLE 99% Quantile	1.802109	
MVU Estimate of Median	0.410974	
MVU Estimate of Mean	0.502616	
MVU Estimate of Standard Deviation	0.351896	
MVU Estimate of SE of Mean	0.028499	
95% H-UCL	0.555684	
95% Chebyshev (MVUE) UCL	0.62684	
97.5% Chebyshev (MVUE) UCL	0.680592	
99% Chebyshev (MVUE) UCL	0.786177	
Non-parametric Statisitics		
95% CLT UCL	0.672875	
95% Adjusted-CLT UCL	0.70008	
95% Modified-t UCL	0.677795	
95% Jackknife UCL	0.673551	
95% Chebyshev (Mean, Sd) UCL	0.849931	
97.5% Chebyshev (Mean, Sd) UCL	0.972974	
99% Chebyshev (Mean, Sd) UCL	1.214668	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.673458	
95% Bootstrap-t UCL	0.730418	
95% Hall's Bootstrap UCL	0.697003	
95% Percentile Bootstrap UCL	0.679832	
95% BCA Bootstrap UCL	0.713356	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.849931	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Car Wash-Study Area-121404.xls	
Variable:	4-Methyl-2-Pentanone	
Raw Statistics		
Number of Observations	153	
Number of Missing Data	0	
Number of Valid Observations	153	
Number of Distinct Observations	12	
Minimum	1	
Maximum	120	
Mean	4.594771	
Standard Deviation	14.27661	
Variance	203.8216	
Coefficient of Variation	3.107142	
Skewness	6.098603	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.486431	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	6.504895	
Gamma Statistics		
k hat	0.812233	
k star (bias corrected)	0.800664	
Theta hat	5.656961	
Theta star	5.738698	
nu hat	248.5434	
nu star	245.0033	
5% Approximate Chi Square Value	209.7575	
Adjusted Level of Significance	0.048431	
Adjusted Chi Square Value	209.4502	
Anderson-Darling Test Statistic	38.57565	
Anderson-Darling 5% Critical Value	0.792623	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.472118	
Kolmogrov-Smirnov 5% Critical Value	0.078584	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	5.366836	
95% Adjusted Gamma UCL	5.374709	
Lognormal Statistics		
Minimum of log data	0	
Maximum of log data	4.787492	
Mean of log data	0.795681	
Standard Deviation of log data	0.730343	
Variance of log data	0.533401	
Lilliefors Test Statisitic	0.362521	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	2.893254	
MLE Standard Deviation	2.42882	
MLE Coefficient of Variation	0.839477	
MLE Skewness	3.110027	
MLE Median	2.21595	
MLE 80% Quantile	4.107528	
MLE 90% Quantile	5.664239	
MLE 95% Quantile	7.36763	
MLE 99% Quantile	12.11519	
MVU Estimate of Median	2.212091	
MVU Estimate of Mean	2.886905	
MVU Estimate of Standard Deviation	2.402461	
MVU Estimate of SE of Mean	0.190464	
95% H-UCL	3.248371	
95% Chebyshev (MVUE) UCL	3.717117	
97.5% Chebyshev (MVUE) UCL	4.07635	
99% Chebyshev (MVUE) UCL	4.781994	
Non-parametric Statisitics		
95% CLT UCL	6.493254	
95% Adjusted-CLT UCL	7.101311	
95% Modified-t UCL	6.59974	
95% Jackknife UCL	6.504895	
95% Chebyshev (Mean, Sd) UCL	9.625792	
97.5% Chebyshev (Mean, Sd) UCL	11.80272	
99% Chebyshev (Mean, Sd) UCL	16.07887	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	6.483474	
95% Bootstrap-t UCL	8.148924	
95% Hall's Bootstrap UCL	6.654691	
95% Percentile Bootstrap UCL	6.686275	
95% BCA Bootstrap UCL	7.372549	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	9.625792	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Car Wash-Study Area-121404.xls		
Variable:	Acetone		
Raw Statistics			
Number of Observations	153		
Number of Missing Data	0		
Number of Valid Observations	153		
Number of Distinct Observations	24		
Minimum	1.65		
Maximum	16000		
Mean	147.3794		
Standard Deviation	1324.728		
Variance	1754904		
Coefficient of Variation	8.988556		
Skewness	11.52276		
Too Few Distinct Observations?	NO		
Normal Statistics			
Lilliefors Test Statisitic	0.483548		
Lilliefors 5% Critical Value	0.071629		
Shapiro-Wilk Test Statisitic	N/A		
Shapiro-Wilk 5% Critical Value	N/A		
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level	
95% Student's-t UCL	324.62		
Gamma Statistics			
k hat	0.205352		
k star (bias corrected)	0.205683		
Theta hat	717.6906		
Theta star	716.5364		
nu hat	62.8378		
nu star	62.93902		
5% Approximate Chi Square Value	45.68616		
Adjusted Level of Significance	0.048431		
Adjusted Chi Square Value	45.54696		
Anderson-Darling Test Statistic	51.85276		
Anderson-Darling 5% Critical Value	0.910915		
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level	
Kolmogrov-Smirnov Test Statistic	0.495727		
Kolmogrov-Smirnov 5% Critical Value	0.083843		
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level	
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level	
95% Approximate Gamma UCL	203.0356		
95% Adjusted Gamma UCL	203.6561		
Lognormal Statistics			
Minimum of log data	0.500775		
Maximum of log data	9.680344		
Mean of log data	1.424081		
Standard Deviation of log data	1.30981		
Variance of log data	1.715601		
Lilliefors Test Statisitic	0.447794		
Lilliefors 5% Critical Value	0.071629		
Shapiro-Wilk Test Statisitic	N/A		
Shapiro-Wilk 5% Critical Value	N/A		
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level	
MLE Mean	9.795092		
MLE Standard Deviation	20.91664		
MLE Coefficient of Variation	2.13542		
MLE Skewness	16.14382		
MLE Median	4.154037		
MLE 80% Quantile	12.56443		
MLE 90% Quantile	22.35805		
MLE 95% Quantile	35.82757		
MLE 99% Quantile	87.41773		
MVU Estimate of Median	4.130812		
MVU Estimate of Mean	9.695157		
MVU Estimate of Standard Deviation	19.83808		
MVU Estimate of SE of Mean	1.364745		
95% H-UCL	12.70984		
95% Chebyshev (MVUE) UCL	15.64394		
97.5% Chebyshev (MVUE) UCL	18.21799		
99% Chebyshev (MVUE) UCL	23.2742		
Non-parametric Statisitics			
95% CLT UCL	323.5398		
95% Adjusted-CLT UCL	430.1435		
95% Modified-t UCL	341.248		
95% Jackknife UCL	324.62		
95% Chebyshev (Mean, Sd) UCL	614.2084		
97.5% Chebyshev (Mean, Sd) UCL	816.2057		
99% Chebyshev (Mean, Sd) UCL	1212.99		
Bootstrap Statistics			
Number of Bootstrap Runs	2000		
95% Standard Bootstrap UCL	324.0406		
95% Bootstrap-t UCL	1378.176		
95% Hall's Bootstrap UCL	1700.232		
95% Percentile Bootstrap UCL	354.701		
95% BCA Bootstrap UCL	547.1157		
Recommendations			
Human Inspection Recommended?	NO		
Appropriate Distribution	NON-PARAMETRIC		
1st Recommended UCL	816.2057	97.5% Chebyshev (Mean, Sd) UCL	
2nd Recommended UCL			
3rd Recommended UCL			
Recommended UCL > Max Data Value			
Recommendation Warning!	NONE		
Alternative UCL	NONE		

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-all-B+T-011705.xls								
Variable:			Benzene								
Raw Statistics											
Number of Observations			445								
Number of Missing Data			0								
Number of Valid Observations			445								
Number of Distinct Observations			88								
Minimum			0.1								
Maximum			69000								
Mean			583.663								
Standard Deviation			3826.824								
Variance			14644579								
Coefficient of Variation			6.556564								
Skewness			13.90764								
Too Few Distinct Observations?			NO								
Normal Statistics											
Lilliefors Test Statisitic			0.439399								
Lilliefors 5% Critical Value			0.042								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level						
95% Student's-t UCL			882.6778								
Gamma Statistics											
k hat			0.137123								
k star (bias corrected)			0.137697								
Theta hat			4256.484								
Theta star			4238.749								
nu hat			122.0397								
nu star			122.5503								
5% Approximate Chi Square Value			97.98027								
Adjusted Level of Significance			0.049461								
Adjusted Chi Square Value			97.90951								
Anderson-Darling Test Statistic			101.258								
Anderson-Darling 5% Critical Value			1.150786								
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level						
Kolmogrov-Smirnov Test Statistic			0.400019								
Kolmogrov-Smirnov 5% Critical Value			0.051492								
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level						
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level						
95% Approximate Gamma UCL			730.0253								
95% Adjusted Gamma UCL			730.553								
Lognormal Statistics											
Minimum of log data			-2.302585								
Maximum of log data			11.14186								
Mean of log data			0.691699								
Standard Deviation of log data			2.906458								
Variance of log data			8.447495								
Lilliefors Test Statisitic			0.390996								
Lilliefors 5% Critical Value			0.042								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level						
MLE Mean			136.3803								
MLE Standard Deviation			9312.265								
MLE Coefficient of Variation			68.28161								
MLE Skewness			318559.6								
MLE Median			1.997106								
MLE 80% Quantile			23.28143								
MLE 90% Quantile			83.63795								
MLE 95% Quantile			238.1313								
MLE 99% Quantile			1723.512								
MVU Estimate of Median			1.97824								
MVU Estimate of Mean			129.9436								
MVU Estimate of Standard Deviation			6833.055								
MVU Estimate of SE of Mean			38.60726								
95% H-UCL			239.5228								
95% Chebyshev (MVUE) UCL			298.2287								
97.5% Chebyshev (MVUE) UCL			371.0458								
99% Chebyshev (MVUE) UCL			514.0809								
Non-parametric Statisitics											
95% CLT UCL			882.054								
95% Adjusted-CLT UCL			1009.848								
95% Modified-t UCL			902.6112								
95% Jackknife UCL			882.6778								
95% Chebyshev (Mean, Sd) UCL			1374.406								
97.5% Chebyshev (Mean, Sd) UCL			1716.561								
99% Chebyshev (Mean, Sd) UCL			2388.658								
Bootstrap Statistics											
Number of Bootstrap Runs			2000								
95% Standard Bootstrap UCL			881.9074								
95% Bootstrap-t UCL			1214.121								
95% Hall's Bootstrap UCL			2037.399								
95% Percentile Bootstrap UCL			911.3593								
95% BCA Bootstrap UCL			1062.223								
Recommendations											
Human Inspection Recommended?			NO								
Appropriate Distribution			NON-PARAMETRIC								
1st Recommended UCL			2388.658		99% Chebyshev (Mean, Sd) UCL						
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!			NONE								
Alternative UCL			NONE								

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Car Wash-Study Area-121404.xls	
Variable:	Chlorobenzene	
Raw Statistics		
Number of Observations	153	
Number of Missing Data	0	
Number of Valid Observations	153	
Number of Distinct Observations	16	
Minimum	0.25	
Maximum	35	
Mean	1.366013	
Standard Deviation	4.081713	
Variance	16.66038	
Coefficient of Variation	2.988048	
Skewness	5.539777	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.453293	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1.912122	
Gamma Statistics		
k hat	0.606426	
k star (bias corrected)	0.598893	
Theta hat	2.252562	
Theta star	2.280896	
nu hat	185.5665	
nu star	183.2613	
5% Approximate Chi Square Value	152.9422	
Adjusted Level of Significance	0.048431	
Adjusted Chi Square Value	152.681	
Anderson-Darling Test Statistic	31.61488	
Anderson-Darling 5% Critical Value	0.80949	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.455589	
Kolmogrov-Smirnov 5% Critical Value	0.079562	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	1.63681	
95% Adjusted Gamma UCL	1.63961	
Lognormal Statistics		
Minimum of log data	-1.386294	
Maximum of log data	3.555348	
Mean of log data	-0.705387	
Standard Deviation of log data	0.990679	
Variance of log data	0.981445	
Lilliefors Test Statisitic	0.364352	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.806812	
MLE Standard Deviation	1.042103	
MLE Coefficient of Variation	1.291631	
MLE Skewness	6.029731	
MLE Median	0.493918	
MLE 80% Quantile	1.140808	
MLE 90% Quantile	1.764092	
MLE 95% Quantile	2.520054	
MLE 99% Quantile	4.94775	
MVU Estimate of Median	0.492336	
MVU Estimate of Mean	0.802999	
MVU Estimate of Standard Deviation	1.01758	
MVU Estimate of SE of Mean	0.077453	
95% H-UCL	0.959513	
95% Chebyshev (MVUE) UCL	1.140611	
97.5% Chebyshev (MVUE) UCL	1.286695	
99% Chebyshev (MVUE) UCL	1.573651	
Non-parametric Statisitics		
95% CLT UCL	1.908793	
95% Adjusted-CLT UCL	2.066708	
95% Modified-t UCL	1.936753	
95% Jackknife UCL	1.912122	
95% Chebyshev (Mean, Sd) UCL	2.804393	
97.5% Chebyshev (Mean, Sd) UCL	3.426781	
99% Chebyshev (Mean, Sd) UCL	4.649342	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1.922257	
95% Bootstrap-t UCL	2.23416	
95% Hall's Bootstrap UCL	2.13316	
95% Percentile Bootstrap UCL	1.939542	
95% BCA Bootstrap UCL	2.138889	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	2.804393	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Car Wash-Study Area-121404.xls	
Variable:	Chloroethane	
Raw Statistics		
Number of Observations	153	
Number of Missing Data	0	
Number of Valid Observations	153	
Number of Distinct Observations	7	
Minimum	0.25	
Maximum	37	
Mean	1.027778	
Standard Deviation	3.019067	
Variance	9.114766	
Coefficient of Variation	2.937471	
Skewness	11.31601	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.451383	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1.431711	
Gamma Statistics		
k hat	1.071996	
k star (bias corrected)	1.055334	
Theta hat	0.958751	
Theta star	0.973888	
nu hat	328.0309	
nu star	322.9323	
5% Approximate Chi Square Value	282.2894	
Adjusted Level of Significance	0.048431	
Adjusted Chi Square Value	281.9317	
Anderson-Darling Test Statistic	1.8E+308	
Anderson-Darling 5% Critical Value	0.781623	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.330456	
Kolmogrov-Smirnov 5% Critical Value	0.077896	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	1.175753	
95% Adjusted Gamma UCL	1.177245	
Lognormal Statistics		
Minimum of log data	-1.386294	
Maximum of log data	3.610918	
Mean of log data	-0.506763	
Standard Deviation of log data	0.83793	
Variance of log data	0.702127	
Lilliefors Test Statisitic	0.309037	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.855816	
MLE Standard Deviation	0.863501	
MLE Coefficient of Variation	1.00898	
MLE Skewness	4.054121	
MLE Median	0.602443	
MLE 80% Quantile	1.222977	
MLE 90% Quantile	1.768227	
MLE 95% Quantile	2.390809	
MLE 99% Quantile	4.230255	
MVU Estimate of Median	0.601062	
MVU Estimate of Mean	0.853185	
MVU Estimate of Standard Deviation	0.850344	
MVU Estimate of SE of Mean	0.066536	
95% H-UCL	0.982646	
95% Chebyshev (MVUE) UCL	1.14321	
97.5% Chebyshev (MVUE) UCL	1.268704	
99% Chebyshev (MVUE) UCL	1.515213	
Non-parametric Statisitics		
95% CLT UCL	1.429249	
95% Adjusted-CLT UCL	1.66784	
95% Modified-t UCL	1.468926	
95% Jackknife UCL	1.431711	
95% Chebyshev (Mean, Sd) UCL	2.091685	
97.5% Chebyshev (Mean, Sd) UCL	2.552039	
99% Chebyshev (Mean, Sd) UCL	3.456314	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1.427047	
95% Bootstrap-t UCL	2.655704	
95% Hall's Bootstrap UCL	2.870492	
95% Percentile Bootstrap UCL	1.49183	
95% BCA Bootstrap UCL	1.843137	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	2.091685	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Car Wash-Study Area-121404.xls	
Variable:	Chloroform	
Raw Statistics		
Number of Observations	153	
Number of Missing Data	0	
Number of Valid Observations	153	
Number of Distinct Observations	10	
Minimum	0.25	
Maximum	5	
Mean	0.523725	
Standard Deviation	0.627803	
Variance	0.394137	
Coefficient of Variation	1.198725	
Skewness	5.132483	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.449714	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.607722	
Gamma Statistics		
k hat	2.245556	
k star (bias corrected)	2.205882	
Theta hat	0.233228	
Theta star	0.237422	
nu hat	687.14	
nu star	675	
5% Approximate Chi Square Value	615.7101	
Adjusted Level of Significance	0.048431	
Adjusted Chi Square Value	615.1778	
Anderson-Darling Test Statistic	20.02665	
Anderson-Darling 5% Critical Value	0.764227	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.372594	
Kolmogrov-Smirnov 5% Critical Value	0.076655	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.574158	
95% Adjusted Gamma UCL	0.574655	
Lognormal Statistics		
Minimum of log data	-1.386294	
Maximum of log data	1.609438	
Mean of log data	-0.885674	
Standard Deviation of log data	0.56342	
Variance of log data	0.317442	
Lilliefors Test Statisitic	0.300925	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.483379	
MLE Standard Deviation	0.295459	
MLE Coefficient of Variation	0.611236	
MLE Skewness	2.06207	
MLE Median	0.412436	
MLE 80% Quantile	0.663926	
MLE 90% Quantile	0.850713	
MLE 95% Quantile	1.042009	
MLE 99% Quantile	1.529345	
MVU Estimate of Median	0.412008	
MVU Estimate of Mean	0.482801	
MVU Estimate of Standard Deviation	0.293711	
MVU Estimate of SE of Mean	0.023573	
95% H-UCL	0.525963	
95% Chebyshev (MVUE) UCL	0.585551	
97.5% Chebyshev (MVUE) UCL	0.630011	
99% Chebyshev (MVUE) UCL	0.717345	
Non-parametric Statisitics		
95% CLT UCL	0.60721	
95% Adjusted-CLT UCL	0.629713	
95% Modified-t UCL	0.611232	
95% Jackknife UCL	0.607722	
95% Chebyshev (Mean, Sd) UCL	0.744961	
97.5% Chebyshev (Mean, Sd) UCL	0.84069	
99% Chebyshev (Mean, Sd) UCL	1.02873	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.605088	
95% Bootstrap-t UCL	0.652451	
95% Hall's Bootstrap UCL	0.632441	
95% Percentile Bootstrap UCL	0.61732	
95% BCA Bootstrap UCL	0.631046	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.744961	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Car Wash-Study Area-121404.xls	
Variable:	cis-1,2-Dichloroethene	
Raw Statistics		
Number of Observations	153	
Number of Missing Data	0	
Number of Valid Observations	153	
Number of Distinct Observations	25	
Minimum	0.2	
Maximum	50	
Mean	1.100719	
Standard Deviation	4.387738	
Variance	19.25224	
Coefficient of Variation	3.986247	
Skewness	9.818157	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.418676	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1.687772	
Gamma Statistics		
k hat	0.744618	
k star (bias corrected)	0.734375	
Theta hat	1.478233	
Theta star	1.498851	
nu hat	227.8532	
nu star	224.7188	
5% Approximate Chi Square Value	191.0147	
Adjusted Level of Significance	0.048431	
Adjusted Chi Square Value	190.7219	
Anderson-Darling Test Statistic	28.04752	
Anderson-Darling 5% Critical Value	0.796174	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.428236	
Kolmogrov-Smirnov 5% Critical Value	0.078803	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	1.294938	
95% Adjusted Gamma UCL	1.296927	
Lognormal Statistics		
Minimum of log data	-1.609438	
Maximum of log data	3.912023	
Mean of log data	-0.708771	
Standard Deviation of log data	0.817202	
Variance of log data	0.667819	
Lilliefors Test Statisitic	0.342047	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.687385	
MLE Standard Deviation	0.669973	
MLE Coefficient of Variation	0.974669	
MLE Skewness	3.849924	
MLE Median	0.492249	
MLE 80% Quantile	0.98193	
MLE 90% Quantile	1.406823	
MLE 95% Quantile	1.888016	
MLE 99% Quantile	3.293798	
MVU Estimate of Median	0.491176	
MVU Estimate of Mean	0.685399	
MVU Estimate of Standard Deviation	0.660387	
MVU Estimate of SE of Mean	0.051823	
95% H-UCL	0.785743	
95% Chebyshev (MVUE) UCL	0.911289	
97.5% Chebyshev (MVUE) UCL	1.009032	
99% Chebyshev (MVUE) UCL	1.201029	
Non-parametric Statisitics		
95% CLT UCL	1.684194	
95% Adjusted-CLT UCL	1.985051	
95% Modified-t UCL	1.734699	
95% Jackknife UCL	1.687772	
95% Chebyshev (Mean, Sd) UCL	2.646941	
97.5% Chebyshev (Mean, Sd) UCL	3.315992	
99% Chebyshev (Mean, Sd) UCL	4.630214	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1.707031	
95% Bootstrap-t UCL	3.645836	
95% Hall's Bootstrap UCL	3.690413	
95% Percentile Bootstrap UCL	1.789935	
95% BCA Bootstrap UCL	2.213987	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	2.646941	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Car Wash-Study Area-121404.xls	
Variable:	Methyl tert-Butyl Ether	
Raw Statistics		
Number of Observations	70	
Number of Missing Data	0	
Number of Valid Observations	70	
Number of Distinct Observations	32	
Minimum	0.1	
Maximum	4000	
Mean	57.747	
Standard Deviation	478.0186	
Variance	228501.8	
Coefficient of Variation	8.277809	
Skewness	8.366577	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.531305	
Lilliefors 5% Critical Value	0.105897	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	153.0032	
Gamma Statistics		
k hat	0.158702	
k star (bias corrected)	0.161425	
Theta hat	363.8697	
Theta star	357.7334	
nu hat	22.21834	
nu star	22.59946	
5% Approximate Chi Square Value	12.78705	
Adjusted Level of Significance	0.046571	
Adjusted Chi Square Value	12.6315	
Anderson-Darling Test Statistic	23.57688	
Anderson-Darling 5% Critical Value	0.943512	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.484275	
Kolmogrov-Smirnov 5% Critical Value	0.119466	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	102.0603	
95% Adjusted Gamma UCL	103.3172	
Lognormal Statistics		
Minimum of log data	-2.302585	
Maximum of log data	8.29405	
Mean of log data	-0.746985	
Standard Deviation of log data	1.365064	
Variance of log data	1.863399	
Lilliefors Test Statisitic	0.265942	
Lilliefors 5% Critical Value	0.105897	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	1.202875	
MLE Standard Deviation	2.807008	
MLE Coefficient of Variation	2.333582	
MLE Skewness	19.70852	
MLE Median	0.473793	
MLE 80% Quantile	1.501544	
MLE 90% Quantile	2.73771	
MLE 95% Quantile	4.475173	
MLE 99% Quantile	11.33792	
MVU Estimate of Median	0.467527	
MVU Estimate of Mean	1.173401	
MVU Estimate of Standard Deviation	2.481559	
MVU Estimate of SE of Mean	0.251357	
95% H-UCL	1.855318	
95% Chebyshev (MVUE) UCL	2.269041	
97.5% Chebyshev (MVUE) UCL	2.743125	
99% Chebyshev (MVUE) UCL	3.674372	
Non-parametric Statisitics		
95% CLT UCL	151.7243	
95% Adjusted-CLT UCL	212.7728	
95% Modified-t UCL	162.5256	
95% Jackknife UCL	153.0032	
95% Chebyshev (Mean, Sd) UCL	306.789	
97.5% Chebyshev (Mean, Sd) UCL	414.5497	
99% Chebyshev (Mean, Sd) UCL	626.2247	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	152.2932	
95% Bootstrap-t UCL	50029.15	
95% Hall's Bootstrap UCL	20714.72	
95% Percentile Bootstrap UCL	172.0094	
95% BCA Bootstrap UCL	229.2219	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	414.5497	97.5% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Car Wash-Study Area-121404.xls	
Variable:	Tetrachloroethene	
Raw Statistics		
Number of Observations	153	
Number of Missing Data	0	
Number of Valid Observations	153	
Number of Distinct Observations	14	
Minimum	0.21	
Maximum	5	
Mean	0.489542	
Standard Deviation	0.498494	
Variance	0.248496	
Coefficient of Variation	1.018286	
Skewness	6.107266	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.419736	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.556238	
Gamma Statistics		
k hat	2.825271	
k star (bias corrected)	2.774231	
Theta hat	0.173273	
Theta star	0.176461	
nu hat	864.5328	
nu star	848.9145	
5% Approximate Chi Square Value	782.2808	
Adjusted Level of Significance	0.048431	
Adjusted Chi Square Value	781.6798	
Anderson-Darling Test Statistic	16.94242	
Anderson-Darling 5% Critical Value	0.760606	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.3352	
Kolmogrov-Smirnov 5% Critical Value	0.07637	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.531241	
95% Adjusted Gamma UCL	0.53165	
Lognormal Statistics		
Minimum of log data	-1.560648	
Maximum of log data	1.609438	
Mean of log data	-0.901574	
Standard Deviation of log data	0.519611	
Variance of log data	0.269995	
Lilliefors Test Statisitic	0.27227	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.464601	
MLE Standard Deviation	0.258661	
MLE Coefficient of Variation	0.556739	
MLE Skewness	1.842783	
MLE Median	0.40593	
MLE 80% Quantile	0.629705	
MLE 90% Quantile	0.791461	
MLE 95% Quantile	0.954264	
MLE 99% Quantile	1.359396	
MVU Estimate of Median	0.405572	
MVU Estimate of Mean	0.464137	
MVU Estimate of Standard Deviation	0.257386	
MVU Estimate of SE of Mean	0.020698	
95% H-UCL	0.501703	
95% Chebyshev (MVUE) UCL	0.554356	
97.5% Chebyshev (MVUE) UCL	0.593394	
99% Chebyshev (MVUE) UCL	0.670076	
Non-parametric Statisitics		
95% CLT UCL	0.555832	
95% Adjusted-CLT UCL	0.577093	
95% Modified-t UCL	0.559554	
95% Jackknife UCL	0.556238	
95% Chebyshev (Mean, Sd) UCL	0.66521	
97.5% Chebyshev (Mean, Sd) UCL	0.741221	
99% Chebyshev (Mean, Sd) UCL	0.890531	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.554913	
95% Bootstrap-t UCL	0.604111	
95% Hall's Bootstrap UCL	0.657245	
95% Percentile Bootstrap UCL	0.561176	
95% BCA Bootstrap UCL	0.584771	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.66521	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-all-B+T-011705.xls								
Variable:			Toluene								
Raw Statistics											
Number of Observations			445								
Number of Missing Data			0								
Number of Valid Observations			445								
Number of Distinct Observations			71								
Minimum			0.1								
Maximum			3600								
Mean			70.35176								
Standard Deviation			358.2093								
Variance			128313.9								
Coefficient of Variation			5.091689								
Skewness			6.841421								
Too Few Distinct Observations?			NO								
Normal Statistics											
Lilliefors Test Statisitic			0.471514								
Lilliefors 5% Critical Value			0.042								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level						
95% Student's-t UCL			98.341								
Gamma Statistics											
k hat			0.174968								
k star (bias corrected)			0.175286								
Theta hat			402.0841								
Theta star			401.3533								
nu hat			155.7213								
nu star			156.0049								
5% Approximate Chi Square Value			128.1256								
Adjusted Level of Significance			0.049461								
Adjusted Chi Square Value			128.0443								
Anderson-Darling Test Statistic			127.0169								
Anderson-Darling 5% Critical Value			1.010283								
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level						
Kolmogrov-Smirnov Test Statistic			0.477094								
Kolmogrov-Smirnov 5% Critical Value			0.049217								
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level						
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level						
95% Approximate Gamma UCL			85.65983								
95% Adjusted Gamma UCL			85.71423								
Lognormal Statistics											
Minimum of log data			-2.302585								
Maximum of log data			8.188689								
Mean of log data			-0.039913								
Standard Deviation of log data			2.004647								
Variance of log data			4.018611								
Lilliefors Test Statisitic			0.438971								
Lilliefors 5% Critical Value			0.042								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level						
MLE Mean			7.166319								
MLE Standard Deviation			52.96476								
MLE Coefficient of Variation			7.390791								
MLE Skewness			425.8853								
MLE Median			0.960873								
MLE 80% Quantile			5.227921								
MLE 90% Quantile			12.62979								
MLE 95% Quantile			25.99051								
MLE 99% Quantile			101.7884								
MVU Estimate of Median			0.956544								
MVU Estimate of Mean			7.070781								
MVU Estimate of Standard Deviation			48.94712								
MVU Estimate of SE of Mean			1.138679								
95% H-UCL			9.578267								
95% Chebyshev (MVUE) UCL			12.03417								
97.5% Chebyshev (MVUE) UCL			14.18183								
99% Chebyshev (MVUE) UCL			18.40049								
Non-parametric Statisitics											
95% CLT UCL			98.28261								
95% Adjusted-CLT UCL			104.167								
95% Modified-t UCL			99.25886								
95% Jackknife UCL			98.341								
95% Chebyshev (Mean, Sd) UCL			144.3691								
97.5% Chebyshev (Mean, Sd) UCL			176.3965								
99% Chebyshev (Mean, Sd) UCL			239.3081								
Bootstrap Statistics											
Number of Bootstrap Runs			2000								
95% Standard Bootstrap UCL			98.36671								
95% Bootstrap-t UCL			109.6255								
95% Hall's Bootstrap UCL			106.7127								
95% Percentile Bootstrap UCL			99.49788								
95% BCA Bootstrap UCL			106.9825								
Recommendations											
Human Inspection Recommended?			NO								
Appropriate Distribution			NON-PARAMETRIC								
1st Recommended UCL			239.3081		99% Chebyshev (Mean, Sd) UCL						
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!			NONE								
Alternative UCL			NONE								

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Car Wash-Study Area-121404.xls	
Variable:	trans-1,2-Dichloroethene	
Raw Statistics		
Number of Observations	153	
Number of Missing Data	0	
Number of Valid Observations	153	
Number of Distinct Observations	11	
Minimum	0.19	
Maximum	5	
Mean	0.483399	
Standard Deviation	0.497106	
Variance	0.247115	
Coefficient of Variation	1.028357	
Skewness	6.220902	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.434392	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.549909	
Gamma Statistics		
k hat	2.868091	
k star (bias corrected)	2.816212	
Theta hat	0.168544	
Theta star	0.171649	
nu hat	877.6359	
nu star	861.7607	
5% Approximate Chi Square Value	794.6158	
Adjusted Level of Significance	0.048431	
Adjusted Chi Square Value	794.01	
Anderson-Darling Test Statistic	18.28946	
Anderson-Darling 5% Critical Value	0.760339	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.347009	
Kolmogrov-Smirnov 5% Critical Value	0.076349	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.524246	
95% Adjusted Gamma UCL	0.524646	
Lognormal Statistics		
Minimum of log data	-1.660731	
Maximum of log data	1.609438	
Mean of log data	-0.911259	
Standard Deviation of log data	0.511721	
Variance of log data	0.261859	
Lilliefors Test Statisitic	0.282682	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.458255	
MLE Standard Deviation	0.250722	
MLE Coefficient of Variation	0.547123	
MLE Skewness	1.805145	
MLE Median	0.402018	
MLE 80% Quantile	0.619493	
MLE 90% Quantile	0.775927	
MLE 95% Quantile	0.932881	
MLE 99% Quantile	1.321814	
MVU Estimate of Median	0.401674	
MVU Estimate of Mean	0.457813	
MVU Estimate of Standard Deviation	0.249526	
MVU Estimate of SE of Mean	0.020072	
95% H-UCL	0.494186	
95% Chebyshev (MVUE) UCL	0.545304	
97.5% Chebyshev (MVUE) UCL	0.583161	
99% Chebyshev (MVUE) UCL	0.657525	
Non-parametric Statisitics		
95% CLT UCL	0.549503	
95% Adjusted-CLT UCL	0.5711	
95% Modified-t UCL	0.553277	
95% Jackknife UCL	0.549909	
95% Chebyshev (Mean, Sd) UCL	0.658577	
97.5% Chebyshev (Mean, Sd) UCL	0.734377	
99% Chebyshev (Mean, Sd) UCL	0.883271	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.549038	
95% Bootstrap-t UCL	0.591988	
95% Hall's Bootstrap UCL	0.7461	
95% Percentile Bootstrap UCL	0.553137	
95% BCA Bootstrap UCL	0.583791	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.658577	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Car Wash-Study Area-121404.xls	
Variable:	Trichloroethene	
Raw Statistics		
Number of Observations	153	
Number of Missing Data	0	
Number of Valid Observations	153	
Number of Distinct Observations	34	
Minimum	0.15	
Maximum	110	
Mean	3.224412	
Standard Deviation	12.37591	
Variance	153.1631	
Coefficient of Variation	3.838191	
Skewness	6.393106	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.418763	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	4.880234	
Gamma Statistics		
k hat	0.399255	
k star (bias corrected)	0.395784	
Theta hat	8.076069	
Theta star	8.1469	
nu hat	122.1721	
nu star	121.1099	
5% Approximate Chi Square Value	96.69193	
Adjusted Level of Significance	0.048431	
Adjusted Chi Square Value	96.48589	
Anderson-Darling Test Statistic	32.61532	
Anderson-Darling 5% Critical Value	0.844275	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.445759	
Kolmogrov-Smirnov 5% Critical Value	0.081214	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	4.038683	
95% Adjusted Gamma UCL	4.047307	
Lognormal Statistics		
Minimum of log data	-1.89712	
Maximum of log data	4.70048	
Mean of log data	-0.477908	
Standard Deviation of log data	1.264117	
Variance of log data	1.597992	
Lilliefors Test Statisitic	0.378058	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	1.378627	
MLE Standard Deviation	2.737571	
MLE Coefficient of Variation	1.985723	
MLE Skewness	13.78706	
MLE Median	0.620079	
MLE 80% Quantile	1.804478	
MLE 90% Quantile	3.147104	
MLE 95% Quantile	4.960788	
MLE 99% Quantile	11.73327	
MVU Estimate of Median	0.61685	
MVU Estimate of Mean	1.365921	
MVU Estimate of Standard Deviation	2.610355	
MVU Estimate of SE of Mean	0.182946	
95% H-UCL	1.764607	
95% Chebyshev (MVUE) UCL	2.163366	
97.5% Chebyshev (MVUE) UCL	2.508421	
99% Chebyshev (MVUE) UCL	3.186215	
Non-parametric Statisitics		
95% CLT UCL	4.870142	
95% Adjusted-CLT UCL	5.4227	
95% Modified-t UCL	4.966421	
95% Jackknife UCL	4.880234	
95% Chebyshev (Mean, Sd) UCL	7.585633	
97.5% Chebyshev (Mean, Sd) UCL	9.472738	
99% Chebyshev (Mean, Sd) UCL	13.17959	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	4.852664	
95% Bootstrap-t UCL	6.279255	
95% Hall's Bootstrap UCL	6.42237	
95% Percentile Bootstrap UCL	4.965392	
95% BCA Bootstrap UCL	5.41281	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	9.472738	97.5% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Car Wash-Study Area-121404.xls										
Variable:	Vinyl Chloride										
Raw Statistics											
Number of Observations	153										
Number of Missing Data	0										
Number of Valid Observations	153										
Number of Distinct Observations	8										
Minimum	0.25										
Maximum	5										
Mean	0.482745										
Standard Deviation	0.485168										
Variance	0.235388										
Coefficient of Variation	1.00502										
Skewness	6.484292										
Too Few Distinct Observations?	NO										
Normal Statistics											
Lilliefors Test Statisitic	0.420455										
Lilliefors 5% Critical Value	0.071629										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Normality Test Result	NOT NORMAL		Data not normal at 5% significance level								
95% Student's-t UCL	0.547658										
Gamma Statistics											
k hat	2.972997										
k star (bias corrected)	2.91906										
Theta hat	0.162377										
Theta star	0.165377										
nu hat	909.737										
nu star	893.2323										
5% Approximate Chi Square Value	824.8511										
Adjusted Level of Significance	0.048431										
Adjusted Chi Square Value	824.2337										
Anderson-Darling Test Statistic	17.53494										
Anderson-Darling 5% Critical Value	0.759683										
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA		Data not gamma distributed at 5% significance level								
Kolmogrov-Smirnov Test Statistic	0.334005										
Kolmogrov-Smirnov 5% Critical Value	0.076298										
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA		Data not gamma distributed at 5% significance level								
5% Gamma Test Result	NOT GAMMA		Data not gamma distributed at 5% significance level								
95% Approximate Gamma UCL	0.522765										
95% Adjusted Gamma UCL	0.523157										
Lognormal Statistics											
Minimum of log data	-1.386294										
Maximum of log data	1.609438										
Mean of log data	-0.905774										
Standard Deviation of log data	0.506065										
Variance of log data	0.256101										
Lilliefors Test Statisitic	0.271826										
Lilliefors 5% Critical Value	0.071629										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Lognormality Test Result	NOT LOGNORMAL		Data not lognormal at 5% significance level								
MLE Mean	0.459451										
MLE Standard Deviation	0.248224										
MLE Coefficient of Variation	0.540263										
MLE Skewness	1.778482										
MLE Median	0.404229										
MLE 80% Quantile	0.61993										
MLE 90% Quantile	0.774544										
MLE 95% Quantile	0.929324										
MLE 99% Quantile	1.311711										
MVU Estimate of Median	0.403891										
MVU Estimate of Mean	0.459018										
MVU Estimate of Standard Deviation	0.24707										
MVU Estimate of SE of Mean	0.019878										
95% H-UCL	0.495001										
95% Chebyshev (MVUE) UCL	0.545666										
97.5% Chebyshev (MVUE) UCL	0.583159										
99% Chebyshev (MVUE) UCL	0.656806										
Non-parametric Statisitics											
95% CLT UCL	0.547262										
95% Adjusted-CLT UCL	0.569233										
95% Modified-t UCL	0.551085										
95% Jackknife UCL	0.547658										
95% Chebyshev (Mean, Sd) UCL	0.653717										
97.5% Chebyshev (Mean, Sd) UCL	0.727696										
99% Chebyshev (Mean, Sd) UCL	0.873014										
Bootstrap Statistics											
Number of Bootstrap Runs	2000										
95% Standard Bootstrap UCL	0.546982										
95% Bootstrap-t UCL	0.598848										
95% Hall's Bootstrap UCL	0.795407										
95% Percentile Bootstrap UCL	0.553922										
95% BCA Bootstrap UCL	0.572614										
Recommendations											
Human Inspection Recommended?	NO										
Appropriate Distribution	NON-PARAMETRIC										
1st Recommended UCL	0.653717		95% Chebyshev (Mean, Sd) UCL								
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!	NONE										
Alternative UCL	NONE										

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Car Wash-Study Area-121404.xls	
Variable:	Xylene, total	
Raw Statistics		
Number of Observations	153	
Number of Missing Data	0	
Number of Valid Observations	153	
Number of Distinct Observations	24	
Minimum	0.25	
Maximum	120	
Mean	2.910327	
Standard Deviation	11.98963	
Variance	143.7513	
Coefficient of Variation	4.119686	
Skewness	7.581297	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.425686	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	4.514467	
Gamma Statistics		
k hat	0.407966	
k star (bias corrected)	0.404324	
Theta hat	7.133749	
Theta star	7.198008	
nu hat	124.8376	
nu star	123.7231	
5% Approximate Chi Square Value	99.02991	
Adjusted Level of Significance	0.048431	
Adjusted Chi Square Value	98.8213	
Anderson-Darling Test Statistic	34.36214	
Anderson-Darling 5% Critical Value	0.842154	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.469473	
Kolmogrov-Smirnov 5% Critical Value	0.081122	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	3.63602	
95% Adjusted Gamma UCL	3.643696	
Lognormal Statistics		
Minimum of log data	-1.386294	
Maximum of log data	4.787492	
Mean of log data	-0.539596	
Standard Deviation of log data	1.21738	
Variance of log data	1.482013	
Lilliefors Test Statisitic	0.393324	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	1.223127	
MLE Standard Deviation	2.255931	
MLE Coefficient of Variation	1.844396	
MLE Skewness	11.80745	
MLE Median	0.582984	
MLE 80% Quantile	1.630831	
MLE 90% Quantile	2.786362	
MLE 95% Quantile	4.318869	
MLE 99% Quantile	9.894994	
MVU Estimate of Median	0.580167	
MVU Estimate of Mean	1.212994	
MVU Estimate of Standard Deviation	2.161925	
MVU Estimate of SE of Mean	0.154195	
95% H-UCL	1.544466	
95% Chebyshev (MVUE) UCL	1.885113	
97.5% Chebyshev (MVUE) UCL	2.175939	
99% Chebyshev (MVUE) UCL	2.747212	
Non-parametric Statisitics		
95% CLT UCL	4.504691	
95% Adjusted-CLT UCL	5.139493	
95% Modified-t UCL	4.613484	
95% Jackknife UCL	4.514467	
95% Chebyshev (Mean, Sd) UCL	7.135427	
97.5% Chebyshev (Mean, Sd) UCL	8.963631	
99% Chebyshev (Mean, Sd) UCL	12.55478	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	4.491547	
95% Bootstrap-t UCL	6.620967	
95% Hall's Bootstrap UCL	10.82993	
95% Percentile Bootstrap UCL	4.741569	
95% BCA Bootstrap UCL	5.422876	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	8.963631	97.5% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Car Wash-Study Area-121404.xls	
Variable:	2-Chloronaphthalene	
Raw Statistics		
Number of Observations	68	
Number of Missing Data	0	
Number of Valid Observations	68	
Number of Distinct Observations	5	
Minimum	0.45	
Maximum	22	
Mean	0.873529	
Standard Deviation	2.619722	
Variance	6.862946	
Coefficient of Variation	2.999009	
Skewness	8.065428	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.483161	
Lilliefors 5% Critical Value	0.107443	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1.403406	
Gamma Statistics		
k hat	1.214811	
k star (bias corrected)	1.17102	
Theta hat	0.719066	
Theta star	0.745956	
nu hat	165.2143	
nu star	159.2588	
5% Approximate Chi Square Value	131.0775	
Adjusted Level of Significance	0.046471	
Adjusted Chi Square Value	130.5264	
Anderson-Darling Test Statistic	20.84054	
Anderson-Darling 5% Critical Value	0.775345	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.523586	
Kolmogrov-Smirnov 5% Critical Value	0.110737	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	1.061335	
95% Adjusted Gamma UCL	1.065817	
Lognormal Statistics		
Minimum of log data	-0.798508	
Maximum of log data	3.091042	
Mean of log data	-0.600231	
Standard Deviation of log data	0.549398	
Variance of log data	0.301838	
Lilliefors Test Statisitic	0.493621	
Lilliefors 5% Critical Value	0.107443	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.638067	
MLE Standard Deviation	0.378746	
MLE Coefficient of Variation	0.593584	
MLE Skewness	1.989896	
MLE Median	0.548685	
MLE 80% Quantile	0.872851	
MLE 90% Quantile	1.111538	
MLE 95% Quantile	1.354629	
MLE 99% Quantile	1.969279	
MVU Estimate of Median	0.547468	
MVU Estimate of Mean	0.636449	
MVU Estimate of Standard Deviation	0.374094	
MVU Estimate of SE of Mean	0.04509	
95% H-UCL	0.72415	
95% Chebyshev (MVUE) UCL	0.832992	
97.5% Chebyshev (MVUE) UCL	0.918036	
99% Chebyshev (MVUE) UCL	1.085088	
Non-parametric Statisitics		
95% CLT UCL	1.39608	
95% Adjusted-CLT UCL	1.728092	
95% Modified-t UCL	1.455193	
95% Jackknife UCL	1.403406	
95% Chebyshev (Mean, Sd) UCL	2.258299	
97.5% Chebyshev (Mean, Sd) UCL	2.85749	
99% Chebyshev (Mean, Sd) UCL	4.034485	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1.398806	
95% Bootstrap-t UCL	5.724531	
95% Hall's Bootstrap UCL	5.258337	
95% Percentile Bootstrap UCL	1.4875	
95% BCA Bootstrap UCL	2.097059	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	2.258299	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Car Wash-Study Area-121404.xls	
Variable:	Naphthalene	
Raw Statistics		
Number of Observations	68	
Number of Missing Data	0	
Number of Valid Observations	68	
Number of Distinct Observations	15	
Minimum	0.45	
Maximum	220	
Mean	6.727206	
Standard Deviation	28.56738	
Variance	816.0954	
Coefficient of Variation	4.246545	
Skewness	6.669652	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.413039	
Lilliefors 5% Critical Value	0.107443	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	12.50537	
Gamma Statistics		
k hat	0.334087	
k star (bias corrected)	0.329152	
Theta hat	20.13609	
Theta star	20.438	
nu hat	45.43584	
nu star	44.76465	
5% Approximate Chi Square Value	30.41542	
Adjusted Level of Significance	0.046471	
Adjusted Chi Square Value	30.15923	
Anderson-Darling Test Statistic	17.3659	
Anderson-Darling 5% Critical Value	0.856925	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.485006	
Kolmogrov-Smirnov 5% Critical Value	0.116893	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	9.900932	
95% Adjusted Gamma UCL	9.985038	
Lognormal Statistics		
Minimum of log data	-0.798508	
Maximum of log data	5.393628	
Mean of log data	-0.121926	
Standard Deviation of log data	1.409051	
Variance of log data	1.985424	
Lilliefors Test Statisitic	0.46623	
Lilliefors 5% Critical Value	0.107443	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	2.388787	
MLE Standard Deviation	5.9873	
MLE Coefficient of Variation	2.506419	
MLE Skewness	23.26492	
MLE Median	0.885214	
MLE 80% Quantile	2.911655	
MLE 90% Quantile	5.412461	
MLE 95% Quantile	8.988645	
MLE 99% Quantile	23.46537	
MVU Estimate of Median	0.872382	
MVU Estimate of Mean	2.322877	
MVU Estimate of Standard Deviation	5.210287	
MVU Estimate of SE of Mean	0.526338	
95% H-UCL	3.798165	
95% Chebyshev (MVUE) UCL	4.617131	
97.5% Chebyshev (MVUE) UCL	5.609856	
99% Chebyshev (MVUE) UCL	7.559872	
Non-parametric Statisitics		
95% CLT UCL	12.42548	
95% Adjusted-CLT UCL	15.41943	
95% Modified-t UCL	12.97237	
95% Jackknife UCL	12.50537	
95% Chebyshev (Mean, Sd) UCL	21.82776	
97.5% Chebyshev (Mean, Sd) UCL	28.36178	
99% Chebyshev (Mean, Sd) UCL	41.1966	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	12.36634	
95% Bootstrap-t UCL	28.4572	
95% Hall's Bootstrap UCL	32.40711	
95% Percentile Bootstrap UCL	12.81691	
95% BCA Bootstrap UCL	17.65662	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	28.36178	97.5% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Indus-Class A-121304.xls	
Variable:	Methyl tert-Butyl Ether	
Raw Statistics		
Number of Observations	18	
Number of Missing Data	0	
Number of Valid Observations	18	
Number of Distinct Observations	4	
Minimum	0.25	
Maximum	1.7	
Mean	0.363611	
Standard Deviation	0.357663	
Variance	0.127923	
Coefficient of Variation	0.983642	
Skewness	3.539986	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.371535	
Shapiro-Wilk 5% Critical Value	0.897	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.510263	
Gamma Statistics		
k hat	2.728355	
k star (bias corrected)	2.310666	
Theta hat	0.133271	
Theta star	0.157362	
nu hat	98.22077	
nu star	83.18398	
5% Approximate Chi Square Value	63.16051	
Adjusted Level of Significance	0.03574	
Adjusted Chi Square Value	61.48643	
Anderson-Darling Test Statistic	5.250628	
Anderson-Darling 5% Critical Value	0.747633	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.479005	
Kolmogrov-Smirnov 5% Critical Value	0.205373	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.478885	
95% Adjusted Gamma UCL	0.491923	
Lognormal Statistics		
Minimum of log data	-1.386294	
Maximum of log data	0.530628	
Mean of log data	-1.205984	
Standard Deviation of log data	0.51276	
Variance of log data	0.262923	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.41213	
Shapiro-Wilk 5% Critical Value	0.897	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.341461	
MLE Standard Deviation	0.187252	
MLE Coefficient of Variation	0.548386	
MLE Skewness	1.810071	
MLE Median	0.299397	
MLE 80% Quantile	0.461764	
MLE 90% Quantile	0.578633	
MLE 95% Quantile	0.695939	
MLE 99% Quantile	0.986785	
MVU Estimate of Median	0.297218	
MVU Estimate of Mean	0.338705	
MVU Estimate of Standard Deviation	0.180499	
MVU Estimate of SE of Mean	0.042409	
95% H-UCL	0.440132	
95% Chebyshev (MVUE) UCL	0.523564	
97.5% Chebyshev (MVUE) UCL	0.603552	
99% Chebyshev (MVUE) UCL	0.760674	
Non-parametric Statisitics		
95% CLT UCL	0.502276	
95% Adjusted-CLT UCL	0.577435	
95% Modified-t UCL	0.521987	
95% Jackknife UCL	0.510263	
95% Chebyshev (Mean, Sd) UCL	0.731075	
97.5% Chebyshev (Mean, Sd) UCL	0.890077	
99% Chebyshev (Mean, Sd) UCL	1.202406	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.731075	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Indus-121304.xls							
Variable:			1,1-Dichloroethene							
Raw Statistics										
Number of Observations			153							
Number of Missing Data			0							
Number of Valid Observations			153							
Number of Distinct Observations			17							
Minimum			0.25							
Maximum			8.4							
Mean			0.625458							
Standard Deviation			0.921163							
Variance			0.848541							
Coefficient of Variation			1.472782							
Skewness			5.674386							
Too Few Distinct Observations?			NO							
Normal Statistics										
Lilliefors Test Statisitic			0.443055							
Lilliefors 5% Critical Value			0.071629							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level					
95% Student's-t UCL			0.748704							
Gamma Statistics										
k hat			1.676196							
k star (bias corrected)			1.647687							
Theta hat			0.373141							
Theta star			0.379597							
nu hat			512.9161							
nu star			504.1922							
5% Approximate Chi Square Value			453.1107							
Adjusted Level of Significance			0.048431							
Adjusted Chi Square Value			452.6553							
Anderson-Darling Test Statistic			20.31347							
Anderson-Darling 5% Critical Value			0.768903							
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level					
Kolmogrov-Smirnov Test Statistic			0.394939							
Kolmogrov-Smirnov 5% Critical Value			0.077042							
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level					
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level					
95% Approximate Gamma UCL			0.695969							
95% Adjusted Gamma UCL			0.696669							
Lognormal Statistics										
Minimum of log data			-1.386294							
Maximum of log data			2.128232							
Mean of log data			-0.796306							
Standard Deviation of log data			0.64758							
Variance of log data			0.41936							
Lilliefors Test Statisitic			0.325606							
Lilliefors 5% Critical Value			0.071629							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level					
MLE Mean			0.556201							
MLE Standard Deviation			0.401463							
MLE Coefficient of Variation			0.721795							
MLE Skewness			2.541433							
MLE Median			0.450992							
MLE 80% Quantile			0.779501							
MLE 90% Quantile			1.036485							
MLE 95% Quantile			1.308608							
MLE 99% Quantile			2.033922							
MVU Estimate of Median			0.450374							
MVU Estimate of Mean			0.555283							
MVU Estimate of Standard Deviation			0.39819							
MVU Estimate of SE of Mean			0.031795							
95% H-UCL			0.61453							
95% Chebyshev (MVUE) UCL			0.693872							
97.5% Chebyshev (MVUE) UCL			0.75384							
99% Chebyshev (MVUE) UCL			0.871634							
Non-parametric Statisitics										
95% CLT UCL			0.747952							
95% Adjusted-CLT UCL			0.784457							
95% Modified-t UCL			0.754397							
95% Jackknife UCL			0.748704							
95% Chebyshev (Mean, Sd) UCL			0.950072							
97.5% Chebyshev (Mean, Sd) UCL			1.090532							
99% Chebyshev (Mean, Sd) UCL			1.36644							
Bootstrap Statistics										
Number of Bootstrap Runs			2000							
95% Standard Bootstrap UCL			0.748564							
95% Bootstrap-t UCL			0.832363							
95% Hall's Bootstrap UCL			0.832091							
95% Percentile Bootstrap UCL			0.758889							
95% BCA Bootstrap UCL			0.80415							
Recommendations										
Human Inspection Recommended?			NO							
Appropriate Distribution			NON-PARAMETRIC							
1st Recommended UCL			0.950072		95% Chebyshev (Mean, Sd) UCL					
2nd Recommended UCL										
3rd Recommended UCL										
Recommended UCL > Max Data Value										
Recommendation Warning!			NONE							
Alternative UCL			NONE							

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Indus-121304.xls	
Variable:	1,2,4-Trichlorobenzene	
Raw Statistics		
Number of Observations	67	
Number of Missing Data	0	
Number of Valid Observations	67	
Number of Distinct Observations	5	
Minimum	0.11	
Maximum	5	
Mean	0.33194	
Standard Deviation	0.592205	
Variance	0.350707	
Coefficient of Variation	1.784071	
Skewness	7.70324	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.525173	
Lilliefors 5% Critical Value	0.108242	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.452639	
Gamma Statistics		
k hat	2.264358	
k star (bias corrected)	2.172919	
Theta hat	0.146594	
Theta star	0.152762	
nu hat	303.4239	
nu star	291.1711	
5% Approximate Chi Square Value	252.6391	
Adjusted Level of Significance	0.046418	
Adjusted Chi Square Value	251.8547	
Anderson-Darling Test Statistic	23.05314	
Anderson-Darling 5% Critical Value	0.761757	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.541326	
Kolmogrov-Smirnov 5% Critical Value	0.110116	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.382567	
95% Adjusted Gamma UCL	0.383759	
Lognormal Statistics		
Minimum of log data	-2.207275	
Maximum of log data	1.609438	
Mean of log data	-1.339574	
Standard Deviation of log data	0.435544	
Variance of log data	0.189698	
Lilliefors Test Statisitic	0.512862	
Lilliefors 5% Critical Value	0.108242	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.28802	
MLE Standard Deviation	0.131636	
MLE Coefficient of Variation	0.457039	
MLE Skewness	1.466586	
MLE Median	0.261957	
MLE 80% Quantile	0.3785	
MLE 90% Quantile	0.458452	
MLE 95% Quantile	0.536277	
MLE 99% Quantile	0.721445	
MVU Estimate of Median	0.261587	
MVU Estimate of Mean	0.287576	
MVU Estimate of Standard Deviation	0.13065	
MVU Estimate of SE of Mean	0.015922	
95% H-UCL	0.317485	
95% Chebyshev (MVUE) UCL	0.356978	
97.5% Chebyshev (MVUE) UCL	0.387008	
99% Chebyshev (MVUE) UCL	0.445997	
Non-parametric Statisitics		
95% CLT UCL	0.450944	
95% Adjusted-CLT UCL	0.523697	
95% Modified-t UCL	0.463987	
95% Jackknife UCL	0.452639	
95% Chebyshev (Mean, Sd) UCL	0.647304	
97.5% Chebyshev (Mean, Sd) UCL	0.783762	
99% Chebyshev (Mean, Sd) UCL	1.051807	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.448048	
95% Bootstrap-t UCL	3.241418	
95% Hall's Bootstrap UCL	3.817593	
95% Percentile Bootstrap UCL	0.469552	
95% BCA Bootstrap UCL	0.557463	
Recommendations		
Human Inspection Recommended?	YES	Users must select one of the recommended UCLS
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.452639	95% Student's-t UCL
2nd Recommended UCL	0.463987	95% Modified-t UCL
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Indus-121304.xls							
Variable:			1,2-Dichlorobenzene							
Raw Statistics										
Number of Observations			149							
Number of Missing Data			0							
Number of Valid Observations			149							
Number of Distinct Observations			14							
Minimum			0.25							
Maximum			11							
Mean			0.678322							
Standard Deviation			1.331968							
Variance			1.774138							
Coefficient of Variation			1.963621							
Skewness			6.047056							
Too Few Distinct Observations?			NO							
Normal Statistics										
Lilliefors Test Statisitic			0.425734							
Lilliefors 5% Critical Value			0.072584							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level					
95% Student's-t UCL			0.858938							
Gamma Statistics										
k hat			1.257162							
k star (bias corrected)			1.236324							
Theta hat			0.539566							
Theta star			0.548661							
nu hat			374.6342							
nu star			368.4245							
5% Approximate Chi Square Value			324.9317							
Adjusted Level of Significance			0.048389							
Adjusted Chi Square Value			324.5369							
Anderson-Darling Test Statistic			21.85811							
Anderson-Darling 5% Critical Value			0.776808							
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level					
Kolmogrov-Smirnov Test Statistic			0.379849							
Kolmogrov-Smirnov 5% Critical Value			0.078648							
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level					
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level					
95% Approximate Gamma UCL			0.769117							
95% Adjusted Gamma UCL			0.770053							
Lognormal Statistics										
Minimum of log data			-1.386294							
Maximum of log data			2.397895							
Mean of log data			-0.835902							
Standard Deviation of log data			0.705789							
Variance of log data			0.498138							
Lilliefors Test Statisitic			0.292339							
Lilliefors 5% Critical Value			0.072584							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level					
MLE Mean			0.556086							
MLE Standard Deviation			0.44683							
MLE Coefficient of Variation			0.803526							
MLE Skewness			2.92938							
MLE Median			0.433483							
MLE 80% Quantile			0.787013							
MLE 90% Quantile			1.073621							
MLE 95% Quantile			1.384198							
MLE 99% Quantile			2.238405							
MVU Estimate of Median			0.432759							
MVU Estimate of Mean			0.554931							
MVU Estimate of Standard Deviation			0.442247							
MVU Estimate of SE of Mean			0.035613							
95% H-UCL			0.622297							
95% Chebyshev (MVUE) UCL			0.710167							
97.5% Chebyshev (MVUE) UCL			0.777337							
99% Chebyshev (MVUE) UCL			0.909281							
Non-parametric Statisitics										
95% CLT UCL			0.857807							
95% Adjusted-CLT UCL			0.915568							
95% Modified-t UCL			0.867947							
95% Jackknife UCL			0.858938							
95% Chebyshev (Mean, Sd) UCL			1.153961							
97.5% Chebyshev (Mean, Sd) UCL			1.35977							
99% Chebyshev (Mean, Sd) UCL			1.764043							
Bootstrap Statistics										
Number of Bootstrap Runs			2000							
95% Standard Bootstrap UCL			0.856768							
95% Bootstrap-t UCL			1.001299							
95% Hall's Bootstrap UCL			1.096317							
95% Percentile Bootstrap UCL			0.881879							
95% BCA Bootstrap UCL			0.947718							
Recommendations										
Human Inspection Recommended?			NO							
Appropriate Distribution			NON-PARAMETRIC							
1st Recommended UCL			1.153961		95% Chebyshev (Mean, Sd) UCL					
2nd Recommended UCL										
3rd Recommended UCL										
Recommended UCL > Max Data Value										
Recommendation Warning!			NONE							
Alternative UCL			NONE							

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Indus-121304.xls							
Variable:			1,2-Dichloroethane							
Raw Statistics										
Number of Observations			153							
Number of Missing Data			0							
Number of Valid Observations			153							
Number of Distinct Observations			9							
Minimum			0.17							
Maximum			48							
Mean			0.767451							
Standard Deviation			3.86999							
Variance			14.97682							
Coefficient of Variation			5.042655							
Skewness			12.12716							
Too Few Distinct Observations?			NO							
Normal Statistics										
Lilliefors Test Statisitic			0.481797							
Lilliefors 5% Critical Value			0.071629							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level					
95% Student's-t UCL			1.285232							
Gamma Statistics										
k hat			0.905441							
k star (bias corrected)			0.892045							
Theta hat			0.847599							
Theta star			0.860328							
nu hat			277.065							
nu star			272.9657							
5% Approximate Chi Square Value			235.696							
Adjusted Level of Significance			0.048431							
Adjusted Chi Square Value			235.3698							
Anderson-Darling Test Statistic			1.8E+308							
Anderson-Darling 5% Critical Value			0.788082							
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level					
Kolmogrov-Smirnov Test Statistic			0.460808							
Kolmogrov-Smirnov 5% Critical Value			0.078302							
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level					
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level					
95% Approximate Gamma UCL			0.888805							
95% Adjusted Gamma UCL			0.890037							
Lognormal Statistics										
Minimum of log data			-1.771957							
Maximum of log data			3.871201							
Mean of log data			-0.909861							
Standard Deviation of log data			0.613374							
Variance of log data			0.376228							
Lilliefors Test Statisitic			0.316175							
Lilliefors 5% Critical Value			0.071629							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level					
MLE Mean			0.485903							
MLE Standard Deviation			0.328399							
MLE Coefficient of Variation			0.675854							
MLE Skewness			2.336278							
MLE Median			0.40258							
MLE 80% Quantile			0.676002							
MLE 90% Quantile			0.885436							
MLE 95% Quantile			1.10422							
MLE 99% Quantile			1.676733							
MVU Estimate of Median			0.402086							
MVU Estimate of Mean			0.485196							
MVU Estimate of Standard Deviation			0.32604							
MVU Estimate of SE of Mean			0.026094							
95% H-UCL			0.533468							
95% Chebyshev (MVUE) UCL			0.598937							
97.5% Chebyshev (MVUE) UCL			0.648152							
99% Chebyshev (MVUE) UCL			0.744827							
Non-parametric Statisitics										
95% CLT UCL			1.282077							
95% Adjusted-CLT UCL			1.609838							
95% Modified-t UCL			1.336356							
95% Jackknife UCL			1.285232							
95% Chebyshev (Mean, Sd) UCL			2.13122							
97.5% Chebyshev (Mean, Sd) UCL			2.721325							
99% Chebyshev (Mean, Sd) UCL			3.88047							
Bootstrap Statistics										
Number of Bootstrap Runs			2000							
95% Standard Bootstrap UCL			1.280051							
95% Bootstrap-t UCL			6.590569							
95% Hall's Bootstrap UCL			3.427094							
95% Percentile Bootstrap UCL			1.385098							
95% BCA Bootstrap UCL			1.756013							
Recommendations										
Human Inspection Recommended?			NO							
Appropriate Distribution			NON-PARAMETRIC							
1st Recommended UCL			2.13122		95% Chebyshev (Mean, Sd) UCL					
2nd Recommended UCL										
3rd Recommended UCL										
Recommended UCL > Max Data Value										
Recommendation Warning!			NONE							
Alternative UCL			NONE							

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Indus-121304.xls							
Variable:			1,4-Dichlorobenzene							
Raw Statistics										
Number of Observations			149							
Number of Missing Data			0							
Number of Valid Observations			149							
Number of Distinct Observations			13							
Minimum			0.125							
Maximum			6							
Mean			0.56557							
Standard Deviation			0.796316							
Variance			0.634118							
Coefficient of Variation			1.407986							
Skewness			4.763891							
Too Few Distinct Observations?			NO							
Normal Statistics										
Lilliefors Test Statisitic			0.445564							
Lilliefors 5% Critical Value			0.072584							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level					
95% Student's-t UCL			0.673551							
Gamma Statistics										
k hat			1.720395							
k star (bias corrected)			1.69023							
Theta hat			0.328745							
Theta star			0.334612							
nu hat			512.6776							
nu star			503.6886							
5% Approximate Chi Square Value			452.6332							
Adjusted Level of Significance			0.048389							
Adjusted Chi Square Value			452.1656							
Anderson-Darling Test Statistic			19.57122							
Anderson-Darling 5% Critical Value			0.768415							
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level					
Kolmogrov-Smirnov Test Statistic			0.372676							
Kolmogrov-Smirnov 5% Critical Value			0.078054							
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level					
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level					
95% Approximate Gamma UCL			0.629365							
95% Adjusted Gamma UCL			0.630016							
Lognormal Statistics										
Minimum of log data			-2.079442							
Maximum of log data			1.791759							
Mean of log data			-0.887873							
Standard Deviation of log data			0.634923							
Variance of log data			0.403127							
Lilliefors Test Statisitic			0.292291							
Lilliefors 5% Critical Value			0.072584							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level					
MLE Mean			0.503431							
MLE Standard Deviation			0.35473							
MLE Coefficient of Variation			0.704626							
MLE Skewness			2.463721							
MLE Median			0.41153							
MLE 80% Quantile			0.703728							
MLE 90% Quantile			0.930534							
MLE 95% Quantile			1.169499							
MLE 99% Quantile			1.802109							
MVU Estimate of Median			0.410974							
MVU Estimate of Mean			0.502616							
MVU Estimate of Standard Deviation			0.351896							
MVU Estimate of SE of Mean			0.028499							
95% H-UCL			0.555684							
95% Chebyshev (MVUE) UCL			0.62684							
97.5% Chebyshev (MVUE) UCL			0.680592							
99% Chebyshev (MVUE) UCL			0.786177							
Non-parametric Statisitics										
95% CLT UCL			0.672875							
95% Adjusted-CLT UCL			0.70008							
95% Modified-t UCL			0.677795							
95% Jackknife UCL			0.673551							
95% Chebyshev (Mean, Sd) UCL			0.849931							
97.5% Chebyshev (Mean, Sd) UCL			0.972974							
99% Chebyshev (Mean, Sd) UCL			1.214668							
Bootstrap Statistics										
Number of Bootstrap Runs			2000							
95% Standard Bootstrap UCL			0.673591							
95% Bootstrap-t UCL			0.713531							
95% Hall's Bootstrap UCL			0.701944							
95% Percentile Bootstrap UCL			0.684195							
95% BCA Bootstrap UCL			0.708154							
Recommendations										
Human Inspection Recommended?			NO							
Appropriate Distribution			NON-PARAMETRIC							
1st Recommended UCL			0.849931		95% Chebyshev (Mean, Sd) UCL					
2nd Recommended UCL										
3rd Recommended UCL										
Recommended UCL > Max Data Value										
Recommendation Warning!			NONE							
Alternative UCL			NONE							

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Indus-121304.xls									
Variable:	2-Butanone									
Raw Statistics										
Number of Observations	153									
Number of Missing Data	0									
Number of Valid Observations	153									
Number of Distinct Observations	15									
Minimum	1.5									
Maximum	470									
Mean	7.22549									
Standard Deviation	39.34801									
Variance	1548.266									
Coefficient of Variation	5.445723									
Skewness	10.99366									
Too Few Distinct Observations?	NO									
Normal Statistics										
Lilliefors Test Statisitic	0.456293									
Lilliefors 5% Critical Value	0.071629									
Shapiro-Wilk Test Statisitic	N/A									
Shapiro-Wilk 5% Critical Value	N/A									
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level								
95% Student's-t UCL	12.49002									
Gamma Statistics										
k hat	0.558645									
k star (bias corrected)	0.552049									
Theta hat	12.93395									
Theta star	13.0885									
nu hat	170.9455									
nu star	168.927									
5% Approximate Chi Square Value	139.8664									
Adjusted Level of Significance	0.048431									
Adjusted Chi Square Value	139.617									
Anderson-Darling Test Statistic	1.8E+308									
Anderson-Darling 5% Critical Value	0.814094									
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level								
Kolmogrov-Smirnov Test Statistic	0.489011									
Kolmogrov-Smirnov 5% Critical Value	0.079824									
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level								
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level								
95% Approximate Gamma UCL	8.726757									
95% Adjusted Gamma UCL	8.742347									
Lognormal Statistics										
Minimum of log data	0.405465									
Maximum of log data	6.152733									
Mean of log data	0.859744									
Standard Deviation of log data	0.83615									
Variance of log data	0.699147									
Lilliefors Test Statisitic	0.381538									
Lilliefors 5% Critical Value	0.071629									
Shapiro-Wilk Test Statisitic	N/A									
Shapiro-Wilk 5% Critical Value	N/A									
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level								
MLE Mean	3.351195									
MLE Standard Deviation	3.371301									
MLE Coefficient of Variation	1.006									
MLE Skewness	4.036106									
MLE Median	2.362555									
MLE 80% Quantile	4.78885									
MLE 90% Quantile	6.918482									
MLE 95% Quantile	9.348448									
MLE 99% Quantile	16.52094									
MVU Estimate of Median	2.357163									
MVU Estimate of Mean	3.340945									
MVU Estimate of Standard Deviation	3.320207									
MVU Estimate of SE of Mean	0.259861									
95% H-UCL	3.84635									
95% Chebyshev (MVUE) UCL	4.473652									
97.5% Chebyshev (MVUE) UCL	4.963775									
99% Chebyshev (MVUE) UCL	5.926527									
Non-parametric Statisitics										
95% CLT UCL	12.45793									
95% Adjusted-CLT UCL	15.47896									
95% Modified-t UCL	12.96124									
95% Jackknife UCL	12.49002									
95% Chebyshev (Mean, Sd) UCL	21.09158									
97.5% Chebyshev (Mean, Sd) UCL	27.09144									
99% Chebyshev (Mean, Sd) UCL	38.87702									
Bootstrap Statistics										
Number of Bootstrap Runs	2000									
95% Standard Bootstrap UCL	12.6469									
95% Bootstrap-t UCL	31.87877									
95% Hall's Bootstrap UCL	29.02735									
95% Percentile Bootstrap UCL	13.2451									
95% BCA Bootstrap UCL	17.33333									
Recommendations										
Human Inspection Recommended?	NO									
Appropriate Distribution	NON-PARAMETRIC									
1st Recommended UCL	21.09158	95% Chebyshev (Mean, Sd) UCL								
2nd Recommended UCL										
3rd Recommended UCL										
Recommended UCL > Max Data Value										
Recommendation Warning!	NONE									
Alternative UCL	NONE									

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Indus-121304.xls							
Variable:			4-Methyl-2-Pentanone							
Raw Statistics										
Number of Observations			153							
Number of Missing Data			0							
Number of Valid Observations			153							
Number of Distinct Observations			12							
Minimum			1							
Maximum			120							
Mean			4.594771							
Standard Deviation			14.27661							
Variance			203.8216							
Coefficient of Variation			3.107142							
Skewness			6.098603							
Too Few Distinct Observations?			NO							
Normal Statistics										
Lilliefors Test Statisitic			0.486431							
Lilliefors 5% Critical Value			0.071629							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level					
95% Student's-t UCL			6.504895							
Gamma Statistics										
k hat			0.812233							
k star (bias corrected)			0.800664							
Theta hat			5.656961							
Theta star			5.738698							
nu hat			248.5434							
nu star			245.0033							
5% Approximate Chi Square Value			209.7575							
Adjusted Level of Significance			0.048431							
Adjusted Chi Square Value			209.4502							
Anderson-Darling Test Statistic			38.57565							
Anderson-Darling 5% Critical Value			0.792623							
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level					
Kolmogrov-Smirnov Test Statistic			0.472118							
Kolmogrov-Smirnov 5% Critical Value			0.078584							
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level					
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level					
95% Approximate Gamma UCL			5.366836							
95% Adjusted Gamma UCL			5.374709							
Lognormal Statistics										
Minimum of log data			0							
Maximum of log data			4.787492							
Mean of log data			0.795681							
Standard Deviation of log data			0.730343							
Variance of log data			0.533401							
Lilliefors Test Statisitic			0.362521							
Lilliefors 5% Critical Value			0.071629							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level					
MLE Mean			2.893254							
MLE Standard Deviation			2.42882							
MLE Coefficient of Variation			0.839477							
MLE Skewness			3.110027							
MLE Median			2.21595							
MLE 80% Quantile			4.107528							
MLE 90% Quantile			5.664239							
MLE 95% Quantile			7.36763							
MLE 99% Quantile			12.11519							
MVU Estimate of Median			2.212091							
MVU Estimate of Mean			2.886905							
MVU Estimate of Standard Deviation			2.402461							
MVU Estimate of SE of Mean			0.190464							
95% H-UCL			3.248371							
95% Chebyshev (MVUE) UCL			3.717117							
97.5% Chebyshev (MVUE) UCL			4.07635							
99% Chebyshev (MVUE) UCL			4.781994							
Non-parametric Statisitics										
95% CLT UCL			6.493254							
95% Adjusted-CLT UCL			7.101311							
95% Modified-t UCL			6.59974							
95% Jackknife UCL			6.504895							
95% Chebyshev (Mean, Sd) UCL			9.625792							
97.5% Chebyshev (Mean, Sd) UCL			11.80272							
99% Chebyshev (Mean, Sd) UCL			16.07887							
Bootstrap Statistics										
Number of Bootstrap Runs			2000							
95% Standard Bootstrap UCL			6.435555							
95% Bootstrap-t UCL			8.065125							
95% Hall's Bootstrap UCL			6.667649							
95% Percentile Bootstrap UCL			6.598039							
95% BCA Bootstrap UCL			7.284314							
Recommendations										
Human Inspection Recommended?			NO							
Appropriate Distribution			NON-PARAMETRIC							
1st Recommended UCL			9.625792		95% Chebyshev (Mean, Sd) UCL					
2nd Recommended UCL										
3rd Recommended UCL										
Recommended UCL > Max Data Value										
Recommendation Warning!			NONE							
Alternative UCL			NONE							

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Indus-121304.xls									
Variable:	Acetone									
Raw Statistics										
Number of Observations	153									
Number of Missing Data	0									
Number of Valid Observations	153									
Number of Distinct Observations	24									
Minimum	1.65									
Maximum	16000									
Mean	147.3794									
Standard Deviation	1324.728									
Variance	1754904									
Coefficient of Variation	8.988556									
Skewness	11.52276									
Too Few Distinct Observations?	NO									
Normal Statistics										
Lilliefors Test Statisitic	0.483548									
Lilliefors 5% Critical Value	0.071629									
Shapiro-Wilk Test Statisitic	N/A									
Shapiro-Wilk 5% Critical Value	N/A									
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level								
95% Student's-t UCL	324.62									
Gamma Statistics										
k hat	0.205352									
k star (bias corrected)	0.205683									
Theta hat	717.6906									
Theta star	716.5364									
nu hat	62.8378									
nu star	62.93902									
5% Approximate Chi Square Value	45.68616									
Adjusted Level of Significance	0.048431									
Adjusted Chi Square Value	45.54696									
Anderson-Darling Test Statistic	51.85276									
Anderson-Darling 5% Critical Value	0.910915									
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level								
Kolmogrov-Smirnov Test Statistic	0.495727									
Kolmogrov-Smirnov 5% Critical Value	0.083843									
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level								
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level								
95% Approximate Gamma UCL	203.0356									
95% Adjusted Gamma UCL	203.6561									
Lognormal Statistics										
Minimum of log data	0.500775									
Maximum of log data	9.680344									
Mean of log data	1.424081									
Standard Deviation of log data	1.30981									
Variance of log data	1.715601									
Lilliefors Test Statisitic	0.447794									
Lilliefors 5% Critical Value	0.071629									
Shapiro-Wilk Test Statisitic	N/A									
Shapiro-Wilk 5% Critical Value	N/A									
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level								
MLE Mean	9.795092									
MLE Standard Deviation	20.91664									
MLE Coefficient of Variation	2.13542									
MLE Skewness	16.14382									
MLE Median	4.154037									
MLE 80% Quantile	12.56443									
MLE 90% Quantile	22.35805									
MLE 95% Quantile	35.82757									
MLE 99% Quantile	87.41773									
MVU Estimate of Median	4.130812									
MVU Estimate of Mean	9.695157									
MVU Estimate of Standard Deviation	19.83808									
MVU Estimate of SE of Mean	1.364745									
95% H-UCL	12.70984									
95% Chebyshev (MVUE) UCL	15.64394									
97.5% Chebyshev (MVUE) UCL	18.21799									
99% Chebyshev (MVUE) UCL	23.2742									
Non-parametric Statisitics										
95% CLT UCL	323.5398									
95% Adjusted-CLT UCL	430.1435									
95% Modified-t UCL	341.248									
95% Jackknife UCL	324.62									
95% Chebyshev (Mean, Sd) UCL	614.2084									
97.5% Chebyshev (Mean, Sd) UCL	816.2057									
99% Chebyshev (Mean, Sd) UCL	1212.99									
Bootstrap Statistics										
Number of Bootstrap Runs	2000									
95% Standard Bootstrap UCL	331.1076									
95% Bootstrap-t UCL	2641.436									
95% Hall's Bootstrap UCL	2197.604									
95% Percentile Bootstrap UCL	348.0023									
95% BCA Bootstrap UCL	490.0941									
Recommendations										
Human Inspection Recommended?	NO									
Appropriate Distribution	NON-PARAMETRIC									
1st Recommended UCL	816.2057	97.5% Chebyshev (Mean, Sd) UCL								
2nd Recommended UCL										
3rd Recommended UCL										
Recommended UCL > Max Data Value										
Recommendation Warning!	NONE									
Alternative UCL	NONE									

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-all-B+T-011705.xls	
Variable:	Benzene	
Raw Statistics		
Number of Observations	445	
Number of Missing Data	0	
Number of Valid Observations	445	
Number of Distinct Observations	88	
Minimum	0.1	
Maximum	69000	
Mean	583.663	
Standard Deviation	3826.824	
Variance	14644579	
Coefficient of Variation	6.556564	
Skewness	13.90764	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.439399	
Lilliefors 5% Critical Value	0.042	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	882.6778	
Gamma Statistics		
k hat	0.137123	
k star (bias corrected)	0.137697	
Theta hat	4256.484	
Theta star	4238.749	
nu hat	122.0397	
nu star	122.5503	
5% Approximate Chi Square Value	97.98027	
Adjusted Level of Significance	0.049461	
Adjusted Chi Square Value	97.90951	
Anderson-Darling Test Statistic	101.258	
Anderson-Darling 5% Critical Value	1.150786	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.400019	
Kolmogrov-Smirnov 5% Critical Value	0.051492	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	730.0253	
95% Adjusted Gamma UCL	730.553	
Lognormal Statistics		
Minimum of log data	-2.302585	
Maximum of log data	11.14186	
Mean of log data	0.691699	
Standard Deviation of log data	2.906458	
Variance of log data	8.447495	
Lilliefors Test Statisitic	0.390996	
Lilliefors 5% Critical Value	0.042	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	136.3803	
MLE Standard Deviation	9312.265	
MLE Coefficient of Variation	68.28161	
MLE Skewness	318559.6	
MLE Median	1.997106	
MLE 80% Quantile	23.28143	
MLE 90% Quantile	83.63795	
MLE 95% Quantile	238.1313	
MLE 99% Quantile	1723.512	
MVU Estimate of Median	1.97824	
MVU Estimate of Mean	129.9436	
MVU Estimate of Standard Deviation	6833.055	
MVU Estimate of SE of Mean	38.60726	
95% H-UCL	239.5228	
95% Chebyshev (MVUE) UCL	298.2287	
97.5% Chebyshev (MVUE) UCL	371.0458	
99% Chebyshev (MVUE) UCL	514.0809	
Non-parametric Statisitics		
95% CLT UCL	882.054	
95% Adjusted-CLT UCL	1009.848	
95% Modified-t UCL	902.6112	
95% Jackknife UCL	882.6778	
95% Chebyshev (Mean, Sd) UCL	1374.406	
97.5% Chebyshev (Mean, Sd) UCL	1716.561	
99% Chebyshev (Mean, Sd) UCL	2388.658	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	881.9074	
95% Bootstrap-t UCL	1214.121	
95% Hall's Bootstrap UCL	2037.399	
95% Percentile Bootstrap UCL	911.3593	
95% BCA Bootstrap UCL	1062.223	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	2388.658	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Indus-121304.xls							
Variable:			Chlorobenzene							
Raw Statistics										
Number of Observations			153							
Number of Missing Data			0							
Number of Valid Observations			153							
Number of Distinct Observations			16							
Minimum			0.25							
Maximum			35							
Mean			1.366013							
Standard Deviation			4.081713							
Variance			16.66038							
Coefficient of Variation			2.988048							
Skewness			5.539777							
Too Few Distinct Observations?			NO							
Normal Statistics										
Lilliefors Test Statisitic			0.453293							
Lilliefors 5% Critical Value			0.071629							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level					
95% Student's-t UCL			1.912122							
Gamma Statistics										
k hat			0.606426							
k star (bias corrected)			0.598893							
Theta hat			2.252562							
Theta star			2.280896							
nu hat			185.5665							
nu star			183.2613							
5% Approximate Chi Square Value			152.9422							
Adjusted Level of Significance			0.048431							
Adjusted Chi Square Value			152.681							
Anderson-Darling Test Statistic			31.61488							
Anderson-Darling 5% Critical Value			0.80949							
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level					
Kolmogrov-Smirnov Test Statistic			0.455589							
Kolmogrov-Smirnov 5% Critical Value			0.079562							
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level					
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level					
95% Approximate Gamma UCL			1.63681							
95% Adjusted Gamma UCL			1.63961							
Lognormal Statistics										
Minimum of log data			-1.386294							
Maximum of log data			3.555348							
Mean of log data			-0.705387							
Standard Deviation of log data			0.990679							
Variance of log data			0.981445							
Lilliefors Test Statisitic			0.364352							
Lilliefors 5% Critical Value			0.071629							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level					
MLE Mean			0.806812							
MLE Standard Deviation			1.042103							
MLE Coefficient of Variation			1.291631							
MLE Skewness			6.029731							
MLE Median			0.493918							
MLE 80% Quantile			1.140808							
MLE 90% Quantile			1.764092							
MLE 95% Quantile			2.520054							
MLE 99% Quantile			4.94775							
MVU Estimate of Median			0.492336							
MVU Estimate of Mean			0.802999							
MVU Estimate of Standard Deviation			1.01758							
MVU Estimate of SE of Mean			0.077453							
95% H-UCL			0.959513							
95% Chebyshev (MVUE) UCL			1.140611							
97.5% Chebyshev (MVUE) UCL			1.286695							
99% Chebyshev (MVUE) UCL			1.573651							
Non-parametric Statisitics										
95% CLT UCL			1.908793							
95% Adjusted-CLT UCL			2.066708							
95% Modified-t UCL			1.936753							
95% Jackknife UCL			1.912122							
95% Chebyshev (Mean, Sd) UCL			2.804393							
97.5% Chebyshev (Mean, Sd) UCL			3.426781							
99% Chebyshev (Mean, Sd) UCL			4.649342							
Bootstrap Statistics										
Number of Bootstrap Runs			2000							
95% Standard Bootstrap UCL			1.913562							
95% Bootstrap-t UCL			2.237515							
95% Hall's Bootstrap UCL			2.147904							
95% Percentile Bootstrap UCL			1.919935							
95% BCA Bootstrap UCL			2.084967							
Recommendations										
Human Inspection Recommended?			NO							
Appropriate Distribution			NON-PARAMETRIC							
1st Recommended UCL			2.804393		95% Chebyshev (Mean, Sd) UCL					
2nd Recommended UCL										
3rd Recommended UCL										
Recommended UCL > Max Data Value										
Recommendation Warning!			NONE							
Alternative UCL			NONE							

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Indus-121304.xls							
Variable:			Chloroethane							
Raw Statistics										
Number of Observations			153							
Number of Missing Data			0							
Number of Valid Observations			153							
Number of Distinct Observations			7							
Minimum			0.25							
Maximum			37							
Mean			1.027778							
Standard Deviation			3.019067							
Variance			9.114766							
Coefficient of Variation			2.937471							
Skewness			11.31601							
Too Few Distinct Observations?			NO							
Normal Statistics										
Lilliefors Test Statisitic			0.451383							
Lilliefors 5% Critical Value			0.071629							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level					
95% Student's-t UCL			1.431711							
Gamma Statistics										
k hat			1.071996							
k star (bias corrected)			1.055334							
Theta hat			0.958751							
Theta star			0.973888							
nu hat			328.0309							
nu star			322.9323							
5% Approximate Chi Square Value			282.2894							
Adjusted Level of Significance			0.048431							
Adjusted Chi Square Value			281.9317							
Anderson-Darling Test Statistic			1.8E+308							
Anderson-Darling 5% Critical Value			0.781623							
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level					
Kolmogrov-Smirnov Test Statistic			0.330456							
Kolmogrov-Smirnov 5% Critical Value			0.077896							
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level					
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level					
95% Approximate Gamma UCL			1.175753							
95% Adjusted Gamma UCL			1.177245							
Lognormal Statistics										
Minimum of log data			-1.386294							
Maximum of log data			3.610918							
Mean of log data			-0.506763							
Standard Deviation of log data			0.83793							
Variance of log data			0.702127							
Lilliefors Test Statisitic			0.309037							
Lilliefors 5% Critical Value			0.071629							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level					
MLE Mean			0.855816							
MLE Standard Deviation			0.863501							
MLE Coefficient of Variation			1.00898							
MLE Skewness			4.054121							
MLE Median			0.602443							
MLE 80% Quantile			1.222977							
MLE 90% Quantile			1.768227							
MLE 95% Quantile			2.390809							
MLE 99% Quantile			4.230255							
MVU Estimate of Median			0.601062							
MVU Estimate of Mean			0.853185							
MVU Estimate of Standard Deviation			0.850344							
MVU Estimate of SE of Mean			0.066536							
95% H-UCL			0.982646							
95% Chebyshev (MVUE) UCL			1.14321							
97.5% Chebyshev (MVUE) UCL			1.268704							
99% Chebyshev (MVUE) UCL			1.515213							
Non-parametric Statisitics										
95% CLT UCL			1.429249							
95% Adjusted-CLT UCL			1.66784							
95% Modified-t UCL			1.468926							
95% Jackknife UCL			1.431711							
95% Chebyshev (Mean, Sd) UCL			2.091685							
97.5% Chebyshev (Mean, Sd) UCL			2.552039							
99% Chebyshev (Mean, Sd) UCL			3.456314							
Bootstrap Statistics										
Number of Bootstrap Runs			2000							
95% Standard Bootstrap UCL			1.428025							
95% Bootstrap-t UCL			2.533451							
95% Hall's Bootstrap UCL			2.872092							
95% Percentile Bootstrap UCL			1.49183							
95% BCA Bootstrap UCL			1.771242							
Recommendations										
Human Inspection Recommended?			NO							
Appropriate Distribution			NON-PARAMETRIC							
1st Recommended UCL			2.091685		95% Chebyshev (Mean, Sd) UCL					
2nd Recommended UCL										
3rd Recommended UCL										
Recommended UCL > Max Data Value										
Recommendation Warning!			NONE							
Alternative UCL			NONE							

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Indus-121304.xls									
Variable:	Chloroform									
Raw Statistics										
Number of Observations	153									
Number of Missing Data	0									
Number of Valid Observations	153									
Number of Distinct Observations	10									
Minimum	0.25									
Maximum	5									
Mean	0.523725									
Standard Deviation	0.627803									
Variance	0.394137									
Coefficient of Variation	1.198725									
Skewness	5.132483									
Too Few Distinct Observations?	NO									
Normal Statistics										
Lilliefors Test Statisitic	0.449714									
Lilliefors 5% Critical Value	0.071629									
Shapiro-Wilk Test Statisitic	N/A									
Shapiro-Wilk 5% Critical Value	N/A									
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level								
95% Student's-t UCL	0.607722									
Gamma Statistics										
k hat	2.245556									
k star (bias corrected)	2.205882									
Theta hat	0.233228									
Theta star	0.237422									
nu hat	687.14									
nu star	675									
5% Approximate Chi Square Value	615.7101									
Adjusted Level of Significance	0.048431									
Adjusted Chi Square Value	615.1778									
Anderson-Darling Test Statistic	20.02665									
Anderson-Darling 5% Critical Value	0.764227									
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level								
Kolmogrov-Smirnov Test Statistic	0.372594									
Kolmogrov-Smirnov 5% Critical Value	0.076655									
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level								
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level								
95% Approximate Gamma UCL	0.574158									
95% Adjusted Gamma UCL	0.574655									
Lognormal Statistics										
Minimum of log data	-1.386294									
Maximum of log data	1.609438									
Mean of log data	-0.885674									
Standard Deviation of log data	0.56342									
Variance of log data	0.317442									
Lilliefors Test Statisitic	0.300925									
Lilliefors 5% Critical Value	0.071629									
Shapiro-Wilk Test Statisitic	N/A									
Shapiro-Wilk 5% Critical Value	N/A									
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level								
MLE Mean	0.483379									
MLE Standard Deviation	0.295459									
MLE Coefficient of Variation	0.611236									
MLE Skewness	2.06207									
MLE Median	0.412436									
MLE 80% Quantile	0.663926									
MLE 90% Quantile	0.850713									
MLE 95% Quantile	1.042009									
MLE 99% Quantile	1.529345									
MVU Estimate of Median	0.412008									
MVU Estimate of Mean	0.482801									
MVU Estimate of Standard Deviation	0.293711									
MVU Estimate of SE of Mean	0.023573									
95% H-UCL	0.525963									
95% Chebyshev (MVUE) UCL	0.585551									
97.5% Chebyshev (MVUE) UCL	0.630011									
99% Chebyshev (MVUE) UCL	0.717345									
Non-parametric Statisitics										
95% CLT UCL	0.60721									
95% Adjusted-CLT UCL	0.629713									
95% Modified-t UCL	0.611232									
95% Jackknife UCL	0.607722									
95% Chebyshev (Mean, Sd) UCL	0.744961									
97.5% Chebyshev (Mean, Sd) UCL	0.84069									
99% Chebyshev (Mean, Sd) UCL	1.02873									
Bootstrap Statistics										
Number of Bootstrap Runs	2000									
95% Standard Bootstrap UCL	0.608522									
95% Bootstrap-t UCL	0.648826									
95% Hall's Bootstrap UCL	0.638574									
95% Percentile Bootstrap UCL	0.609085									
95% BCA Bootstrap UCL	0.638889									
Recommendations										
Human Inspection Recommended?	NO									
Appropriate Distribution	NON-PARAMETRIC									
1st Recommended UCL	0.744961	95% Chebyshev (Mean, Sd) UCL								
2nd Recommended UCL										
3rd Recommended UCL										
Recommended UCL > Max Data Value										
Recommendation Warning!	NONE									
Alternative UCL	NONE									

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Indus-121304.xls							
Variable:			cis-1,2-Dichloroethene							
Raw Statistics										
Number of Observations			153							
Number of Missing Data			0							
Number of Valid Observations			153							
Number of Distinct Observations			25							
Minimum			0.2							
Maximum			50							
Mean			1.100719							
Standard Deviation			4.387738							
Variance			19.25224							
Coefficient of Variation			3.986247							
Skewness			9.818157							
Too Few Distinct Observations?			NO							
Normal Statistics										
Lilliefors Test Statisitic			0.418676							
Lilliefors 5% Critical Value			0.071629							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level					
95% Student's-t UCL			1.687772							
Gamma Statistics										
k hat			0.744618							
k star (bias corrected)			0.734375							
Theta hat			1.478233							
Theta star			1.498851							
nu hat			227.8532							
nu star			224.7188							
5% Approximate Chi Square Value			191.0147							
Adjusted Level of Significance			0.048431							
Adjusted Chi Square Value			190.7219							
Anderson-Darling Test Statistic			28.04752							
Anderson-Darling 5% Critical Value			0.796174							
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level					
Kolmogrov-Smirnov Test Statistic			0.428236							
Kolmogrov-Smirnov 5% Critical Value			0.078803							
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level					
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level					
95% Approximate Gamma UCL			1.294938							
95% Adjusted Gamma UCL			1.296927							
Lognormal Statistics										
Minimum of log data			-1.609438							
Maximum of log data			3.912023							
Mean of log data			-0.708771							
Standard Deviation of log data			0.817202							
Variance of log data			0.667819							
Lilliefors Test Statisitic			0.342047							
Lilliefors 5% Critical Value			0.071629							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level					
MLE Mean			0.687385							
MLE Standard Deviation			0.669973							
MLE Coefficient of Variation			0.974669							
MLE Skewness			3.849924							
MLE Median			0.492249							
MLE 80% Quantile			0.98193							
MLE 90% Quantile			1.406823							
MLE 95% Quantile			1.888016							
MLE 99% Quantile			3.293798							
MVU Estimate of Median			0.491176							
MVU Estimate of Mean			0.685399							
MVU Estimate of Standard Deviation			0.660387							
MVU Estimate of SE of Mean			0.051823							
95% H-UCL			0.785743							
95% Chebyshev (MVUE) UCL			0.911289							
97.5% Chebyshev (MVUE) UCL			1.009032							
99% Chebyshev (MVUE) UCL			1.201029							
Non-parametric Statisitics										
95% CLT UCL			1.684194							
95% Adjusted-CLT UCL			1.985051							
95% Modified-t UCL			1.734699							
95% Jackknife UCL			1.687772							
95% Chebyshev (Mean, Sd) UCL			2.646941							
97.5% Chebyshev (Mean, Sd) UCL			3.315992							
99% Chebyshev (Mean, Sd) UCL			4.630214							
Bootstrap Statistics										
Number of Bootstrap Runs			2000							
95% Standard Bootstrap UCL			1.67282							
95% Bootstrap-t UCL			3.49235							
95% Hall's Bootstrap UCL			3.6816							
95% Percentile Bootstrap UCL			1.784052							
95% BCA Bootstrap UCL			2.264444							
Recommendations										
Human Inspection Recommended?			NO							
Appropriate Distribution			NON-PARAMETRIC							
1st Recommended UCL			2.646941		95% Chebyshev (Mean, Sd) UCL					
2nd Recommended UCL										
3rd Recommended UCL										
Recommended UCL > Max Data Value										
Recommendation Warning!			NONE							
Alternative UCL			NONE							

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Indus-121304.xls								
Variable:	Methyl tert-Butyl Ether								
Raw Statistics									
Number of Observations	70								
Number of Missing Data	0								
Number of Valid Observations	70								
Number of Distinct Observations	32								
Minimum	0.1								
Maximum	4000								
Mean	57.747								
Standard Deviation	478.0186								
Variance	228501.8								
Coefficient of Variation	8.277809								
Skewness	8.366577								
Too Few Distinct Observations?	NO								
Normal Statistics									
Lilliefors Test Statisitic	0.531305								
Lilliefors 5% Critical Value	0.105897								
Shapiro-Wilk Test Statisitic	N/A								
Shapiro-Wilk 5% Critical Value	N/A								
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level							
95% Student's-t UCL	153.0032								
Gamma Statistics									
k hat	0.158702								
k star (bias corrected)	0.161425								
Theta hat	363.8697								
Theta star	357.7334								
nu hat	22.21834								
nu star	22.59946								
5% Approximate Chi Square Value	12.78705								
Adjusted Level of Significance	0.046571								
Adjusted Chi Square Value	12.6315								
Anderson-Darling Test Statistic	23.57688								
Anderson-Darling 5% Critical Value	0.943512								
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level							
Kolmogrov-Smirnov Test Statistic	0.484275								
Kolmogrov-Smirnov 5% Critical Value	0.119466								
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level							
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level							
95% Approximate Gamma UCL	102.0603								
95% Adjusted Gamma UCL	103.3172								
Lognormal Statistics									
Minimum of log data	-2.302585								
Maximum of log data	8.29405								
Mean of log data	-0.746985								
Standard Deviation of log data	1.365064								
Variance of log data	1.863399								
Lilliefors Test Statisitic	0.265942								
Lilliefors 5% Critical Value	0.105897								
Shapiro-Wilk Test Statisitic	N/A								
Shapiro-Wilk 5% Critical Value	N/A								
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level							
MLE Mean	1.202875								
MLE Standard Deviation	2.807008								
MLE Coefficient of Variation	2.333582								
MLE Skewness	19.70852								
MLE Median	0.473793								
MLE 80% Quantile	1.501544								
MLE 90% Quantile	2.73771								
MLE 95% Quantile	4.475173								
MLE 99% Quantile	11.33792								
MVU Estimate of Median	0.467527								
MVU Estimate of Mean	1.173401								
MVU Estimate of Standard Deviation	2.481559								
MVU Estimate of SE of Mean	0.251357								
95% H-UCL	1.855318								
95% Chebyshev (MVUE) UCL	2.269041								
97.5% Chebyshev (MVUE) UCL	2.743125								
99% Chebyshev (MVUE) UCL	3.674372								
Non-parametric Statisitics									
95% CLT UCL	151.7243								
95% Adjusted-CLT UCL	212.7728								
95% Modified-t UCL	162.5256								
95% Jackknife UCL	153.0032								
95% Chebyshev (Mean, Sd) UCL	306.789								
97.5% Chebyshev (Mean, Sd) UCL	414.5497								
99% Chebyshev (Mean, Sd) UCL	626.2247								
Bootstrap Statistics									
Number of Bootstrap Runs	2000								
95% Standard Bootstrap UCL	149.7044								
95% Bootstrap-t UCL	51071.49								
95% Hall's Bootstrap UCL	21543.6								
95% Percentile Bootstrap UCL	172.0229								
95% BCA Bootstrap UCL	229.2507								
Recommendations									
Human Inspection Recommended?	NO								
Appropriate Distribution	NON-PARAMETRIC								
1st Recommended UCL	414.5497	97.5% Chebyshev (Mean, Sd) UCL							
2nd Recommended UCL									
3rd Recommended UCL									
Recommended UCL > Max Data Value									
Recommendation Warning!	NONE								
Alternative UCL	NONE								

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Indus-121304.xls							
Variable:			Tetrachloroethene							
Raw Statistics										
Number of Observations			153							
Number of Missing Data			0							
Number of Valid Observations			153							
Number of Distinct Observations			14							
Minimum			0.21							
Maximum			5							
Mean			0.489542							
Standard Deviation			0.498494							
Variance			0.248496							
Coefficient of Variation			1.018286							
Skewness			6.107266							
Too Few Distinct Observations?			NO							
Normal Statistics										
Lilliefors Test Statisitic			0.419736							
Lilliefors 5% Critical Value			0.071629							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level					
95% Student's-t UCL			0.556238							
Gamma Statistics										
k hat			2.825271							
k star (bias corrected)			2.774231							
Theta hat			0.173273							
Theta star			0.176461							
nu hat			864.5328							
nu star			848.9145							
5% Approximate Chi Square Value			782.2808							
Adjusted Level of Significance			0.048431							
Adjusted Chi Square Value			781.6798							
Anderson-Darling Test Statistic			16.94242							
Anderson-Darling 5% Critical Value			0.760606							
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level					
Kolmogrov-Smirnov Test Statistic			0.3352							
Kolmogrov-Smirnov 5% Critical Value			0.07637							
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level					
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level					
95% Approximate Gamma UCL			0.531241							
95% Adjusted Gamma UCL			0.53165							
Lognormal Statistics										
Minimum of log data			-1.560648							
Maximum of log data			1.609438							
Mean of log data			-0.901574							
Standard Deviation of log data			0.519611							
Variance of log data			0.269995							
Lilliefors Test Statisitic			0.27227							
Lilliefors 5% Critical Value			0.071629							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level					
MLE Mean			0.464601							
MLE Standard Deviation			0.258661							
MLE Coefficient of Variation			0.556739							
MLE Skewness			1.842783							
MLE Median			0.40593							
MLE 80% Quantile			0.629705							
MLE 90% Quantile			0.791461							
MLE 95% Quantile			0.954264							
MLE 99% Quantile			1.359396							
MVU Estimate of Median			0.405572							
MVU Estimate of Mean			0.464137							
MVU Estimate of Standard Deviation			0.257386							
MVU Estimate of SE of Mean			0.020698							
95% H-UCL			0.501703							
95% Chebyshev (MVUE) UCL			0.554356							
97.5% Chebyshev (MVUE) UCL			0.593394							
99% Chebyshev (MVUE) UCL			0.670076							
Non-parametric Statisitics										
95% CLT UCL			0.555832							
95% Adjusted-CLT UCL			0.577093							
95% Modified-t UCL			0.559554							
95% Jackknife UCL			0.556238							
95% Chebyshev (Mean, Sd) UCL			0.66521							
97.5% Chebyshev (Mean, Sd) UCL			0.741221							
99% Chebyshev (Mean, Sd) UCL			0.890531							
Bootstrap Statistics										
Number of Bootstrap Runs			2000							
95% Standard Bootstrap UCL			0.55814							
95% Bootstrap-t UCL			0.595658							
95% Hall's Bootstrap UCL			0.645743							
95% Percentile Bootstrap UCL			0.563399							
95% BCA Bootstrap UCL			0.589346							
Recommendations										
Human Inspection Recommended?			NO							
Appropriate Distribution			NON-PARAMETRIC							
1st Recommended UCL			0.66521		95% Chebyshev (Mean, Sd) UCL					
2nd Recommended UCL										
3rd Recommended UCL										
Recommended UCL > Max Data Value										
Recommendation Warning!			NONE							
Alternative UCL			NONE							

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-all-B+T-011705.xls										
Variable:	Toluene										
Raw Statistics											
Number of Observations	445										
Number of Missing Data	0										
Number of Valid Observations	445										
Number of Distinct Observations	71										
Minimum	0.1										
Maximum	3600										
Mean	70.35176										
Standard Deviation	358.2093										
Variance	128313.9										
Coefficient of Variation	5.091689										
Skewness	6.841421										
Too Few Distinct Observations?	NO										
Normal Statistics											
Lilliefors Test Statisitic	0.471514										
Lilliefors 5% Critical Value	0.042										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level									
95% Student's-t UCL	98.341										
Gamma Statistics											
k hat	0.174968										
k star (bias corrected)	0.175286										
Theta hat	402.0841										
Theta star	401.3533										
nu hat	155.7213										
nu star	156.0049										
5% Approximate Chi Square Value	128.1256										
Adjusted Level of Significance	0.049461										
Adjusted Chi Square Value	128.0443										
Anderson-Darling Test Statistic	127.0169										
Anderson-Darling 5% Critical Value	1.010283										
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level									
Kolmogrov-Smirnov Test Statistic	0.477094										
Kolmogrov-Smirnov 5% Critical Value	0.049217										
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level									
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level									
95% Approximate Gamma UCL	85.65983										
95% Adjusted Gamma UCL	85.71423										
Lognormal Statistics											
Minimum of log data	-2.302585										
Maximum of log data	8.188689										
Mean of log data	-0.039913										
Standard Deviation of log data	2.004647										
Variance of log data	4.018611										
Lilliefors Test Statisitic	0.438971										
Lilliefors 5% Critical Value	0.042										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level									
MLE Mean	7.166319										
MLE Standard Deviation	52.96476										
MLE Coefficient of Variation	7.390791										
MLE Skewness	425.8853										
MLE Median	0.960873										
MLE 80% Quantile	5.227921										
MLE 90% Quantile	12.62979										
MLE 95% Quantile	25.99051										
MLE 99% Quantile	101.7884										
MVU Estimate of Median	0.956544										
MVU Estimate of Mean	7.070781										
MVU Estimate of Standard Deviation	48.94712										
MVU Estimate of SE of Mean	1.138679										
95% H-UCL	9.578267										
95% Chebyshev (MVUE) UCL	12.03417										
97.5% Chebyshev (MVUE) UCL	14.18183										
99% Chebyshev (MVUE) UCL	18.40049										
Non-parametric Statisitics											
95% CLT UCL	98.28261										
95% Adjusted-CLT UCL	104.167										
95% Modified-t UCL	99.25886										
95% Jackknife UCL	98.341										
95% Chebyshev (Mean, Sd) UCL	144.3691										
97.5% Chebyshev (Mean, Sd) UCL	176.3965										
99% Chebyshev (Mean, Sd) UCL	239.3081										
Bootstrap Statistics											
Number of Bootstrap Runs	2000										
95% Standard Bootstrap UCL	98.36671										
95% Bootstrap-t UCL	109.6255										
95% Hall's Bootstrap UCL	106.7127										
95% Percentile Bootstrap UCL	99.49788										
95% BCA Bootstrap UCL	106.9825										
Recommendations											
Human Inspection Recommended?	NO										
Appropriate Distribution	NON-PARAMETRIC										
1st Recommended UCL	239.3081	99% Chebyshev (Mean, Sd) UCL									
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!	NONE										
Alternative UCL	NONE										

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Indus-121304.xls							
Variable:			Trichloroethene							
Raw Statistics										
Number of Observations			153							
Number of Missing Data			0							
Number of Valid Observations			153							
Number of Distinct Observations			34							
Minimum			0.15							
Maximum			110							
Mean			3.224412							
Standard Deviation			12.37591							
Variance			153.1631							
Coefficient of Variation			3.838191							
Skewness			6.393106							
Too Few Distinct Observations?			NO							
Normal Statistics										
Lilliefors Test Statisitic			0.418763							
Lilliefors 5% Critical Value			0.071629							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level					
95% Student's-t UCL			4.880234							
Gamma Statistics										
k hat			0.399255							
k star (bias corrected)			0.395784							
Theta hat			8.076069							
Theta star			8.1469							
nu hat			122.1721							
nu star			121.1099							
5% Approximate Chi Square Value			96.69193							
Adjusted Level of Significance			0.048431							
Adjusted Chi Square Value			96.48589							
Anderson-Darling Test Statistic			32.61532							
Anderson-Darling 5% Critical Value			0.844275							
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level					
Kolmogrov-Smirnov Test Statistic			0.445759							
Kolmogrov-Smirnov 5% Critical Value			0.081214							
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level					
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level					
95% Approximate Gamma UCL			4.038683							
95% Adjusted Gamma UCL			4.047307							
Lognormal Statistics										
Minimum of log data			-1.89712							
Maximum of log data			4.70048							
Mean of log data			-0.477908							
Standard Deviation of log data			1.264117							
Variance of log data			1.597992							
Lilliefors Test Statisitic			0.378058							
Lilliefors 5% Critical Value			0.071629							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level					
MLE Mean			1.378627							
MLE Standard Deviation			2.737571							
MLE Coefficient of Variation			1.985723							
MLE Skewness			13.78706							
MLE Median			0.620079							
MLE 80% Quantile			1.804478							
MLE 90% Quantile			3.147104							
MLE 95% Quantile			4.960788							
MLE 99% Quantile			11.73327							
MVU Estimate of Median			0.61685							
MVU Estimate of Mean			1.365921							
MVU Estimate of Standard Deviation			2.610355							
MVU Estimate of SE of Mean			0.182946							
95% H-UCL			1.764607							
95% Chebyshev (MVUE) UCL			2.163366							
97.5% Chebyshev (MVUE) UCL			2.508421							
99% Chebyshev (MVUE) UCL			3.186215							
Non-parametric Statisitics										
95% CLT UCL			4.870142							
95% Adjusted-CLT UCL			5.4227							
95% Modified-t UCL			4.966421							
95% Jackknife UCL			4.880234							
95% Chebyshev (Mean, Sd) UCL			7.585633							
97.5% Chebyshev (Mean, Sd) UCL			9.472738							
99% Chebyshev (Mean, Sd) UCL			13.17959							
Bootstrap Statistics										
Number of Bootstrap Runs			2000							
95% Standard Bootstrap UCL			4.835648							
95% Bootstrap-t UCL			6.176395							
95% Hall's Bootstrap UCL			6.126505							
95% Percentile Bootstrap UCL			5.004575							
95% BCA Bootstrap UCL			5.773627							
Recommendations										
Human Inspection Recommended?			NO							
Appropriate Distribution			NON-PARAMETRIC							
1st Recommended UCL			9.472738		97.5% Chebyshev (Mean, Sd) UCL					
2nd Recommended UCL										
3rd Recommended UCL										
Recommended UCL > Max Data Value										
Recommendation Warning!			NONE							
Alternative UCL			NONE							

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Indus-121304.xls							
Variable:			Vinyl Chloride							
Raw Statistics										
Number of Observations			153							
Number of Missing Data			0							
Number of Valid Observations			153							
Number of Distinct Observations			8							
Minimum			0.25							
Maximum			5							
Mean			0.482745							
Standard Deviation			0.485168							
Variance			0.235388							
Coefficient of Variation			1.00502							
Skewness			6.484292							
Too Few Distinct Observations?			NO							
Normal Statistics										
Lilliefors Test Statisitic			0.420455							
Lilliefors 5% Critical Value			0.071629							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level					
95% Student's-t UCL			0.547658							
Gamma Statistics										
k hat			2.972997							
k star (bias corrected)			2.91906							
Theta hat			0.162377							
Theta star			0.165377							
nu hat			909.737							
nu star			893.2323							
5% Approximate Chi Square Value			824.8511							
Adjusted Level of Significance			0.048431							
Adjusted Chi Square Value			824.2337							
Anderson-Darling Test Statistic			17.53494							
Anderson-Darling 5% Critical Value			0.759683							
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level					
Kolmogrov-Smirnov Test Statistic			0.334005							
Kolmogrov-Smirnov 5% Critical Value			0.076298							
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level					
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level					
95% Approximate Gamma UCL			0.522765							
95% Adjusted Gamma UCL			0.523157							
Lognormal Statistics										
Minimum of log data			-1.386294							
Maximum of log data			1.609438							
Mean of log data			-0.905774							
Standard Deviation of log data			0.506065							
Variance of log data			0.256101							
Lilliefors Test Statisitic			0.271826							
Lilliefors 5% Critical Value			0.071629							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level					
MLE Mean			0.459451							
MLE Standard Deviation			0.248224							
MLE Coefficient of Variation			0.540263							
MLE Skewness			1.778482							
MLE Median			0.404229							
MLE 80% Quantile			0.61993							
MLE 90% Quantile			0.774544							
MLE 95% Quantile			0.929324							
MLE 99% Quantile			1.311711							
MVU Estimate of Median			0.403891							
MVU Estimate of Mean			0.459018							
MVU Estimate of Standard Deviation			0.24707							
MVU Estimate of SE of Mean			0.019878							
95% H-UCL			0.495001							
95% Chebyshev (MVUE) UCL			0.545666							
97.5% Chebyshev (MVUE) UCL			0.583159							
99% Chebyshev (MVUE) UCL			0.656806							
Non-parametric Statisitics										
95% CLT UCL			0.547262							
95% Adjusted-CLT UCL			0.569233							
95% Modified-t UCL			0.551085							
95% Jackknife UCL			0.547658							
95% Chebyshev (Mean, Sd) UCL			0.653717							
97.5% Chebyshev (Mean, Sd) UCL			0.727696							
99% Chebyshev (Mean, Sd) UCL			0.873014							
Bootstrap Statistics										
Number of Bootstrap Runs			2000							
95% Standard Bootstrap UCL			0.546405							
95% Bootstrap-t UCL			0.597817							
95% Hall's Bootstrap UCL			0.792708							
95% Percentile Bootstrap UCL			0.553007							
95% BCA Bootstrap UCL			0.57915							
Recommendations										
Human Inspection Recommended?			NO							
Appropriate Distribution			NON-PARAMETRIC							
1st Recommended UCL			0.653717		95% Chebyshev (Mean, Sd) UCL					
2nd Recommended UCL										
3rd Recommended UCL										
Recommended UCL > Max Data Value										
Recommendation Warning!			NONE							
Alternative UCL			NONE							

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Indus-121304.xls	
Variable:	Xylene, total	
Raw Statistics		
Number of Observations	153	
Number of Missing Data	0	
Number of Valid Observations	153	
Number of Distinct Observations	24	
Minimum	0.25	
Maximum	120	
Mean	2.910327	
Standard Deviation	11.98963	
Variance	143.7513	
Coefficient of Variation	4.119686	
Skewness	7.581297	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.425686	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	4.514467	
Gamma Statistics		
k hat	0.407966	
k star (bias corrected)	0.404324	
Theta hat	7.133749	
Theta star	7.198008	
nu hat	124.8376	
nu star	123.7231	
5% Approximate Chi Square Value	99.02991	
Adjusted Level of Significance	0.048431	
Adjusted Chi Square Value	98.8213	
Anderson-Darling Test Statistic	34.36214	
Anderson-Darling 5% Critical Value	0.842154	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.469473	
Kolmogrov-Smirnov 5% Critical Value	0.081122	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	3.63602	
95% Adjusted Gamma UCL	3.643696	
Lognormal Statistics		
Minimum of log data	-1.386294	
Maximum of log data	4.787492	
Mean of log data	-0.539596	
Standard Deviation of log data	1.21738	
Variance of log data	1.482013	
Lilliefors Test Statisitic	0.393324	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	1.223127	
MLE Standard Deviation	2.255931	
MLE Coefficient of Variation	1.844396	
MLE Skewness	11.80745	
MLE Median	0.582984	
MLE 80% Quantile	1.630831	
MLE 90% Quantile	2.786362	
MLE 95% Quantile	4.318869	
MLE 99% Quantile	9.894994	
MVU Estimate of Median	0.580167	
MVU Estimate of Mean	1.212994	
MVU Estimate of Standard Deviation	2.161925	
MVU Estimate of SE of Mean	0.154195	
95% H-UCL	1.544466	
95% Chebyshev (MVUE) UCL	1.885113	
97.5% Chebyshev (MVUE) UCL	2.175939	
99% Chebyshev (MVUE) UCL	2.747212	
Non-parametric Statisitics		
95% CLT UCL	4.504691	
95% Adjusted-CLT UCL	5.139493	
95% Modified-t UCL	4.613484	
95% Jackknife UCL	4.514467	
95% Chebyshev (Mean, Sd) UCL	7.135427	
97.5% Chebyshev (Mean, Sd) UCL	8.963631	
99% Chebyshev (Mean, Sd) UCL	12.55478	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	4.478752	
95% Bootstrap-t UCL	6.685674	
95% Hall's Bootstrap UCL	10.86315	
95% Percentile Bootstrap UCL	4.761699	
95% BCA Bootstrap UCL	5.376144	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	8.963631	97.5% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Indus-121304.xls							
Variable:			2-Chloronaphthalene							
Raw Statistics										
Number of Observations			68							
Number of Missing Data			0							
Number of Valid Observations			68							
Number of Distinct Observations			5							
Minimum			0.45							
Maximum			22							
Mean			0.873529							
Standard Deviation			2.619722							
Variance			6.862946							
Coefficient of Variation			2.999009							
Skewness			8.065428							
Too Few Distinct Observations?			NO							
Normal Statistics										
Lilliefors Test Statisitic			0.483161							
Lilliefors 5% Critical Value			0.107443							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level					
95% Student's-t UCL			1.403406							
Gamma Statistics										
k hat			1.214811							
k star (bias corrected)			1.17102							
Theta hat			0.719066							
Theta star			0.745956							
nu hat			165.2143							
nu star			159.2588							
5% Approximate Chi Square Value			131.0775							
Adjusted Level of Significance			0.046471							
Adjusted Chi Square Value			130.5264							
Anderson-Darling Test Statistic			20.84054							
Anderson-Darling 5% Critical Value			0.775345							
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level					
Kolmogrov-Smirnov Test Statistic			0.523586							
Kolmogrov-Smirnov 5% Critical Value			0.110737							
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level					
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level					
95% Approximate Gamma UCL			1.061335							
95% Adjusted Gamma UCL			1.065817							
Lognormal Statistics										
Minimum of log data			-0.798508							
Maximum of log data			3.091042							
Mean of log data			-0.600231							
Standard Deviation of log data			0.549398							
Variance of log data			0.301838							
Lilliefors Test Statisitic			0.493621							
Lilliefors 5% Critical Value			0.107443							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level					
MLE Mean			0.638067							
MLE Standard Deviation			0.378746							
MLE Coefficient of Variation			0.593584							
MLE Skewness			1.989896							
MLE Median			0.548685							
MLE 80% Quantile			0.872851							
MLE 90% Quantile			1.111538							
MLE 95% Quantile			1.354629							
MLE 99% Quantile			1.969279							
MVU Estimate of Median			0.547468							
MVU Estimate of Mean			0.636449							
MVU Estimate of Standard Deviation			0.374094							
MVU Estimate of SE of Mean			0.04509							
95% H-UCL			0.72415							
95% Chebyshev (MVUE) UCL			0.832992							
97.5% Chebyshev (MVUE) UCL			0.918036							
99% Chebyshev (MVUE) UCL			1.085088							
Non-parametric Statisitics										
95% CLT UCL			1.39608							
95% Adjusted-CLT UCL			1.728092							
95% Modified-t UCL			1.455193							
95% Jackknife UCL			1.403406							
95% Chebyshev (Mean, Sd) UCL			2.258299							
97.5% Chebyshev (Mean, Sd) UCL			2.85749							
99% Chebyshev (Mean, Sd) UCL			4.034485							
Bootstrap Statistics										
Number of Bootstrap Runs			2000							
95% Standard Bootstrap UCL			1.401508							
95% Bootstrap-t UCL			5.712041							
95% Hall's Bootstrap UCL			5.261298							
95% Percentile Bootstrap UCL			1.489706							
95% BCA Bootstrap UCL			1.855882							
Recommendations										
Human Inspection Recommended?			NO							
Appropriate Distribution			NON-PARAMETRIC							
1st Recommended UCL			2.258299		95% Chebyshev (Mean, Sd) UCL					
2nd Recommended UCL										
3rd Recommended UCL										
Recommended UCL > Max Data Value										
Recommendation Warning!			NONE							
Alternative UCL			NONE							

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\Air-Indus-121304.xls							
Variable:			Naphthalene							
Raw Statistics										
Number of Observations			68							
Number of Missing Data			0							
Number of Valid Observations			68							
Number of Distinct Observations			15							
Minimum			0.45							
Maximum			220							
Mean			6.727206							
Standard Deviation			28.56738							
Variance			816.0954							
Coefficient of Variation			4.246545							
Skewness			6.669652							
Too Few Distinct Observations?			NO							
Normal Statistics										
Lilliefors Test Statisitic			0.413039							
Lilliefors 5% Critical Value			0.107443							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level					
95% Student's-t UCL			12.50537							
Gamma Statistics										
k hat			0.334087							
k star (bias corrected)			0.329152							
Theta hat			20.13609							
Theta star			20.438							
nu hat			45.43584							
nu star			44.76465							
5% Approximate Chi Square Value			30.41542							
Adjusted Level of Significance			0.046471							
Adjusted Chi Square Value			30.15923							
Anderson-Darling Test Statistic			17.3659							
Anderson-Darling 5% Critical Value			0.856925							
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level					
Kolmogrov-Smirnov Test Statistic			0.485006							
Kolmogrov-Smirnov 5% Critical Value			0.116893							
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level					
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level					
95% Approximate Gamma UCL			9.900932							
95% Adjusted Gamma UCL			9.985038							
Lognormal Statistics										
Minimum of log data			-0.798508							
Maximum of log data			5.393628							
Mean of log data			-0.121926							
Standard Deviation of log data			1.409051							
Variance of log data			1.985424							
Lilliefors Test Statisitic			0.46623							
Lilliefors 5% Critical Value			0.107443							
Shapiro-Wilk Test Statisitic			N/A							
Shapiro-Wilk 5% Critical Value			N/A							
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level					
MLE Mean			2.388787							
MLE Standard Deviation			5.9873							
MLE Coefficient of Variation			2.506419							
MLE Skewness			23.26492							
MLE Median			0.885214							
MLE 80% Quantile			2.911655							
MLE 90% Quantile			5.412461							
MLE 95% Quantile			8.988645							
MLE 99% Quantile			23.46537							
MVU Estimate of Median			0.872382							
MVU Estimate of Mean			2.322877							
MVU Estimate of Standard Deviation			5.210287							
MVU Estimate of SE of Mean			0.526338							
95% H-UCL			3.798165							
95% Chebyshev (MVUE) UCL			4.617131							
97.5% Chebyshev (MVUE) UCL			5.609856							
99% Chebyshev (MVUE) UCL			7.559872							
Non-parametric Statisitics										
95% CLT UCL			12.42548							
95% Adjusted-CLT UCL			15.41943							
95% Modified-t UCL			12.97237							
95% Jackknife UCL			12.50537							
95% Chebyshev (Mean, Sd) UCL			21.82776							
97.5% Chebyshev (Mean, Sd) UCL			28.36178							
99% Chebyshev (Mean, Sd) UCL			41.1966							
Bootstrap Statistics										
Number of Bootstrap Runs			2000							
95% Standard Bootstrap UCL			12.42423							
95% Bootstrap-t UCL			31.55045							
95% Hall's Bootstrap UCL			31.7593							
95% Percentile Bootstrap UCL			13.2							
95% BCA Bootstrap UCL			17.04926							
Recommendations										
Human Inspection Recommended?			NO							
Appropriate Distribution			NON-PARAMETRIC							
1st Recommended UCL			28.36178		97.5% Chebyshev (Mean, Sd) UCL					
2nd Recommended UCL										
3rd Recommended UCL										
Recommended UCL > Max Data Value										
Recommendation Warning!			NONE							
Alternative UCL			NONE							

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls	
Variable:	1,1-Dichloroethene	
Raw Statistics		
Number of Observations	153	
Number of Missing Data	0	
Number of Valid Observations	153	
Number of Distinct Observations	17	
Minimum	0.25	
Maximum	8.4	
Mean	0.625458	
Standard Deviation	0.921163	
Variance	0.848541	
Coefficient of Variation	1.472782	
Skewness	5.674386	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.443055	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.748704	
Gamma Statistics		
k hat	1.676196	
k star (bias corrected)	1.647687	
Theta hat	0.373141	
Theta star	0.379597	
nu hat	512.9161	
nu star	504.1922	
5% Approximate Chi Square Value	453.1107	
Adjusted Level of Significance	0.048431	
Adjusted Chi Square Value	452.6553	
Anderson-Darling Test Statistic	20.31347	
Anderson-Darling 5% Critical Value	0.768903	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.394939	
Kolmogrov-Smirnov 5% Critical Value	0.077042	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.695969	
95% Adjusted Gamma UCL	0.696669	
Lognormal Statistics		
Minimum of log data	-1.386294	
Maximum of log data	2.128232	
Mean of log data	-0.796306	
Standard Deviation of log data	0.64758	
Variance of log data	0.41936	
Lilliefors Test Statisitic	0.325606	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.556201	
MLE Standard Deviation	0.401463	
MLE Coefficient of Variation	0.721795	
MLE Skewness	2.541433	
MLE Median	0.450992	
MLE 80% Quantile	0.779501	
MLE 90% Quantile	1.036485	
MLE 95% Quantile	1.308608	
MLE 99% Quantile	2.033922	
MVU Estimate of Median	0.450374	
MVU Estimate of Mean	0.555283	
MVU Estimate of Standard Deviation	0.39819	
MVU Estimate of SE of Mean	0.031795	
95% H-UCL	0.61453	
95% Chebyshev (MVUE) UCL	0.693872	
97.5% Chebyshev (MVUE) UCL	0.75384	
99% Chebyshev (MVUE) UCL	0.871634	
Non-parametric Statisitics		
95% CLT UCL	0.747952	
95% Adjusted-CLT UCL	0.784457	
95% Modified-t UCL	0.754397	
95% Jackknife UCL	0.748704	
95% Chebyshev (Mean, Sd) UCL	0.950072	
97.5% Chebyshev (Mean, Sd) UCL	1.090532	
99% Chebyshev (Mean, Sd) UCL	1.36644	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.751964	
95% Bootstrap-t UCL	0.822481	
95% Hall's Bootstrap UCL	0.824393	
95% Percentile Bootstrap UCL	0.75915	
95% BCA Bootstrap UCL	0.800784	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.950072	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls								
Variable:			1,2-Dichloroethane								
Raw Statistics											
Number of Observations			153								
Number of Missing Data			0								
Number of Valid Observations			153								
Number of Distinct Observations			9								
Minimum			0.17								
Maximum			48								
Mean			0.767451								
Standard Deviation			3.86999								
Variance			14.97682								
Coefficient of Variation			5.042655								
Skewness			12.12716								
Too Few Distinct Observations?			NO								
Normal Statistics											
Lilliefors Test Statisitic			0.481797								
Lilliefors 5% Critical Value			0.071629								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level						
95% Student's-t UCL			1.285232								
Gamma Statistics											
k hat			0.905441								
k star (bias corrected)			0.892045								
Theta hat			0.847599								
Theta star			0.860328								
nu hat			277.065								
nu star			272.9657								
5% Approximate Chi Square Value			235.696								
Adjusted Level of Significance			0.048431								
Adjusted Chi Square Value			235.3698								
Anderson-Darling Test Statistic			1.8E+308								
Anderson-Darling 5% Critical Value			0.788082								
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level						
Kolmogrov-Smirnov Test Statistic			0.460808								
Kolmogrov-Smirnov 5% Critical Value			0.078302								
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level						
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level						
95% Approximate Gamma UCL			0.888805								
95% Adjusted Gamma UCL			0.890037								
Lognormal Statistics											
Minimum of log data			-1.771957								
Maximum of log data			3.871201								
Mean of log data			-0.909861								
Standard Deviation of log data			0.613374								
Variance of log data			0.376228								
Lilliefors Test Statisitic			0.316175								
Lilliefors 5% Critical Value			0.071629								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level						
MLE Mean			0.485903								
MLE Standard Deviation			0.328399								
MLE Coefficient of Variation			0.675854								
MLE Skewness			2.336278								
MLE Median			0.40258								
MLE 80% Quantile			0.676002								
MLE 90% Quantile			0.885436								
MLE 95% Quantile			1.10422								
MLE 99% Quantile			1.676733								
MVU Estimate of Median			0.402086								
MVU Estimate of Mean			0.485196								
MVU Estimate of Standard Deviation			0.32604								
MVU Estimate of SE of Mean			0.026094								
95% H-UCL			0.533468								
95% Chebyshev (MVUE) UCL			0.598937								
97.5% Chebyshev (MVUE) UCL			0.648152								
99% Chebyshev (MVUE) UCL			0.744827								
Non-parametric Statisitics											
95% CLT UCL			1.282077								
95% Adjusted-CLT UCL			1.609838								
95% Modified-t UCL			1.336356								
95% Jackknife UCL			1.285232								
95% Chebyshev (Mean, Sd) UCL			2.13122								
97.5% Chebyshev (Mean, Sd) UCL			2.721325								
99% Chebyshev (Mean, Sd) UCL			3.88047								
Bootstrap Statistics											
Number of Bootstrap Runs			2000								
95% Standard Bootstrap UCL			1.292626								
95% Bootstrap-t UCL			6.4871								
95% Hall's Bootstrap UCL			3.443588								
95% Percentile Bootstrap UCL			1.382941								
95% BCA Bootstrap UCL			1.740196								
Recommendations											
Human Inspection Recommended?			NO								
Appropriate Distribution			NON-PARAMETRIC								
1st Recommended UCL			2.13122		95% Chebyshev (Mean, Sd) UCL						
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!			NONE								
Alternative UCL			NONE								

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls	
Variable:	1,4-Dichlorobenzene	
Raw Statistics		
Number of Observations	149	
Number of Missing Data	0	
Number of Valid Observations	149	
Number of Distinct Observations	13	
Minimum	0.125	
Maximum	6	
Mean	0.56557	
Standard Deviation	0.796316	
Variance	0.634118	
Coefficient of Variation	1.407986	
Skewness	4.763891	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.445564	
Lilliefors 5% Critical Value	0.072584	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.673551	
Gamma Statistics		
k hat	1.720395	
k star (bias corrected)	1.69023	
Theta hat	0.328745	
Theta star	0.334612	
nu hat	512.6776	
nu star	503.6886	
5% Approximate Chi Square Value	452.6332	
Adjusted Level of Significance	0.048389	
Adjusted Chi Square Value	452.1656	
Anderson-Darling Test Statistic	19.57122	
Anderson-Darling 5% Critical Value	0.768415	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.372676	
Kolmogrov-Smirnov 5% Critical Value	0.078054	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.629365	
95% Adjusted Gamma UCL	0.630016	
Lognormal Statistics		
Minimum of log data	-2.079442	
Maximum of log data	1.791759	
Mean of log data	-0.887873	
Standard Deviation of log data	0.634923	
Variance of log data	0.403127	
Lilliefors Test Statisitic	0.292291	
Lilliefors 5% Critical Value	0.072584	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.503431	
MLE Standard Deviation	0.35473	
MLE Coefficient of Variation	0.704626	
MLE Skewness	2.463721	
MLE Median	0.41153	
MLE 80% Quantile	0.703728	
MLE 90% Quantile	0.930534	
MLE 95% Quantile	1.169499	
MLE 99% Quantile	1.802109	
MVU Estimate of Median	0.410974	
MVU Estimate of Mean	0.502616	
MVU Estimate of Standard Deviation	0.351896	
MVU Estimate of SE of Mean	0.028499	
95% H-UCL	0.555684	
95% Chebyshev (MVUE) UCL	0.62684	
97.5% Chebyshev (MVUE) UCL	0.680592	
99% Chebyshev (MVUE) UCL	0.786177	
Non-parametric Statisitics		
95% CLT UCL	0.672875	
95% Adjusted-CLT UCL	0.70008	
95% Modified-t UCL	0.677795	
95% Jackknife UCL	0.673551	
95% Chebyshev (Mean, Sd) UCL	0.849931	
97.5% Chebyshev (Mean, Sd) UCL	0.972974	
99% Chebyshev (Mean, Sd) UCL	1.214668	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.67255	
95% Bootstrap-t UCL	0.72037	
95% Hall's Bootstrap UCL	0.693929	
95% Percentile Bootstrap UCL	0.67594	
95% BCA Bootstrap UCL	0.69896	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.849931	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls										
Variable:	Acetone										
Raw Statistics											
Number of Observations	153										
Number of Missing Data	0										
Number of Valid Observations	153										
Number of Distinct Observations	24										
Minimum	1.65										
Maximum	16000										
Mean	147.3794										
Standard Deviation	1324.728										
Variance	1754904										
Coefficient of Variation	8.988556										
Skewness	11.52276										
Too Few Distinct Observations?	NO										
Normal Statistics											
Lilliefors Test Statisitic	0.483548										
Lilliefors 5% Critical Value	0.071629										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Normality Test Result	NOT NORMAL		Data not normal at 5% significance level								
95% Student's-t UCL	324.62										
Gamma Statistics											
k hat	0.205352										
k star (bias corrected)	0.205683										
Theta hat	717.6906										
Theta star	716.5364										
nu hat	62.8378										
nu star	62.93902										
5% Approximate Chi Square Value	45.68616										
Adjusted Level of Significance	0.048431										
Adjusted Chi Square Value	45.54696										
Anderson-Darling Test Statistic	51.85276										
Anderson-Darling 5% Critical Value	0.910915										
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA		Data not gamma distributed at 5% significance level								
Kolmogrov-Smirnov Test Statistic	0.495727										
Kolmogrov-Smirnov 5% Critical Value	0.083843										
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA		Data not gamma distributed at 5% significance level								
5% Gamma Test Result	NOT GAMMA		Data not gamma distributed at 5% significance level								
95% Approximate Gamma UCL	203.0356										
95% Adjusted Gamma UCL	203.6561										
Lognormal Statistics											
Minimum of log data	0.500775										
Maximum of log data	9.680344										
Mean of log data	1.424081										
Standard Deviation of log data	1.30981										
Variance of log data	1.715601										
Lilliefors Test Statisitic	0.447794										
Lilliefors 5% Critical Value	0.071629										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Lognormality Test Result	NOT LOGNORMAL		Data not lognormal at 5% significance level								
MLE Mean	9.795092										
MLE Standard Deviation	20.91664										
MLE Coefficient of Variation	2.13542										
MLE Skewness	16.14382										
MLE Median	4.154037										
MLE 80% Quantile	12.56443										
MLE 90% Quantile	22.35805										
MLE 95% Quantile	35.82757										
MLE 99% Quantile	87.41773										
MVU Estimate of Median	4.130812										
MVU Estimate of Mean	9.695157										
MVU Estimate of Standard Deviation	19.83808										
MVU Estimate of SE of Mean	1.364745										
95% H-UCL	12.70984										
95% Chebyshev (MVUE) UCL	15.64394										
97.5% Chebyshev (MVUE) UCL	18.21799										
99% Chebyshev (MVUE) UCL	23.2742										
Non-parametric Statisitics											
95% CLT UCL	323.5398										
95% Adjusted-CLT UCL	430.1435										
95% Modified-t UCL	341.248										
95% Jackknife UCL	324.62										
95% Chebyshev (Mean, Sd) UCL	614.2084										
97.5% Chebyshev (Mean, Sd) UCL	816.2057										
99% Chebyshev (Mean, Sd) UCL	1212.99										
Bootstrap Statistics											
Number of Bootstrap Runs	2000										
95% Standard Bootstrap UCL	325.2308										
95% Bootstrap-t UCL	1386.099										
95% Hall's Bootstrap UCL	1457.604										
95% Percentile Bootstrap UCL	355.4827										
95% BCA Bootstrap UCL	584.633										
Recommendations											
Human Inspection Recommended?	NO										
Appropriate Distribution	NON-PARAMETRIC										
1st Recommended UCL	816.2057		97.5% Chebyshev (Mean, Sd) UCL								
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!	NONE										
Alternative UCL	NONE										

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-all-B+T-011705.xls								
Variable:			Benzene								
Raw Statistics											
Number of Observations			445								
Number of Missing Data			0								
Number of Valid Observations			445								
Number of Distinct Observations			88								
Minimum			0.1								
Maximum			69000								
Mean			583.663								
Standard Deviation			3826.824								
Variance			14644579								
Coefficient of Variation			6.556564								
Skewness			13.90764								
Too Few Distinct Observations?			NO								
Normal Statistics											
Lilliefors Test Statisitic			0.439399								
Lilliefors 5% Critical Value			0.042								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level						
95% Student's-t UCL			882.6778								
Gamma Statistics											
k hat			0.137123								
k star (bias corrected)			0.137697								
Theta hat			4256.484								
Theta star			4238.749								
nu hat			122.0397								
nu star			122.5503								
5% Approximate Chi Square Value			97.98027								
Adjusted Level of Significance			0.049461								
Adjusted Chi Square Value			97.90951								
Anderson-Darling Test Statistic			101.258								
Anderson-Darling 5% Critical Value			1.150786								
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level						
Kolmogrov-Smirnov Test Statistic			0.400019								
Kolmogrov-Smirnov 5% Critical Value			0.051492								
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level						
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level						
95% Approximate Gamma UCL			730.0253								
95% Adjusted Gamma UCL			730.553								
Lognormal Statistics											
Minimum of log data			-2.302585								
Maximum of log data			11.14186								
Mean of log data			0.691699								
Standard Deviation of log data			2.906458								
Variance of log data			8.447495								
Lilliefors Test Statisitic			0.390996								
Lilliefors 5% Critical Value			0.042								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level						
MLE Mean			136.3803								
MLE Standard Deviation			9312.265								
MLE Coefficient of Variation			68.28161								
MLE Skewness			318559.6								
MLE Median			1.997106								
MLE 80% Quantile			23.28143								
MLE 90% Quantile			83.63795								
MLE 95% Quantile			238.1313								
MLE 99% Quantile			1723.512								
MVU Estimate of Median			1.97824								
MVU Estimate of Mean			129.9436								
MVU Estimate of Standard Deviation			6833.055								
MVU Estimate of SE of Mean			38.60726								
95% H-UCL			239.5228								
95% Chebyshev (MVUE) UCL			298.2287								
97.5% Chebyshev (MVUE) UCL			371.0458								
99% Chebyshev (MVUE) UCL			514.0809								
Non-parametric Statisitics											
95% CLT UCL			882.054								
95% Adjusted-CLT UCL			1009.848								
95% Modified-t UCL			902.6112								
95% Jackknife UCL			882.6778								
95% Chebyshev (Mean, Sd) UCL			1374.406								
97.5% Chebyshev (Mean, Sd) UCL			1716.561								
99% Chebyshev (Mean, Sd) UCL			2388.658								
Bootstrap Statistics											
Number of Bootstrap Runs			2000								
95% Standard Bootstrap UCL			881.9074								
95% Bootstrap-t UCL			1214.121								
95% Hall's Bootstrap UCL			2037.399								
95% Percentile Bootstrap UCL			911.3593								
95% BCA Bootstrap UCL			1062.223								
Recommendations											
Human Inspection Recommended?			NO								
Appropriate Distribution			NON-PARAMETRIC								
1st Recommended UCL			2388.658		99% Chebyshev (Mean, Sd) UCL						
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!			NONE								
Alternative UCL			NONE								

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls										
Variable:	Chlorobenzene										
Raw Statistics											
Number of Observations	153										
Number of Missing Data	0										
Number of Valid Observations	153										
Number of Distinct Observations	16										
Minimum	0.25										
Maximum	35										
Mean	1.366013										
Standard Deviation	4.081713										
Variance	16.66038										
Coefficient of Variation	2.988048										
Skewness	5.539777										
Too Few Distinct Observations?	NO										
Normal Statistics											
Lilliefors Test Statisitic	0.453293										
Lilliefors 5% Critical Value	0.071629										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Normality Test Result	NOT NORMAL		Data not normal at 5% significance level								
95% Student's-t UCL	1.912122										
Gamma Statistics											
k hat	0.606426										
k star (bias corrected)	0.598893										
Theta hat	2.252562										
Theta star	2.280896										
nu hat	185.5665										
nu star	183.2613										
5% Approximate Chi Square Value	152.9422										
Adjusted Level of Significance	0.048431										
Adjusted Chi Square Value	152.681										
Anderson-Darling Test Statistic	31.61488										
Anderson-Darling 5% Critical Value	0.80949										
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA		Data not gamma distributed at 5% significance level								
Kolmogrov-Smirnov Test Statistic	0.455589										
Kolmogrov-Smirnov 5% Critical Value	0.079562										
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA		Data not gamma distributed at 5% significance level								
5% Gamma Test Result	NOT GAMMA		Data not gamma distributed at 5% significance level								
95% Approximate Gamma UCL	1.63681										
95% Adjusted Gamma UCL	1.63961										
Lognormal Statistics											
Minimum of log data	-1.386294										
Maximum of log data	3.555348										
Mean of log data	-0.705387										
Standard Deviation of log data	0.990679										
Variance of log data	0.981445										
Lilliefors Test Statisitic	0.364352										
Lilliefors 5% Critical Value	0.071629										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Lognormality Test Result	NOT LOGNORMAL		Data not lognormal at 5% significance level								
MLE Mean	0.806812										
MLE Standard Deviation	1.042103										
MLE Coefficient of Variation	1.291631										
MLE Skewness	6.029731										
MLE Median	0.493918										
MLE 80% Quantile	1.140808										
MLE 90% Quantile	1.764092										
MLE 95% Quantile	2.520054										
MLE 99% Quantile	4.94775										
MVU Estimate of Median	0.492336										
MVU Estimate of Mean	0.802999										
MVU Estimate of Standard Deviation	1.01758										
MVU Estimate of SE of Mean	0.077453										
95% H-UCL	0.959513										
95% Chebyshev (MVUE) UCL	1.140611										
97.5% Chebyshev (MVUE) UCL	1.286695										
99% Chebyshev (MVUE) UCL	1.573651										
Non-parametric Statisitics											
95% CLT UCL	1.908793										
95% Adjusted-CLT UCL	2.066708										
95% Modified-t UCL	1.936753										
95% Jackknife UCL	1.912122										
95% Chebyshev (Mean, Sd) UCL	2.804393										
97.5% Chebyshev (Mean, Sd) UCL	3.426781										
99% Chebyshev (Mean, Sd) UCL	4.649342										
Bootstrap Statistics											
Number of Bootstrap Runs	2000										
95% Standard Bootstrap UCL	1.900966										
95% Bootstrap-t UCL	2.222463										
95% Hall's Bootstrap UCL	2.119566										
95% Percentile Bootstrap UCL	1.954248										
95% BCA Bootstrap UCL	2.166667										
Recommendations											
Human Inspection Recommended?	NO										
Appropriate Distribution	NON-PARAMETRIC										
1st Recommended UCL	2.804393		95% Chebyshev (Mean, Sd) UCL								
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!	NONE										
Alternative UCL	NONE										

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls										
Variable:	Chloroethane										
Raw Statistics											
Number of Observations	153										
Number of Missing Data	0										
Number of Valid Observations	153										
Number of Distinct Observations	7										
Minimum	0.25										
Maximum	37										
Mean	1.027778										
Standard Deviation	3.019067										
Variance	9.114766										
Coefficient of Variation	2.937471										
Skewness	11.31601										
Too Few Distinct Observations?	NO										
Normal Statistics											
Lilliefors Test Statisitic	0.451383										
Lilliefors 5% Critical Value	0.071629										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Normality Test Result	NOT NORMAL		Data not normal at 5% significance level								
95% Student's-t UCL	1.431711										
Gamma Statistics											
k hat	1.071996										
k star (bias corrected)	1.055334										
Theta hat	0.958751										
Theta star	0.973888										
nu hat	328.0309										
nu star	322.9323										
5% Approximate Chi Square Value	282.2894										
Adjusted Level of Significance	0.048431										
Adjusted Chi Square Value	281.9317										
Anderson-Darling Test Statistic	1.8E+308										
Anderson-Darling 5% Critical Value	0.781623										
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA		Data not gamma distributed at 5% significance level								
Kolmogrov-Smirnov Test Statistic	0.330456										
Kolmogrov-Smirnov 5% Critical Value	0.077896										
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA		Data not gamma distributed at 5% significance level								
5% Gamma Test Result	NOT GAMMA		Data not gamma distributed at 5% significance level								
95% Approximate Gamma UCL	1.175753										
95% Adjusted Gamma UCL	1.177245										
Lognormal Statistics											
Minimum of log data	-1.386294										
Maximum of log data	3.610918										
Mean of log data	-0.506763										
Standard Deviation of log data	0.83793										
Variance of log data	0.702127										
Lilliefors Test Statisitic	0.309037										
Lilliefors 5% Critical Value	0.071629										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Lognormality Test Result	NOT LOGNORMAL		Data not lognormal at 5% significance level								
MLE Mean	0.855816										
MLE Standard Deviation	0.863501										
MLE Coefficient of Variation	1.00898										
MLE Skewness	4.054121										
MLE Median	0.602443										
MLE 80% Quantile	1.222977										
MLE 90% Quantile	1.768227										
MLE 95% Quantile	2.390809										
MLE 99% Quantile	4.230255										
MVU Estimate of Median	0.601062										
MVU Estimate of Mean	0.853185										
MVU Estimate of Standard Deviation	0.850344										
MVU Estimate of SE of Mean	0.066536										
95% H-UCL	0.982646										
95% Chebyshev (MVUE) UCL	1.14321										
97.5% Chebyshev (MVUE) UCL	1.268704										
99% Chebyshev (MVUE) UCL	1.515213										
Non-parametric Statisitics											
95% CLT UCL	1.429249										
95% Adjusted-CLT UCL	1.66784										
95% Modified-t UCL	1.468926										
95% Jackknife UCL	1.431711										
95% Chebyshev (Mean, Sd) UCL	2.091685										
97.5% Chebyshev (Mean, Sd) UCL	2.552039										
99% Chebyshev (Mean, Sd) UCL	3.456314										
Bootstrap Statistics											
Number of Bootstrap Runs	2000										
95% Standard Bootstrap UCL	1.437735										
95% Bootstrap-t UCL	2.538814										
95% Hall's Bootstrap UCL	2.874155										
95% Percentile Bootstrap UCL	1.468954										
95% BCA Bootstrap UCL	1.763072										
Recommendations											
Human Inspection Recommended?	NO										
Appropriate Distribution	NON-PARAMETRIC										
1st Recommended UCL	2.091685		95% Chebyshev (Mean, Sd) UCL								
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!	NONE										
Alternative UCL	NONE										

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls	
Variable:	Chloroform	
Raw Statistics		
Number of Observations	153	
Number of Missing Data	0	
Number of Valid Observations	153	
Number of Distinct Observations	10	
Minimum	0.25	
Maximum	5	
Mean	0.523725	
Standard Deviation	0.627803	
Variance	0.394137	
Coefficient of Variation	1.198725	
Skewness	5.132483	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.449714	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.607722	
Gamma Statistics		
k hat	2.245556	
k star (bias corrected)	2.205882	
Theta hat	0.233228	
Theta star	0.237422	
nu hat	687.14	
nu star	675	
5% Approximate Chi Square Value	615.7101	
Adjusted Level of Significance	0.048431	
Adjusted Chi Square Value	615.1778	
Anderson-Darling Test Statistic	20.02665	
Anderson-Darling 5% Critical Value	0.764227	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.372594	
Kolmogrov-Smirnov 5% Critical Value	0.076655	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.574158	
95% Adjusted Gamma UCL	0.574655	
Lognormal Statistics		
Minimum of log data	-1.386294	
Maximum of log data	1.609438	
Mean of log data	-0.885674	
Standard Deviation of log data	0.56342	
Variance of log data	0.317442	
Lilliefors Test Statisitic	0.300925	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.483379	
MLE Standard Deviation	0.295459	
MLE Coefficient of Variation	0.611236	
MLE Skewness	2.06207	
MLE Median	0.412436	
MLE 80% Quantile	0.663926	
MLE 90% Quantile	0.850713	
MLE 95% Quantile	1.042009	
MLE 99% Quantile	1.529345	
MVU Estimate of Median	0.412008	
MVU Estimate of Mean	0.482801	
MVU Estimate of Standard Deviation	0.293711	
MVU Estimate of SE of Mean	0.023573	
95% H-UCL	0.525963	
95% Chebyshev (MVUE) UCL	0.585551	
97.5% Chebyshev (MVUE) UCL	0.630011	
99% Chebyshev (MVUE) UCL	0.717345	
Non-parametric Statisitics		
95% CLT UCL	0.60721	
95% Adjusted-CLT UCL	0.629713	
95% Modified-t UCL	0.611232	
95% Jackknife UCL	0.607722	
95% Chebyshev (Mean, Sd) UCL	0.744961	
97.5% Chebyshev (Mean, Sd) UCL	0.84069	
99% Chebyshev (Mean, Sd) UCL	1.02873	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.607055	
95% Bootstrap-t UCL	0.665659	
95% Hall's Bootstrap UCL	0.627395	
95% Percentile Bootstrap UCL	0.616013	
95% BCA Bootstrap UCL	0.635229	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.744961	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls								
Variable:			cis-1,2-Dichloroethene								
Raw Statistics											
Number of Observations			153								
Number of Missing Data			0								
Number of Valid Observations			153								
Number of Distinct Observations			25								
Minimum			0.2								
Maximum			50								
Mean			1.100719								
Standard Deviation			4.387738								
Variance			19.25224								
Coefficient of Variation			3.986247								
Skewness			9.818157								
Too Few Distinct Observations?			NO								
Normal Statistics											
Lilliefors Test Statisitic			0.418676								
Lilliefors 5% Critical Value			0.071629								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level						
95% Student's-t UCL			1.687772								
Gamma Statistics											
k hat			0.744618								
k star (bias corrected)			0.734375								
Theta hat			1.478233								
Theta star			1.498851								
nu hat			227.8532								
nu star			224.7188								
5% Approximate Chi Square Value			191.0147								
Adjusted Level of Significance			0.048431								
Adjusted Chi Square Value			190.7219								
Anderson-Darling Test Statistic			28.04752								
Anderson-Darling 5% Critical Value			0.796174								
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level						
Kolmogrov-Smirnov Test Statistic			0.428236								
Kolmogrov-Smirnov 5% Critical Value			0.078803								
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level						
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level						
95% Approximate Gamma UCL			1.294938								
95% Adjusted Gamma UCL			1.296927								
Lognormal Statistics											
Minimum of log data			-1.609438								
Maximum of log data			3.912023								
Mean of log data			-0.708771								
Standard Deviation of log data			0.817202								
Variance of log data			0.667819								
Lilliefors Test Statisitic			0.342047								
Lilliefors 5% Critical Value			0.071629								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level						
MLE Mean			0.687385								
MLE Standard Deviation			0.669973								
MLE Coefficient of Variation			0.974669								
MLE Skewness			3.849924								
MLE Median			0.492249								
MLE 80% Quantile			0.98193								
MLE 90% Quantile			1.406823								
MLE 95% Quantile			1.888016								
MLE 99% Quantile			3.293798								
MVU Estimate of Median			0.491176								
MVU Estimate of Mean			0.685399								
MVU Estimate of Standard Deviation			0.660387								
MVU Estimate of SE of Mean			0.051823								
95% H-UCL			0.785743								
95% Chebyshev (MVUE) UCL			0.911289								
97.5% Chebyshev (MVUE) UCL			1.009032								
99% Chebyshev (MVUE) UCL			1.201029								
Non-parametric Statisitics											
95% CLT UCL			1.684194								
95% Adjusted-CLT UCL			1.985051								
95% Modified-t UCL			1.734699								
95% Jackknife UCL			1.687772								
95% Chebyshev (Mean, Sd) UCL			2.646941								
97.5% Chebyshev (Mean, Sd) UCL			3.315992								
99% Chebyshev (Mean, Sd) UCL			4.630214								
Bootstrap Statistics											
Number of Bootstrap Runs			2000								
95% Standard Bootstrap UCL			1.679346								
95% Bootstrap-t UCL			3.50929								
95% Hall's Bootstrap UCL			3.698721								
95% Percentile Bootstrap UCL			1.72817								
95% BCA Bootstrap UCL			2.140458								
Recommendations											
Human Inspection Recommended?			NO								
Appropriate Distribution			NON-PARAMETRIC								
1st Recommended UCL			2.646941		95% Chebyshev (Mean, Sd) UCL						
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!			NONE								
Alternative UCL			NONE								

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls								
Variable:			Methyl tert-Butyl Ether								
Raw Statistics											
Number of Observations			70								
Number of Missing Data			0								
Number of Valid Observations			70								
Number of Distinct Observations			32								
Minimum			0.1								
Maximum			4000								
Mean			57.747								
Standard Deviation			478.0186								
Variance			228501.8								
Coefficient of Variation			8.277809								
Skewness			8.366577								
Too Few Distinct Observations?			NO								
Normal Statistics											
Lilliefors Test Statisitic			0.531305								
Lilliefors 5% Critical Value			0.105897								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level						
95% Student's-t UCL			153.0032								
Gamma Statistics											
k hat			0.158702								
k star (bias corrected)			0.161425								
Theta hat			363.8697								
Theta star			357.7334								
nu hat			22.21834								
nu star			22.59946								
5% Approximate Chi Square Value			12.78705								
Adjusted Level of Significance			0.046571								
Adjusted Chi Square Value			12.6315								
Anderson-Darling Test Statistic			23.57688								
Anderson-Darling 5% Critical Value			0.943512								
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level						
Kolmogrov-Smirnov Test Statistic			0.484275								
Kolmogrov-Smirnov 5% Critical Value			0.119466								
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level						
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level						
95% Approximate Gamma UCL			102.0603								
95% Adjusted Gamma UCL			103.3172								
Lognormal Statistics											
Minimum of log data			-2.302585								
Maximum of log data			8.29405								
Mean of log data			-0.746985								
Standard Deviation of log data			1.365064								
Variance of log data			1.863399								
Lilliefors Test Statisitic			0.265942								
Lilliefors 5% Critical Value			0.105897								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level						
MLE Mean			1.202875								
MLE Standard Deviation			2.807008								
MLE Coefficient of Variation			2.333582								
MLE Skewness			19.70852								
MLE Median			0.473793								
MLE 80% Quantile			1.501544								
MLE 90% Quantile			2.73771								
MLE 95% Quantile			4.475173								
MLE 99% Quantile			11.33792								
MVU Estimate of Median			0.467527								
MVU Estimate of Mean			1.173401								
MVU Estimate of Standard Deviation			2.481559								
MVU Estimate of SE of Mean			0.251357								
95% H-UCL			1.855318								
95% Chebyshev (MVUE) UCL			2.269041								
97.5% Chebyshev (MVUE) UCL			2.743125								
99% Chebyshev (MVUE) UCL			3.674372								
Non-parametric Statisitics											
95% CLT UCL			151.7243								
95% Adjusted-CLT UCL			212.7728								
95% Modified-t UCL			162.5256								
95% Jackknife UCL			153.0032								
95% Chebyshev (Mean, Sd) UCL			306.789								
97.5% Chebyshev (Mean, Sd) UCL			414.5497								
99% Chebyshev (Mean, Sd) UCL			626.2247								
Bootstrap Statistics											
Number of Bootstrap Runs			2000								
95% Standard Bootstrap UCL			150.9907								
95% Bootstrap-t UCL			51393.37								
95% Hall's Bootstrap UCL			21313.68								
95% Percentile Bootstrap UCL			172.0018								
95% BCA Bootstrap UCL			229.2243								
Recommendations											
Human Inspection Recommended?			NO								
Appropriate Distribution			NON-PARAMETRIC								
1st Recommended UCL			414.5497		97.5% Chebyshev (Mean, Sd) UCL						
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!			NONE								
Alternative UCL			NONE								

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls								
Variable:			Tetrachloroethene								
Raw Statistics											
Number of Observations			153								
Number of Missing Data			0								
Number of Valid Observations			153								
Number of Distinct Observations			14								
Minimum			0.21								
Maximum			5								
Mean			0.489542								
Standard Deviation			0.498494								
Variance			0.248496								
Coefficient of Variation			1.018286								
Skewness			6.107266								
Too Few Distinct Observations?			NO								
Normal Statistics											
Lilliefors Test Statisitic			0.419736								
Lilliefors 5% Critical Value			0.071629								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level						
95% Student's-t UCL			0.556238								
Gamma Statistics											
k hat			2.825271								
k star (bias corrected)			2.774231								
Theta hat			0.173273								
Theta star			0.176461								
nu hat			864.5328								
nu star			848.9145								
5% Approximate Chi Square Value			782.2808								
Adjusted Level of Significance			0.048431								
Adjusted Chi Square Value			781.6798								
Anderson-Darling Test Statistic			16.94242								
Anderson-Darling 5% Critical Value			0.760606								
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level						
Kolmogrov-Smirnov Test Statistic			0.3352								
Kolmogrov-Smirnov 5% Critical Value			0.07637								
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level						
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level						
95% Approximate Gamma UCL			0.531241								
95% Adjusted Gamma UCL			0.53165								
Lognormal Statistics											
Minimum of log data			-1.560648								
Maximum of log data			1.609438								
Mean of log data			-0.901574								
Standard Deviation of log data			0.519611								
Variance of log data			0.269995								
Lilliefors Test Statisitic			0.27227								
Lilliefors 5% Critical Value			0.071629								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level						
MLE Mean			0.464601								
MLE Standard Deviation			0.258661								
MLE Coefficient of Variation			0.556739								
MLE Skewness			1.842783								
MLE Median			0.40593								
MLE 80% Quantile			0.629705								
MLE 90% Quantile			0.791461								
MLE 95% Quantile			0.954264								
MLE 99% Quantile			1.359396								
MVU Estimate of Median			0.405572								
MVU Estimate of Mean			0.464137								
MVU Estimate of Standard Deviation			0.257386								
MVU Estimate of SE of Mean			0.020698								
95% H-UCL			0.501703								
95% Chebyshev (MVUE) UCL			0.554356								
97.5% Chebyshev (MVUE) UCL			0.593394								
99% Chebyshev (MVUE) UCL			0.670076								
Non-parametric Statisitics											
95% CLT UCL			0.555832								
95% Adjusted-CLT UCL			0.577093								
95% Modified-t UCL			0.559554								
95% Jackknife UCL			0.556238								
95% Chebyshev (Mean, Sd) UCL			0.66521								
97.5% Chebyshev (Mean, Sd) UCL			0.741221								
99% Chebyshev (Mean, Sd) UCL			0.890531								
Bootstrap Statistics											
Number of Bootstrap Runs			2000								
95% Standard Bootstrap UCL			0.556								
95% Bootstrap-t UCL			0.605987								
95% Hall's Bootstrap UCL			0.788692								
95% Percentile Bootstrap UCL			0.559281								
95% BCA Bootstrap UCL			0.582092								
Recommendations											
Human Inspection Recommended?			NO								
Appropriate Distribution			NON-PARAMETRIC								
1st Recommended UCL			0.66521		95% Chebyshev (Mean, Sd) UCL						
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!			NONE								
Alternative UCL			NONE								

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-all-B+T-011705.xls	
Variable:	Toluene	
Raw Statistics		
Number of Observations	445	
Number of Missing Data	0	
Number of Valid Observations	445	
Number of Distinct Observations	71	
Minimum	0.1	
Maximum	3600	
Mean	70.35176	
Standard Deviation	358.2093	
Variance	128313.9	
Coefficient of Variation	5.091689	
Skewness	6.841421	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.471514	
Lilliefors 5% Critical Value	0.042	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	98.341	
Gamma Statistics		
k hat	0.174968	
k star (bias corrected)	0.175286	
Theta hat	402.0841	
Theta star	401.3533	
nu hat	155.7213	
nu star	156.0049	
5% Approximate Chi Square Value	128.1256	
Adjusted Level of Significance	0.049461	
Adjusted Chi Square Value	128.0443	
Anderson-Darling Test Statistic	127.0169	
Anderson-Darling 5% Critical Value	1.010283	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.477094	
Kolmogrov-Smirnov 5% Critical Value	0.049217	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	85.65983	
95% Adjusted Gamma UCL	85.71423	
Lognormal Statistics		
Minimum of log data	-2.302585	
Maximum of log data	8.188689	
Mean of log data	-0.039913	
Standard Deviation of log data	2.004647	
Variance of log data	4.018611	
Lilliefors Test Statisitic	0.438971	
Lilliefors 5% Critical Value	0.042	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	7.166319	
MLE Standard Deviation	52.96476	
MLE Coefficient of Variation	7.390791	
MLE Skewness	425.8853	
MLE Median	0.960873	
MLE 80% Quantile	5.227921	
MLE 90% Quantile	12.62979	
MLE 95% Quantile	25.99051	
MLE 99% Quantile	101.7884	
MVU Estimate of Median	0.956544	
MVU Estimate of Mean	7.070781	
MVU Estimate of Standard Deviation	48.94712	
MVU Estimate of SE of Mean	1.138679	
95% H-UCL	9.578267	
95% Chebyshev (MVUE) UCL	12.03417	
97.5% Chebyshev (MVUE) UCL	14.18183	
99% Chebyshev (MVUE) UCL	18.40049	
Non-parametric Statisitics		
95% CLT UCL	98.28261	
95% Adjusted-CLT UCL	104.167	
95% Modified-t UCL	99.25886	
95% Jackknife UCL	98.341	
95% Chebyshev (Mean, Sd) UCL	144.3691	
97.5% Chebyshev (Mean, Sd) UCL	176.3965	
99% Chebyshev (Mean, Sd) UCL	239.3081	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	98.36671	
95% Bootstrap-t UCL	109.6255	
95% Hall's Bootstrap UCL	106.7127	
95% Percentile Bootstrap UCL	99.49788	
95% BCA Bootstrap UCL	106.9825	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	239.3081	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls	
Variable:	Trichloroethene	
Raw Statistics		
Number of Observations	153	
Number of Missing Data	0	
Number of Valid Observations	153	
Number of Distinct Observations	34	
Minimum	0.15	
Maximum	110	
Mean	3.224412	
Standard Deviation	12.37591	
Variance	153.1631	
Coefficient of Variation	3.838191	
Skewness	6.393106	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.418763	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	4.880234	
Gamma Statistics		
k hat	0.399255	
k star (bias corrected)	0.395784	
Theta hat	8.076069	
Theta star	8.1469	
nu hat	122.1721	
nu star	121.1099	
5% Approximate Chi Square Value	96.69193	
Adjusted Level of Significance	0.048431	
Adjusted Chi Square Value	96.48589	
Anderson-Darling Test Statistic	32.61532	
Anderson-Darling 5% Critical Value	0.844275	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.445759	
Kolmogrov-Smirnov 5% Critical Value	0.081214	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	4.038683	
95% Adjusted Gamma UCL	4.047307	
Lognormal Statistics		
Minimum of log data	-1.89712	
Maximum of log data	4.70048	
Mean of log data	-0.477908	
Standard Deviation of log data	1.264117	
Variance of log data	1.597992	
Lilliefors Test Statisitic	0.378058	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	1.378627	
MLE Standard Deviation	2.737571	
MLE Coefficient of Variation	1.985723	
MLE Skewness	13.78706	
MLE Median	0.620079	
MLE 80% Quantile	1.804478	
MLE 90% Quantile	3.147104	
MLE 95% Quantile	4.960788	
MLE 99% Quantile	11.73327	
MVU Estimate of Median	0.61685	
MVU Estimate of Mean	1.365921	
MVU Estimate of Standard Deviation	2.610355	
MVU Estimate of SE of Mean	0.182946	
95% H-UCL	1.764607	
95% Chebyshev (MVUE) UCL	2.163366	
97.5% Chebyshev (MVUE) UCL	2.508421	
99% Chebyshev (MVUE) UCL	3.186215	
Non-parametric Statisitics		
95% CLT UCL	4.870142	
95% Adjusted-CLT UCL	5.4227	
95% Modified-t UCL	4.966421	
95% Jackknife UCL	4.880234	
95% Chebyshev (Mean, Sd) UCL	7.585633	
97.5% Chebyshev (Mean, Sd) UCL	9.472738	
99% Chebyshev (Mean, Sd) UCL	13.17959	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	4.862086	
95% Bootstrap-t UCL	6.671473	
95% Hall's Bootstrap UCL	6.16127	
95% Percentile Bootstrap UCL	4.928824	
95% BCA Bootstrap UCL	5.529183	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	9.472738	97.5% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls								
Variable:			Vinyl Chloride								
Raw Statistics											
Number of Observations			153								
Number of Missing Data			0								
Number of Valid Observations			153								
Number of Distinct Observations			8								
Minimum			0.25								
Maximum			5								
Mean			0.482745								
Standard Deviation			0.485168								
Variance			0.235388								
Coefficient of Variation			1.00502								
Skewness			6.484292								
Too Few Distinct Observations?			NO								
Normal Statistics											
Lilliefors Test Statisitic			0.420455								
Lilliefors 5% Critical Value			0.071629								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level						
95% Student's-t UCL			0.547658								
Gamma Statistics											
k hat			2.972997								
k star (bias corrected)			2.91906								
Theta hat			0.162377								
Theta star			0.165377								
nu hat			909.737								
nu star			893.2323								
5% Approximate Chi Square Value			824.8511								
Adjusted Level of Significance			0.048431								
Adjusted Chi Square Value			824.2337								
Anderson-Darling Test Statistic			17.53494								
Anderson-Darling 5% Critical Value			0.759683								
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level						
Kolmogrov-Smirnov Test Statistic			0.334005								
Kolmogrov-Smirnov 5% Critical Value			0.076298								
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level						
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level						
95% Approximate Gamma UCL			0.522765								
95% Adjusted Gamma UCL			0.523157								
Lognormal Statistics											
Minimum of log data			-1.386294								
Maximum of log data			1.609438								
Mean of log data			-0.905774								
Standard Deviation of log data			0.506065								
Variance of log data			0.256101								
Lilliefors Test Statisitic			0.271826								
Lilliefors 5% Critical Value			0.071629								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level						
MLE Mean			0.459451								
MLE Standard Deviation			0.248224								
MLE Coefficient of Variation			0.540263								
MLE Skewness			1.778482								
MLE Median			0.404229								
MLE 80% Quantile			0.61993								
MLE 90% Quantile			0.774544								
MLE 95% Quantile			0.929324								
MLE 99% Quantile			1.311711								
MVU Estimate of Median			0.403891								
MVU Estimate of Mean			0.459018								
MVU Estimate of Standard Deviation			0.24707								
MVU Estimate of SE of Mean			0.019878								
95% H-UCL			0.495001								
95% Chebyshev (MVUE) UCL			0.545666								
97.5% Chebyshev (MVUE) UCL			0.583159								
99% Chebyshev (MVUE) UCL			0.656806								
Non-parametric Statisitics											
95% CLT UCL			0.547262								
95% Adjusted-CLT UCL			0.569233								
95% Modified-t UCL			0.551085								
95% Jackknife UCL			0.547658								
95% Chebyshev (Mean, Sd) UCL			0.653717								
97.5% Chebyshev (Mean, Sd) UCL			0.727696								
99% Chebyshev (Mean, Sd) UCL			0.873014								
Bootstrap Statistics											
Number of Bootstrap Runs			2000								
95% Standard Bootstrap UCL			0.544556								
95% Bootstrap-t UCL			0.595155								
95% Hall's Bootstrap UCL			0.790439								
95% Percentile Bootstrap UCL			0.553922								
95% BCA Bootstrap UCL			0.589673								
Recommendations											
Human Inspection Recommended?			NO								
Appropriate Distribution			NON-PARAMETRIC								
1st Recommended UCL			0.653717		95% Chebyshev (Mean, Sd) UCL						
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!			NONE								
Alternative UCL			NONE								

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls	
Variable:	Xylene, total	
Raw Statistics		
Number of Observations	153	
Number of Missing Data	0	
Number of Valid Observations	153	
Number of Distinct Observations	24	
Minimum	0.25	
Maximum	120	
Mean	2.910327	
Standard Deviation	11.98963	
Variance	143.7513	
Coefficient of Variation	4.119686	
Skewness	7.581297	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.425686	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	4.514467	
Gamma Statistics		
k hat	0.407966	
k star (bias corrected)	0.404324	
Theta hat	7.133749	
Theta star	7.198008	
nu hat	124.8376	
nu star	123.7231	
5% Approximate Chi Square Value	99.02991	
Adjusted Level of Significance	0.048431	
Adjusted Chi Square Value	98.8213	
Anderson-Darling Test Statistic	34.36214	
Anderson-Darling 5% Critical Value	0.842154	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.469473	
Kolmogrov-Smirnov 5% Critical Value	0.081122	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	3.63602	
95% Adjusted Gamma UCL	3.643696	
Lognormal Statistics		
Minimum of log data	-1.386294	
Maximum of log data	4.787492	
Mean of log data	-0.539596	
Standard Deviation of log data	1.21738	
Variance of log data	1.482013	
Lilliefors Test Statisitic	0.393324	
Lilliefors 5% Critical Value	0.071629	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	1.223127	
MLE Standard Deviation	2.255931	
MLE Coefficient of Variation	1.844396	
MLE Skewness	11.80745	
MLE Median	0.582984	
MLE 80% Quantile	1.630831	
MLE 90% Quantile	2.786362	
MLE 95% Quantile	4.318869	
MLE 99% Quantile	9.894994	
MVU Estimate of Median	0.580167	
MVU Estimate of Mean	1.212994	
MVU Estimate of Standard Deviation	2.161925	
MVU Estimate of SE of Mean	0.154195	
95% H-UCL	1.544466	
95% Chebyshev (MVUE) UCL	1.885113	
97.5% Chebyshev (MVUE) UCL	2.175939	
99% Chebyshev (MVUE) UCL	2.747212	
Non-parametric Statisitics		
95% CLT UCL	4.504691	
95% Adjusted-CLT UCL	5.139493	
95% Modified-t UCL	4.613484	
95% Jackknife UCL	4.514467	
95% Chebyshev (Mean, Sd) UCL	7.135427	
97.5% Chebyshev (Mean, Sd) UCL	8.963631	
99% Chebyshev (Mean, Sd) UCL	12.55478	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	4.47871	
95% Bootstrap-t UCL	6.468043	
95% Hall's Bootstrap UCL	10.86768	
95% Percentile Bootstrap UCL	4.694444	
95% BCA Bootstrap UCL	5.301961	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	8.963631	97.5% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls										
Variable:	2,4-Dichlorophenol										
Raw Statistics											
Number of Observations	70										
Number of Missing Data	0										
Number of Valid Observations	70										
Number of Distinct Observations	6										
Minimum	0.45										
Maximum	35										
Mean	1.206429										
Standard Deviation	4.328653										
Variance	18.73724										
Coefficient of Variation	3.58799										
Skewness	7.325867										
Too Few Distinct Observations?	NO										
Normal Statistics											
Lilliefors Test Statisitic	0.464819										
Lilliefors 5% Critical Value	0.105897										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Normality Test Result	NOT NORMAL		Data not normal at 5% significance level								
95% Student's-t UCL	2.069013										
Gamma Statistics											
k hat	0.804654										
k star (bias corrected)	0.779693										
Theta hat	1.499313										
Theta star	1.547313										
nu hat	112.6516										
nu star	109.157										
5% Approximate Chi Square Value	86.03798										
Adjusted Level of Significance	0.046571										
Adjusted Chi Square Value	85.60794										
Anderson-Darling Test Statistic	22.00618										
Anderson-Darling 5% Critical Value	0.789943										
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA		Data not gamma distributed at 5% significance level								
Kolmogrov-Smirnov Test Statistic	0.516232										
Kolmogrov-Smirnov 5% Critical Value	0.110401										
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA		Data not gamma distributed at 5% significance level								
5% Gamma Test Result	NOT GAMMA		Data not gamma distributed at 5% significance level								
95% Approximate Gamma UCL	1.530604										
95% Adjusted Gamma UCL	1.538293										
Lognormal Statistics											
Minimum of log data	-0.798508										
Maximum of log data	3.555348										
Mean of log data	-0.549347										
Standard Deviation of log data	0.683346										
Variance of log data	0.466962										
Lilliefors Test Statisitic	0.483336										
Lilliefors 5% Critical Value	0.105897										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Lognormality Test Result	NOT LOGNORMAL		Data not lognormal at 5% significance level								
MLE Mean	0.729157										
MLE Standard Deviation	0.56251										
MLE Coefficient of Variation	0.771453										
MLE Skewness	2.773482										
MLE Median	0.577327										
MLE 80% Quantile	1.028478										
MLE 90% Quantile	1.389234										
MLE 95% Quantile	1.776698										
MLE 99% Quantile	2.829543										
MVU Estimate of Median	0.575404										
MVU Estimate of Mean	0.726191										
MVU Estimate of Standard Deviation	0.551458										
MVU Estimate of SE of Mean	0.064994										
95% H-UCL	0.857993										
95% Chebyshev (MVUE) UCL	1.009494										
97.5% Chebyshev (MVUE) UCL	1.132079										
99% Chebyshev (MVUE) UCL	1.372874										
Non-parametric Statisitics											
95% CLT UCL	2.057432										
95% Adjusted-CLT UCL	2.541486										
95% Modified-t UCL	2.144515										
95% Jackknife UCL	2.069013										
95% Chebyshev (Mean, Sd) UCL	3.461605										
97.5% Chebyshev (Mean, Sd) UCL	4.437422										
99% Chebyshev (Mean, Sd) UCL	6.354225										
Bootstrap Statistics											
Number of Bootstrap Runs	2000										
95% Standard Bootstrap UCL	2.049175										
95% Bootstrap-t UCL	13.604										
95% Hall's Bootstrap UCL	10.00706										
95% Percentile Bootstrap UCL	2.174286										
95% BCA Bootstrap UCL	3.162857										
Recommendations											
Human Inspection Recommended?	NO										
Appropriate Distribution	NON-PARAMETRIC										
1st Recommended UCL	3.461605		95% Chebyshev (Mean, Sd) UCL								
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!	NONE										
Alternative UCL	NONE										

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls								
Variable:			2-Methylphenol								
Raw Statistics											
Number of Observations			70								
Number of Missing Data			0								
Number of Valid Observations			70								
Number of Distinct Observations			7								
Minimum			0.45								
Maximum			200								
Mean			3.927143								
Standard Deviation			24.02773								
Variance			577.3316								
Coefficient of Variation			6.118373								
Skewness			8.121051								
Too Few Distinct Observations?			NO								
Normal Statistics											
Lilliefors Test Statisitic			0.47482								
Lilliefors 5% Critical Value			0.105897								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level						
95% Student's-t UCL			8.715222								
Gamma Statistics											
k hat			0.365754								
k star (bias corrected)			0.359603								
Theta hat			10.73711								
Theta star			10.92077								
nu hat			51.20561								
nu star			50.34442								
5% Approximate Chi Square Value			35.0491								
Adjusted Level of Significance			0.046571								
Adjusted Chi Square Value			34.7809								
Anderson-Darling Test Statistic			23.50477								
Anderson-Darling 5% Critical Value			0.849603								
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level						
Kolmogrov-Smirnov Test Statistic			0.524106								
Kolmogrov-Smirnov 5% Critical Value			0.114647								
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level						
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level						
95% Approximate Gamma UCL			5.640936								
95% Adjusted Gamma UCL			5.684433								
Lognormal Statistics											
Minimum of log data			-0.798508								
Maximum of log data			5.298317								
Mean of log data			-0.457461								
Standard Deviation of log data			0.964208								
Variance of log data			0.929696								
Lilliefors Test Statisitic			0.482267								
Lilliefors 5% Critical Value			0.105897								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level						
MLE Mean			1.007414								
MLE Standard Deviation			1.247624								
MLE Coefficient of Variation			1.238442								
MLE Skewness			5.614774								
MLE Median			0.632888								
MLE 80% Quantile			1.429457								
MLE 90% Quantile			2.184847								
MLE 95% Quantile			3.091512								
MLE 99% Quantile			5.961282								
MVU Estimate of Median			0.628699								
MVU Estimate of Mean			0.99784								
MVU Estimate of Standard Deviation			1.190768								
MVU Estimate of SE of Mean			0.135418								
95% H-UCL			1.303357								
95% Chebyshev (MVUE) UCL			1.588115								
97.5% Chebyshev (MVUE) UCL			1.843527								
99% Chebyshev (MVUE) UCL			2.345235								
Non-parametric Statisitics											
95% CLT UCL			8.650937								
95% Adjusted-CLT UCL			11.6295								
95% Modified-t UCL			9.179818								
95% Jackknife UCL			8.715222								
95% Chebyshev (Mean, Sd) UCL			16.4453								
97.5% Chebyshev (Mean, Sd) UCL			21.86192								
99% Chebyshev (Mean, Sd) UCL			32.50182								
Bootstrap Statistics											
Number of Bootstrap Runs			2000								
95% Standard Bootstrap UCL			8.660581								
95% Bootstrap-t UCL			105.8975								
95% Hall's Bootstrap UCL			92.30041								
95% Percentile Bootstrap UCL			9.557143								
95% BCA Bootstrap UCL			13.13214								
Recommendations											
Human Inspection Recommended?			NO								
Appropriate Distribution			NON-PARAMETRIC								
1st Recommended UCL			16.4453		95% Chebyshev (Mean, Sd) UCL						
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!			NONE								
Alternative UCL			NONE								

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls	
Variable:	bis(2-Ethylhexyl)phthalate	
Raw Statistics		
Number of Observations	67	
Number of Missing Data	0	
Number of Valid Observations	67	
Number of Distinct Observations	6	
Minimum	1	
Maximum	15	
Mean	1.462687	
Standard Deviation	2.091312	
Variance	4.373587	
Coefficient of Variation	1.429775	
Skewness	5.39176	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.512921	
Lilliefors 5% Critical Value	0.108242	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1.88892	
Gamma Statistics		
k hat	2.148376	
k star (bias corrected)	2.06213	
Theta hat	0.680834	
Theta star	0.709309	
nu hat	287.8824	
nu star	276.3254	
5% Approximate Chi Square Value	238.8197	
Adjusted Level of Significance	0.046418	
Adjusted Chi Square Value	238.0575	
Anderson-Darling Test Statistic	22.41354	
Anderson-Darling 5% Critical Value	0.762406	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.538928	
Kolmogrov-Smirnov 5% Critical Value	0.110189	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	1.692396	
95% Adjusted Gamma UCL	1.697814	
Lognormal Statistics		
Minimum of log data	0	
Maximum of log data	2.70805	
Mean of log data	0.129844	
Standard Deviation of log data	0.499976	
Variance of log data	0.249976	
Lilliefors Test Statisitic	0.527825	
Lilliefors 5% Critical Value	0.108242	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	1.290244	
MLE Standard Deviation	0.687586	
MLE Coefficient of Variation	0.532911	
MLE Skewness	1.750078	
MLE Median	1.13865	
MLE 80% Quantile	1.737284	
MLE 90% Quantile	2.164767	
MLE 95% Quantile	2.591674	
MLE 99% Quantile	3.642927	
MVU Estimate of Median	1.136528	
MVU Estimate of Mean	1.287554	
MVU Estimate of Standard Deviation	0.680631	
MVU Estimate of SE of Mean	0.082801	
95% H-UCL	1.446277	
95% Chebyshev (MVUE) UCL	1.648476	
97.5% Chebyshev (MVUE) UCL	1.804647	
99% Chebyshev (MVUE) UCL	2.111415	
Non-parametric Statisitics		
95% CLT UCL	1.882938	
95% Adjusted-CLT UCL	2.062765	
95% Modified-t UCL	1.91697	
95% Jackknife UCL	1.88892	
95% Chebyshev (Mean, Sd) UCL	2.576361	
97.5% Chebyshev (Mean, Sd) UCL	3.058249	
99% Chebyshev (Mean, Sd) UCL	4.004824	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1.880441	
95% Bootstrap-t UCL	2.979739	
95% Hall's Bootstrap UCL	3.393806	
95% Percentile Bootstrap UCL	1.925373	
95% BCA Bootstrap UCL	2.134328	
Recommendations		
Human Inspection Recommended?	YES	Users must select one of the recommended UCLS
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	1.88892	95% Student's-t UCL
2nd Recommended UCL	1.91697	95% Modified-t UCL
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls	
Variable:	Naphthalene	
Raw Statistics		
Number of Observations	68	
Number of Missing Data	0	
Number of Valid Observations	68	
Number of Distinct Observations	15	
Minimum	0.45	
Maximum	220	
Mean	6.727206	
Standard Deviation	28.56738	
Variance	816.0954	
Coefficient of Variation	4.246545	
Skewness	6.669652	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.413039	
Lilliefors 5% Critical Value	0.107443	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	12.50537	
Gamma Statistics		
k hat	0.334087	
k star (bias corrected)	0.329152	
Theta hat	20.13609	
Theta star	20.438	
nu hat	45.43584	
nu star	44.76465	
5% Approximate Chi Square Value	30.41542	
Adjusted Level of Significance	0.046471	
Adjusted Chi Square Value	30.15923	
Anderson-Darling Test Statistic	17.3659	
Anderson-Darling 5% Critical Value	0.856925	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.485006	
Kolmogrov-Smirnov 5% Critical Value	0.116893	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	9.900932	
95% Adjusted Gamma UCL	9.985038	
Lognormal Statistics		
Minimum of log data	-0.798508	
Maximum of log data	5.393628	
Mean of log data	-0.121926	
Standard Deviation of log data	1.409051	
Variance of log data	1.985424	
Lilliefors Test Statisitic	0.46623	
Lilliefors 5% Critical Value	0.107443	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	2.388787	
MLE Standard Deviation	5.9873	
MLE Coefficient of Variation	2.506419	
MLE Skewness	23.26492	
MLE Median	0.885214	
MLE 80% Quantile	2.911655	
MLE 90% Quantile	5.412461	
MLE 95% Quantile	8.988645	
MLE 99% Quantile	23.46537	
MVU Estimate of Median	0.872382	
MVU Estimate of Mean	2.322877	
MVU Estimate of Standard Deviation	5.210287	
MVU Estimate of SE of Mean	0.526338	
95% H-UCL	3.798165	
95% Chebyshev (MVUE) UCL	4.617131	
97.5% Chebyshev (MVUE) UCL	5.609856	
99% Chebyshev (MVUE) UCL	7.559872	
Non-parametric Statisitics		
95% CLT UCL	12.42548	
95% Adjusted-CLT UCL	15.41943	
95% Modified-t UCL	12.97237	
95% Jackknife UCL	12.50537	
95% Chebyshev (Mean, Sd) UCL	21.82776	
97.5% Chebyshev (Mean, Sd) UCL	28.36178	
99% Chebyshev (Mean, Sd) UCL	41.1966	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	12.35807	
95% Bootstrap-t UCL	28.55127	
95% Hall's Bootstrap UCL	32.4594	
95% Percentile Bootstrap UCL	12.91176	
95% BCA Bootstrap UCL	18.11765	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	28.36178	97.5% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls								
Variable:			Pentachlorophenol								
Raw Statistics											
Number of Observations			70								
Number of Missing Data			0								
Number of Valid Observations			70								
Number of Distinct Observations			3								
Minimum			1.5								
Maximum			10								
Mean			1.65								
Standard Deviation			1.040311								
Variance			1.082246								
Coefficient of Variation			0.630491								
Skewness			7.795404								
Too Few Distinct Observations?			NO								
Normal Statistics											
Lilliefors Test Statisitic			0.528752								
Lilliefors 5% Critical Value			0.105897								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level						
95% Student's-t UCL			1.857306								
Gamma Statistics											
k hat			9.075454								
k star (bias corrected)			8.69603								
Theta hat			0.181809								
Theta star			0.189742								
nu hat			1270.564								
nu star			1217.444								
5% Approximate Chi Square Value			1137.416								
Adjusted Level of Significance			0.046571								
Adjusted Chi Square Value			1135.803								
Anderson-Darling Test Statistic			25.72435								
Anderson-Darling 5% Critical Value			0.751329								
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level						
Kolmogrov-Smirnov Test Statistic			0.539261								
Kolmogrov-Smirnov 5% Critical Value			0.106419								
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level						
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level						
95% Approximate Gamma UCL			1.766094								
95% Adjusted Gamma UCL			1.768601								
Lognormal Statistics											
Minimum of log data			0.405465								
Maximum of log data			2.302585								
Mean of log data			0.444671								
Standard Deviation of log data			0.246993								
Variance of log data			0.061006								
Lilliefors Test Statisitic			0.534489								
Lilliefors 5% Critical Value			0.105897								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level						
MLE Mean			1.608294								
MLE Standard Deviation			0.403373								
MLE Coefficient of Variation			0.250808								
MLE Skewness			0.768202								
MLE Median			1.559977								
MLE 80% Quantile			1.922027								
MLE 90% Quantile			2.142679								
MLE 95% Quantile			2.341928								
MLE 99% Quantile			2.770912								
MVU Estimate of Median			1.559297								
MVU Estimate of Mean			1.607573								
MVU Estimate of Standard Deviation			0.402489								
MVU Estimate of SE of Mean			0.048094								
95% H-UCL			1.692878								
95% Chebyshev (MVUE) UCL			1.817209								
97.5% Chebyshev (MVUE) UCL			1.907918								
99% Chebyshev (MVUE) UCL			2.0861								
Non-parametric Statisitics											
95% CLT UCL			1.854523								
95% Adjusted-CLT UCL			1.978312								
95% Modified-t UCL			1.876615								
95% Jackknife UCL			1.857306								
95% Chebyshev (Mean, Sd) UCL			2.191989								
97.5% Chebyshev (Mean, Sd) UCL			2.426509								
99% Chebyshev (Mean, Sd) UCL			2.887176								
Bootstrap Statistics											
Number of Bootstrap Runs			2000								
95% Standard Bootstrap UCL			N/R		Not enough distinct data warning						
95% Bootstrap-t UCL			N/R		Not enough distinct data warning						
95% Hall's Bootstrap UCL			N/R		Not enough distinct data warning						
95% Percentile Bootstrap UCL			N/R		Not enough distinct data warning						
95% BCA Bootstrap UCL			N/R		Not enough distinct data warning						
Recommendations											
Human Inspection Recommended?			YES		Users must select one of the recommended UCLS						
Appropriate Distribution			NON-PARAMETRIC								
1st Recommended UCL			1.857306		95% Student's-t UCL						
2nd Recommended UCL			1.876615		95% Modified-t UCL						
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!			NONE								
Alternative UCL			NONE								

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls	
Variable:	Antimony	
Raw Statistics		
Number of Observations	137	
Number of Missing Data	0	
Number of Valid Observations	137	
Number of Distinct Observations	15	
Minimum	0.75	
Maximum	49.7	
Mean	2.671168	
Standard Deviation	4.503731	
Variance	20.28359	
Coefficient of Variation	1.686053	
Skewness	8.806449	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.43882	
Lilliefors 5% Critical Value	0.075696	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	3.308415	
Gamma Statistics		
k hat	1.591563	
k star (bias corrected)	1.561577	
Theta hat	1.67833	
Theta star	1.710558	
nu hat	436.0882	
nu star	427.8721	
5% Approximate Chi Square Value	380.9089	
Adjusted Level of Significance	0.048248	
Adjusted Chi Square Value	380.4427	
Anderson-Darling Test Statistic	11.86149	
Anderson-Darling 5% Critical Value	0.769478	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.310926	
Kolmogrov-Smirnov 5% Critical Value	0.081311	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	3.000503	
95% Adjusted Gamma UCL	3.00418	
Lognormal Statistics		
Minimum of log data	-0.287682	
Maximum of log data	3.906005	
Mean of log data	0.636579	
Standard Deviation of log data	0.727927	
Variance of log data	0.529877	
Lilliefors Test Statisitic	0.262458	
Lilliefors 5% Critical Value	0.075696	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	2.463338	
MLE Standard Deviation	2.059096	
MLE Coefficient of Variation	0.835897	
MLE Skewness	3.091751	
MLE Median	1.890004	
MLE 80% Quantile	3.4962	
MLE 90% Quantile	4.8161	
MLE 95% Quantile	6.258985	
MLE 99% Quantile	10.27523	
MVU Estimate of Median	1.886352	
MVU Estimate of Mean	2.457353	
MVU Estimate of Standard Deviation	2.034418	
MVU Estimate of SE of Mean	0.170513	
95% H-UCL	2.783858	
95% Chebyshev (MVUE) UCL	3.200601	
97.5% Chebyshev (MVUE) UCL	3.522205	
99% Chebyshev (MVUE) UCL	4.153933	
Non-parametric Statisitics		
95% CLT UCL	3.304074	
95% Adjusted-CLT UCL	3.613412	
95% Modified-t UCL	3.356665	
95% Jackknife UCL	3.308415	
95% Chebyshev (Mean, Sd) UCL	4.348384	
97.5% Chebyshev (Mean, Sd) UCL	5.074116	
99% Chebyshev (Mean, Sd) UCL	6.499678	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	3.310596	
95% Bootstrap-t UCL	4.286722	
95% Hall's Bootstrap UCL	5.666267	
95% Percentile Bootstrap UCL	3.375547	
95% BCA Bootstrap UCL	3.783577	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	4.348384	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File			J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls								
Variable:			Arsenic								
Raw Statistics											
Number of Observations			357								
Number of Missing Data			0								
Number of Valid Observations			357								
Number of Distinct Observations			298								
Minimum			0.1								
Maximum			24432.5								
Mean			259.4268								
Standard Deviation			1653.62								
Variance			2734458								
Coefficient of Variation			6.374127								
Skewness			12.52103								
Too Few Distinct Observations?			NO								
Normal Statistics											
Lilliefors Test Statisitic			0.437692								
Lilliefors 5% Critical Value			0.046892								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Normality Test Result			NOT NORMAL		Data not normal at 5% significance level						
95% Student's-t UCL			403.7581								
Gamma Statistics											
k hat			0.220126								
k star (bias corrected)			0.220144								
Theta hat			1178.538								
Theta star			1178.444								
nu hat			157.1699								
nu star			157.1825								
5% Approximate Chi Square Value			129.1936								
Adjusted Level of Significance			0.049328								
Adjusted Chi Square Value			129.0917								
Anderson-Darling Test Statistic			23.74132								
Anderson-Darling 5% Critical Value			0.907591								
Anderson-Darling 5% Gamma Test Result			NOT AD GAMMA		Data not gamma distributed at 5% significance level						
Kolmogrov-Smirnov Test Statistic			0.16843								
Kolmogrov-Smirnov 5% Critical Value			0.05315								
Kolmogrov-Smirnov 5% Gamma Test Result			NOT KS GAMMA		Data not gamma distributed at 5% significance level						
5% Gamma Test Result			NOT GAMMA		Data not gamma distributed at 5% significance level						
95% Approximate Gamma UCL			315.6299								
95% Adjusted Gamma UCL			315.879								
Lognormal Statistics											
Minimum of log data			-2.302585								
Maximum of log data			10.10367								
Mean of log data			2.265349								
Standard Deviation of log data			2.694939								
Variance of log data			7.262697								
Lilliefors Test Statisitic			0.103812								
Lilliefors 5% Critical Value			0.046892								
Shapiro-Wilk Test Statisitic			N/A								
Shapiro-Wilk 5% Critical Value			N/A								
5% Lognormality Test Result			NOT LOGNORMAL		Data not lognormal at 5% significance level						
MLE Mean			363.8339								
MLE Standard Deviation			13734.9								
MLE Coefficient of Variation			37.75047								
MLE Skewness			53911.38								
MLE Median			9.634484								
MLE 80% Quantile			93.93212								
MLE 90% Quantile			307.4602								
MLE 95% Quantile			811.2074								
MLE 99% Quantile			5083.612								
MVU Estimate of Median			9.536977								
MVU Estimate of Mean			347.5277								
MVU Estimate of Standard Deviation			10317.3								
MVU Estimate of SE of Mean			100.5451								
95% H-UCL			634.3037								
95% Chebyshev (MVUE) UCL			785.7935								
97.5% Chebyshev (MVUE) UCL			975.4315								
99% Chebyshev (MVUE) UCL			1347.939								
Non-parametric Statisitics											
95% CLT UCL			403.3825								
95% Adjusted-CLT UCL			465.3534								
95% Modified-t UCL			413.4243								
95% Jackknife UCL			403.7581								
95% Chebyshev (Mean, Sd) UCL			640.9126								
97.5% Chebyshev (Mean, Sd) UCL			805.9818								
99% Chebyshev (Mean, Sd) UCL			1130.228								
Bootstrap Statistics											
Number of Bootstrap Runs			2000								
95% Standard Bootstrap UCL			401.2067								
95% Bootstrap-t UCL			832.8663								
95% Hall's Bootstrap UCL			1086.025								
95% Percentile Bootstrap UCL			413.1084								
95% BCA Bootstrap UCL			477.1676								
Recommendations											
Human Inspection Recommended?			NO								
Appropriate Distribution			NON-PARAMETRIC								
1st Recommended UCL			1130.228		99% Chebyshev (Mean, Sd) UCL						
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!			NONE								
Alternative UCL			NONE								

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls	
Variable:	Barium	
Raw Statistics		
Number of Observations	136	
Number of Missing Data	0	
Number of Valid Observations	136	
Number of Distinct Observations	125	
Minimum	4	
Maximum	1540	
Mean	76.93971	
Standard Deviation	145.8317	
Variance	21266.88	
Coefficient of Variation	1.895402	
Skewness	8.026864	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.311338	
Lilliefors 5% Critical Value	0.075974	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	97.65066	
Gamma Statistics		
k hat	1.12744	
k star (bias corrected)	1.107472	
Theta hat	68.24285	
Theta star	69.47329	
nu hat	306.6636	
nu star	301.2323	
5% Approximate Chi Square Value	262.0197	
Adjusted Level of Significance	0.048235	
Adjusted Chi Square Value	261.6317	
Anderson-Darling Test Statistic	3.958023	
Anderson-Darling 5% Critical Value	0.780003	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.137493	
Kolmogrov-Smirnov 5% Critical Value	0.08232	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	88.45413	
95% Adjusted Gamma UCL	88.58531	
Lognormal Statistics		
Minimum of log data	1.386294	
Maximum of log data	7.339538	
Mean of log data	3.837962	
Standard Deviation of log data	0.906785	
Variance of log data	0.822259	
Lilliefors Test Statisitic	0.051425	
Lilliefors 5% Critical Value	0.075974	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	70.04173	
MLE Standard Deviation	79.10795	
MLE Coefficient of Variation	1.12944	
MLE Skewness	4.829075	
MLE Median	46.43073	
MLE 80% Quantile	99.90253	
MLE 90% Quantile	148.8859	
MLE 95% Quantile	206.3602	
MLE 99% Quantile	382.6588	
MVU Estimate of Median	46.29058	
MVU Estimate of Mean	69.74613	
MVU Estimate of Standard Deviation	77.45653	
MVU Estimate of SE of Mean	6.360605	
95% H-UCL	82.49547	
95% Chebyshev (MVUE) UCL	97.47136	
97.5% Chebyshev (MVUE) UCL	109.4681	
99% Chebyshev (MVUE) UCL	133.0333	
Non-parametric Statisitics		
95% CLT UCL	97.50854	
95% Adjusted-CLT UCL	106.7054	
95% Modified-t UCL	99.08518	
95% Jackknife UCL	97.65066	
95% Chebyshev (Mean, Sd) UCL	131.4476	
97.5% Chebyshev (Mean, Sd) UCL	155.0332	
99% Chebyshev (Mean, Sd) UCL	201.3625	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	97.23538	
95% Bootstrap-t UCL	119.4026	
95% Hall's Bootstrap UCL	185.9983	
95% Percentile Bootstrap UCL	100.5246	
95% BCA Bootstrap UCL	112.7827	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	LOGNORMAL	
1st Recommended UCL	82.49547	95% H-UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls										
Variable:	Beryllium										
Raw Statistics											
Number of Observations	137										
Number of Missing Data	0										
Number of Valid Observations	137										
Number of Distinct Observations	18										
Minimum	0.1										
Maximum	10.5										
Mean	0.357518										
Standard Deviation	0.916739										
Variance	0.84041										
Coefficient of Variation	2.564173										
Skewness	10.22443										
Too Few Distinct Observations?	NO										
Normal Statistics											
Lilliefors Test Statisitic	0.457928										
Lilliefors 5% Critical Value	0.075696										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Normality Test Result	NOT NORMAL		Data not normal at 5% significance level								
95% Student's-t UCL	0.48723										
Gamma Statistics											
k hat	1.325087										
k star (bias corrected)	1.300937										
Theta hat	0.269807										
Theta star	0.274816										
nu hat	363.074										
nu star	356.4568										
5% Approximate Chi Square Value	313.6958										
Adjusted Level of Significance	0.048248										
Adjusted Chi Square Value	313.2735										
Anderson-Darling Test Statistic	1.8E+308										
Anderson-Darling 5% Critical Value	0.774893										
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA		Data not gamma distributed at 5% significance level								
Kolmogrov-Smirnov Test Statistic	0.374151										
Kolmogrov-Smirnov 5% Critical Value	0.081702										
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA		Data not gamma distributed at 5% significance level								
5% Gamma Test Result	NOT GAMMA		Data not gamma distributed at 5% significance level								
95% Approximate Gamma UCL	0.406253										
95% Adjusted Gamma UCL	0.4068										
Lognormal Statistics											
Minimum of log data	-2.302585										
Maximum of log data	2.351375										
Mean of log data	-1.451154										
Standard Deviation of log data	0.675712										
Variance of log data	0.456586										
Lilliefors Test Statisitic	0.26389										
Lilliefors 5% Critical Value	0.075696										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Lognormality Test Result	NOT LOGNORMAL		Data not lognormal at 5% significance level								
MLE Mean	0.294387										
MLE Standard Deviation	0.223942										
MLE Coefficient of Variation	0.760707										
MLE Skewness	2.722325										
MLE Median	0.2343										
MLE 80% Quantile	0.414709										
MLE 90% Quantile	0.558297										
MLE 95% Quantile	0.71205										
MLE 99% Quantile	1.128119										
MVU Estimate of Median	0.23391										
MVU Estimate of Mean	0.293788										
MVU Estimate of Standard Deviation	0.221695										
MVU Estimate of SE of Mean	0.018669										
95% H-UCL	0.329098										
95% Chebyshev (MVUE) UCL	0.375162										
97.5% Chebyshev (MVUE) UCL	0.410373										
99% Chebyshev (MVUE) UCL	0.479537										
Non-parametric Statisitics											
95% CLT UCL	0.486347										
95% Adjusted-CLT UCL	0.559452										
95% Modified-t UCL	0.498633										
95% Jackknife UCL	0.48723										
95% Chebyshev (Mean, Sd) UCL	0.698917										
97.5% Chebyshev (Mean, Sd) UCL	0.846641										
99% Chebyshev (Mean, Sd) UCL	1.136815										
Bootstrap Statistics											
Number of Bootstrap Runs	2000										
95% Standard Bootstrap UCL	0.486294										
95% Bootstrap-t UCL	0.808927										
95% Hall's Bootstrap UCL	0.920312										
95% Percentile Bootstrap UCL	0.499088										
95% BCA Bootstrap UCL	0.592737										
Recommendations											
Human Inspection Recommended?	NO										
Appropriate Distribution	NON-PARAMETRIC										
1st Recommended UCL	0.698917		95% Chebyshev (Mean, Sd) UCL								
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!	NONE										
Alternative UCL	NONE										

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls										
Variable:	Cadmium										
Raw Statistics											
Number of Observations	137										
Number of Missing Data	0										
Number of Valid Observations	137										
Number of Distinct Observations	51										
Minimum	0.15										
Maximum	19.95										
Mean	1.038431										
Standard Deviation	2.481007										
Variance	6.155397										
Coefficient of Variation	2.389189										
Skewness	4.926609										
Too Few Distinct Observations?	NO										
Normal Statistics											
Lilliefors Test Statisitic	0.360137										
Lilliefors 5% Critical Value	0.075696										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Normality Test Result	NOT NORMAL		Data not normal at 5% significance level								
95% Student's-t UCL	1.389476										
Gamma Statistics											
k hat	0.673752										
k star (bias corrected)	0.663865										
Theta hat	1.541264										
Theta star	1.56422										
nu hat	184.6082										
nu star	181.899										
5% Approximate Chi Square Value	151.6973										
Adjusted Level of Significance	0.048248										
Adjusted Chi Square Value	151.4065										
Anderson-Darling Test Statistic	19.20351										
Anderson-Darling 5% Critical Value	0.802749										
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA		Data not gamma distributed at 5% significance level								
Kolmogrov-Smirnov Test Statistic	0.354507										
Kolmogrov-Smirnov 5% Critical Value	0.083496										
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA		Data not gamma distributed at 5% significance level								
5% Gamma Test Result	NOT GAMMA		Data not gamma distributed at 5% significance level								
95% Approximate Gamma UCL	1.245174										
95% Adjusted Gamma UCL	1.247566										
Lognormal Statistics											
Minimum of log data	-1.89712										
Maximum of log data	2.993229										
Mean of log data	-0.864105										
Standard Deviation of log data	1.055968										
Variance of log data	1.115068										
Lilliefors Test Statisitic	0.310881										
Lilliefors 5% Critical Value	0.075696										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Lognormality Test Result	NOT LOGNORMAL		Data not lognormal at 5% significance level								
MLE Mean	0.735966										
MLE Standard Deviation	1.053686										
MLE Coefficient of Variation	1.431704										
MLE Skewness	7.229784										
MLE Median	0.421429										
MLE 80% Quantile	1.028589										
MLE 90% Quantile	1.636916										
MLE 95% Quantile	2.393992										
MLE 99% Quantile	4.913942										
MVU Estimate of Median	0.419717										
MVU Estimate of Mean	0.731369										
MVU Estimate of Standard Deviation	1.020975										
MVU Estimate of SE of Mean	0.080919										
95% H-UCL	0.900237										
95% Chebyshev (MVUE) UCL	1.084085										
97.5% Chebyshev (MVUE) UCL	1.236706										
99% Chebyshev (MVUE) UCL	1.536499										
Non-parametric Statisitics											
95% CLT UCL	1.387085										
95% Adjusted-CLT UCL	1.482416										
95% Modified-t UCL	1.404346										
95% Jackknife UCL	1.389476										
95% Chebyshev (Mean, Sd) UCL	1.962372										
97.5% Chebyshev (Mean, Sd) UCL	2.362163										
99% Chebyshev (Mean, Sd) UCL	3.147473										
Bootstrap Statistics											
Number of Bootstrap Runs	2000										
95% Standard Bootstrap UCL	1.383916										
95% Bootstrap-t UCL	1.551211										
95% Hall's Bootstrap UCL	1.557124										
95% Percentile Bootstrap UCL	1.383431										
95% BCA Bootstrap UCL	1.515657										
Recommendations											
Human Inspection Recommended?	NO										
Appropriate Distribution	NON-PARAMETRIC										
1st Recommended UCL	2.362163		97.5% Chebyshev (Mean, Sd) UCL								
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!	NONE										
Alternative UCL	NONE										

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls	
Variable:	Chromium	
Raw Statistics		
Number of Observations	364	
Number of Missing Data	0	
Number of Valid Observations	364	
Number of Distinct Observations	134	
Minimum	0.25	
Maximum	538	
Mean	17.89227	
Standard Deviation	52.38235	
Variance	2743.911	
Coefficient of Variation	2.927653	
Skewness	6.194512	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.368135	
Lilliefors 5% Critical Value	0.046439	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	22.4199	
Gamma Statistics		
k hat	0.436252	
k star (bias corrected)	0.434488	
Theta hat	41.01362	
Theta star	41.18013	
nu hat	317.5913	
nu star	316.3072	
5% Approximate Chi Square Value	276.0957	
Adjusted Level of Significance	0.049341	
Adjusted Chi Square Value	275.9481	
Anderson-Darling Test Statistic	30.4886	
Anderson-Darling 5% Critical Value	0.838012	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.297814	
Kolmogrov-Smirnov 5% Critical Value	0.050861	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	20.49815	
95% Adjusted Gamma UCL	20.50912	
Lognormal Statistics		
Minimum of log data	-1.386294	
Maximum of log data	6.287859	
Mean of log data	1.396801	
Standard Deviation of log data	1.574241	
Variance of log data	2.478236	
Lilliefors Test Statisitic	0.216106	
Lilliefors 5% Critical Value	0.046439	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	13.95613	
MLE Standard Deviation	46.11909	
MLE Coefficient of Variation	3.304576	
MLE Skewness	46.00042	
MLE Median	4.042248	
MLE 80% Quantile	15.28749	
MLE 90% Quantile	30.56028	
MLE 95% Quantile	53.86216	
MLE 99% Quantile	157.3522	
MVU Estimate of Median	4.028511	
MVU Estimate of Mean	13.85115	
MVU Estimate of Standard Deviation	44.24865	
MVU Estimate of SE of Mean	1.682604	
95% H-UCL	17.33442	
95% Chebyshev (MVUE) UCL	21.18545	
97.5% Chebyshev (MVUE) UCL	24.35901	
99% Chebyshev (MVUE) UCL	30.59285	
Non-parametric Statisitics		
95% CLT UCL	22.40835	
95% Adjusted-CLT UCL	23.36086	
95% Modified-t UCL	22.56847	
95% Jackknife UCL	22.4199	
95% Chebyshev (Mean, Sd) UCL	29.85998	
97.5% Chebyshev (Mean, Sd) UCL	35.03842	
99% Chebyshev (Mean, Sd) UCL	45.21046	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	22.34765	
95% Bootstrap-t UCL	24.14413	
95% Hall's Bootstrap UCL	24.05305	
95% Percentile Bootstrap UCL	22.59944	
95% BCA Bootstrap UCL	23.88879	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	35.03842	97.5% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls	
Variable:	Lead	
Raw Statistics		
Number of Observations	364	
Number of Missing Data	0	
Number of Valid Observations	364	
Number of Distinct Observations	51	
Minimum	0.55	
Maximum	2640	
Mean	29.21133	
Standard Deviation	159.3506	
Variance	25392.63	
Coefficient of Variation	5.455096	
Skewness	13.39823	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.458609	
Lilliefors 5% Critical Value	0.046439	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	42.9847	
Gamma Statistics		
k hat	0.49302	
k star (bias corrected)	0.490788	
Theta hat	59.24981	
Theta star	59.51924	
nu hat	358.9185	
nu star	357.2937	
5% Approximate Chi Square Value	314.4811	
Adjusted Level of Significance	0.049341	
Adjusted Chi Square Value	314.3233	
Anderson-Darling Test Statistic	1.8E+308	
Anderson-Darling 5% Critical Value	0.824243	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.394231	
Kolmogrov-Smirnov 5% Critical Value	0.050472	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	33.18808	
95% Adjusted Gamma UCL	33.20474	
Lognormal Statistics		
Minimum of log data	-0.597837	
Maximum of log data	7.878534	
Mean of log data	2.083391	
Standard Deviation of log data	1.316291	
Variance of log data	1.732622	
Lilliefors Test Statisitic	0.259373	
Lilliefors 5% Critical Value	0.046439	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	19.10027	
MLE Standard Deviation	41.21173	
MLE Coefficient of Variation	2.157652	
MLE Skewness	16.51782	
MLE Median	8.031662	
MLE 80% Quantile	24.42622	
MLE 90% Quantile	43.58989	
MLE 95% Quantile	70.01363	
MLE 99% Quantile	171.5859	
MVU Estimate of Median	8.012569	
MVU Estimate of Mean	19.01618	
MVU Estimate of Standard Deviation	40.26157	
MVU Estimate of SE of Mean	1.772899	
95% H-UCL	22.50919	
95% Chebyshev (MVUE) UCL	26.74407	
97.5% Chebyshev (MVUE) UCL	30.08793	
99% Chebyshev (MVUE) UCL	36.65631	
Non-parametric Statisitics		
95% CLT UCL	42.94955	
95% Adjusted-CLT UCL	49.21684	
95% Modified-t UCL	43.96227	
95% Jackknife UCL	42.9847	
95% Chebyshev (Mean, Sd) UCL	65.61791	
97.5% Chebyshev (Mean, Sd) UCL	81.37107	
99% Chebyshev (Mean, Sd) UCL	112.3151	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	42.91686	
95% Bootstrap-t UCL	64.81831	
95% Hall's Bootstrap UCL	88.43795	
95% Percentile Bootstrap UCL	44.01271	
95% BCA Bootstrap UCL	51.96655	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	81.37107	97.5% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls	
Variable:	Manganese	
Raw Statistics		
Number of Observations	137	
Number of Missing Data	0	
Number of Valid Observations	137	
Number of Distinct Observations	132	
Minimum	10.15	
Maximum	8830	
Mean	1247.105	
Standard Deviation	1687.008	
Variance	2845994	
Coefficient of Variation	1.352738	
Skewness	2.587851	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.231711	
Lilliefors 5% Critical Value	0.075696	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1485.805	
Gamma Statistics		
k hat	0.682062	
k star (bias corrected)	0.671993	
Theta hat	1828.434	
Theta star	1855.832	
nu hat	186.885	
nu star	184.126	
5% Approximate Chi Square Value	153.7326	
Adjusted Level of Significance	0.048248	
Adjusted Chi Square Value	153.4397	
Anderson-Darling Test Statistic	0.76022	
Anderson-Darling 5% Critical Value	0.801956	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.070497	
Kolmogrov-Smirnov 5% Critical Value	0.083447	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	1493.662	
95% Adjusted Gamma UCL	1496.513	
Lognormal Statistics		
Minimum of log data	2.317474	
Maximum of log data	9.08591	
Mean of log data	6.239294	
Standard Deviation of log data	1.529292	
Variance of log data	2.338735	
Lilliefors Test Statisitic	0.071237	
Lilliefors 5% Critical Value	0.075696	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	1650.216	
MLE Standard Deviation	5050.876	
MLE Coefficient of Variation	3.060737	
MLE Skewness	37.85553	
MLE Median	512.4965	
MLE 80% Quantile	1865.988	
MLE 90% Quantile	3657.132	
MLE 95% Quantile	6342.191	
MLE 99% Quantile	17969.44	
MVU Estimate of Median	508.1404	
MVU Estimate of Mean	1620.63	
MVU Estimate of Standard Deviation	4592.728	
MVU Estimate of SE of Mean	299.9418	
95% H-UCL	2349.633	
95% Chebyshev (MVUE) UCL	2928.046	
97.5% Chebyshev (MVUE) UCL	3493.766	
99% Chebyshev (MVUE) UCL	4605.013	
Non-parametric Statisitics		
95% CLT UCL	1484.18	
95% Adjusted-CLT UCL	1518.229	
95% Modified-t UCL	1491.117	
95% Jackknife UCL	1485.805	
95% Chebyshev (Mean, Sd) UCL	1875.357	
97.5% Chebyshev (Mean, Sd) UCL	2147.202	
99% Chebyshev (Mean, Sd) UCL	2681.189	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1477.614	
95% Bootstrap-t UCL	1523.803	
95% Hall's Bootstrap UCL	1532.343	
95% Percentile Bootstrap UCL	1499.996	
95% BCA Bootstrap UCL	1499.718	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	1493.662	95% Approximate Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls	
Variable:	Mercury	
Raw Statistics		
Number of Observations	364	
Number of Missing Data	0	
Number of Valid Observations	364	
Number of Distinct Observations	51	
Minimum	0.01	
Maximum	15.9	
Mean	0.179059	
Standard Deviation	0.951224	
Variance	0.904827	
Coefficient of Variation	5.312347	
Skewness	13.42615	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.429468	
Lilliefors 5% Critical Value	0.046439	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.261277	
Gamma Statistics		
k hat	0.492246	
k star (bias corrected)	0.49002	
Theta hat	0.36376	
Theta star	0.365412	
nu hat	358.3548	
nu star	356.7346	
5% Approximate Chi Square Value	313.9565	
Adjusted Level of Significance	0.049341	
Adjusted Chi Square Value	313.7988	
Anderson-Darling Test Statistic	1.8E+308	
Anderson-Darling 5% Critical Value	0.824431	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.405405	
Kolmogrov-Smirnov 5% Critical Value	0.050477	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.203457	
95% Adjusted Gamma UCL	0.203559	
Lognormal Statistics		
Minimum of log data	-4.60517	
Maximum of log data	2.766319	
Mean of log data	-3.013552	
Standard Deviation of log data	1.092526	
Variance of log data	1.193613	
Lilliefors Test Statisitic	0.273478	
Lilliefors 5% Critical Value	0.046439	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.089211	
MLE Standard Deviation	0.135266	
MLE Coefficient of Variation	1.516238	
MLE Skewness	8.034513	
MLE Median	0.049117	
MLE 80% Quantile	0.123642	
MLE 90% Quantile	0.199956	
MLE 95% Quantile	0.296311	
MLE 99% Quantile	0.623543	
MVU Estimate of Median	0.049036	
MVU Estimate of Mean	0.088979	
MVU Estimate of Standard Deviation	0.133463	
MVU Estimate of SE of Mean	0.006392	
95% H-UCL	0.101101	
95% Chebyshev (MVUE) UCL	0.116842	
97.5% Chebyshev (MVUE) UCL	0.128898	
99% Chebyshev (MVUE) UCL	0.152581	
Non-parametric Statisitics		
95% CLT UCL	0.261068	
95% Adjusted-CLT UCL	0.298557	
95% Modified-t UCL	0.267125	
95% Jackknife UCL	0.261277	
95% Chebyshev (Mean, Sd) UCL	0.396384	
97.5% Chebyshev (Mean, Sd) UCL	0.49042	
99% Chebyshev (Mean, Sd) UCL	0.675137	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.25879	
95% Bootstrap-t UCL	0.374517	
95% Hall's Bootstrap UCL	0.551564	
95% Percentile Bootstrap UCL	0.263826	
95% BCA Bootstrap UCL	0.333942	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.49042	97.5% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls										
Variable:	Nickel										
Raw Statistics											
Number of Observations	137										
Number of Missing Data	0										
Number of Valid Observations	137										
Number of Distinct Observations	76										
Minimum	0.5										
Maximum	114										
Mean	7.84854										
Standard Deviation	16.8574										
Variance	284.1718										
Coefficient of Variation	2.147838										
Skewness	4.366513										
Too Few Distinct Observations?	NO										
Normal Statistics											
Lilliefors Test Statisitic	0.331446										
Lilliefors 5% Critical Value	0.075696										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Normality Test Result	NOT NORMAL		Data not normal at 5% significance level								
95% Student's-t UCL	10.23375										
Gamma Statistics											
k hat	0.599335										
k star (bias corrected)	0.591077										
Theta hat	13.09542										
Theta star	13.27837										
nu hat	164.2177										
nu star	161.9551										
5% Approximate Chi Square Value	133.526										
Adjusted Level of Significance	0.048248										
Adjusted Chi Square Value	133.2536										
Anderson-Darling Test Statistic	9.496994										
Anderson-Darling 5% Critical Value	0.809857										
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA		Data not gamma distributed at 5% significance level								
Kolmogrov-Smirnov Test Statistic	0.19933										
Kolmogrov-Smirnov 5% Critical Value	0.083931										
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA		Data not gamma distributed at 5% significance level								
5% Gamma Test Result	NOT GAMMA		Data not gamma distributed at 5% significance level								
95% Approximate Gamma UCL	9.519576										
95% Adjusted Gamma UCL	9.539032										
Lognormal Statistics											
Minimum of log data	-0.693147										
Maximum of log data	4.736198										
Mean of log data	1.029222										
Standard Deviation of log data	1.29032										
Variance of log data	1.664926										
Lilliefors Test Statisitic	0.129806										
Lilliefors 5% Critical Value	0.075696										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Lognormality Test Result	NOT LOGNORMAL		Data not lognormal at 5% significance level								
MLE Mean	6.434573										
MLE Standard Deviation	13.32016										
MLE Coefficient of Variation	2.070093										
MLE Skewness	15.08121										
MLE Median	2.798888										
MLE 80% Quantile	8.32733										
MLE 90% Quantile	14.69172										
MLE 95% Quantile	23.37809										
MLE 99% Quantile	56.28945										
MVU Estimate of Median	2.781932										
MVU Estimate of Mean	6.364506										
MVU Estimate of Standard Deviation	12.59257										
MVU Estimate of SE of Mean	0.924549										
95% H-UCL	8.435399										
95% Chebyshev (MVUE) UCL	10.39452										
97.5% Chebyshev (MVUE) UCL	12.13831										
99% Chebyshev (MVUE) UCL	15.56366										
Non-parametric Statisitics											
95% CLT UCL	10.2175										
95% Adjusted-CLT UCL	10.7916										
95% Modified-t UCL	10.32329										
95% Jackknife UCL	10.23375										
95% Chebyshev (Mean, Sd) UCL	14.12633										
97.5% Chebyshev (Mean, Sd) UCL	16.84274										
99% Chebyshev (Mean, Sd) UCL	22.17859										
Bootstrap Statistics											
Number of Bootstrap Runs	2000										
95% Standard Bootstrap UCL	10.182										
95% Bootstrap-t UCL	11.39142										
95% Hall's Bootstrap UCL	11.31094										
95% Percentile Bootstrap UCL	10.33613										
95% BCA Bootstrap UCL	10.9073										
Recommendations											
Human Inspection Recommended?	NO										
Appropriate Distribution	NON-PARAMETRIC										
1st Recommended UCL	16.84274		97.5% Chebyshev (Mean, Sd) UCL								
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!	NONE										
Alternative UCL	NONE										

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls										
Variable:	Selenium										
Raw Statistics											
Number of Observations	137										
Number of Missing Data	0										
Number of Valid Observations	137										
Number of Distinct Observations	29										
Minimum	0.95										
Maximum	40.8										
Mean	2.688321										
Standard Deviation	3.931127										
Variance	15.45376										
Coefficient of Variation	1.462298										
Skewness	7.2239										
Too Few Distinct Observations?	NO										
Normal Statistics											
Lilliefors Test Statisitic	0.371461										
Lilliefors 5% Critical Value	0.075696										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Normality Test Result	NOT NORMAL		Data not normal at 5% significance level								
95% Student's-t UCL	3.244549										
Gamma Statistics											
k hat	1.667561										
k star (bias corrected)	1.635911										
Theta hat	1.612127										
Theta star	1.643317										
nu hat	456.9118										
nu star	448.2397										
5% Approximate Chi Square Value	400.1438										
Adjusted Level of Significance	0.048248										
Adjusted Chi Square Value	399.6657										
Anderson-Darling Test Statistic	11.47713										
Anderson-Darling 5% Critical Value	0.768746										
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA		Data not gamma distributed at 5% significance level								
Kolmogrov-Smirnov Test Statistic	0.305262										
Kolmogrov-Smirnov 5% Critical Value	0.081246										
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA		Data not gamma distributed at 5% significance level								
5% Gamma Test Result	NOT GAMMA		Data not gamma distributed at 5% significance level								
95% Approximate Gamma UCL	3.011449										
95% Adjusted Gamma UCL	3.015051										
Lognormal Statistics											
Minimum of log data	-0.051293										
Maximum of log data	3.708682										
Mean of log data	0.660048										
Standard Deviation of log data	0.687754										
Variance of log data	0.473006										
Lilliefors Test Statisitic	0.232892										
Lilliefors 5% Critical Value	0.075696										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Lognormality Test Result	NOT LOGNORMAL		Data not lognormal at 5% significance level								
MLE Mean	2.451134										
MLE Standard Deviation	1.906236										
MLE Coefficient of Variation	0.777696										
MLE Skewness	2.803445										
MLE Median	1.934885										
MLE 80% Quantile	3.459764										
MLE 90% Quantile	4.682406										
MLE 95% Quantile	5.997865										
MLE 99% Quantile	9.580828										
MVU Estimate of Median	1.931548										
MVU Estimate of Mean	2.445934										
MVU Estimate of Standard Deviation	1.886292										
MVU Estimate of SE of Mean	0.158682										
95% H-UCL	2.746916										
95% Chebyshev (MVUE) UCL	3.137614										
97.5% Chebyshev (MVUE) UCL	3.436904										
99% Chebyshev (MVUE) UCL	4.024803										
Non-parametric Statisitics											
95% CLT UCL	3.24076										
95% Adjusted-CLT UCL	3.462247										
95% Modified-t UCL	3.279096										
95% Jackknife UCL	3.244549										
95% Chebyshev (Mean, Sd) UCL	4.152296										
97.5% Chebyshev (Mean, Sd) UCL	4.785759										
99% Chebyshev (Mean, Sd) UCL	6.030075										
Bootstrap Statistics											
Number of Bootstrap Runs	2000										
95% Standard Bootstrap UCL	3.237849										
95% Bootstrap-t UCL	3.748324										
95% Hall's Bootstrap UCL	5.57184										
95% Percentile Bootstrap UCL	3.30365										
95% BCA Bootstrap UCL	3.619526										
Recommendations											
Human Inspection Recommended?	NO										
Appropriate Distribution	NON-PARAMETRIC										
1st Recommended UCL	4.152296		95% Chebyshev (Mean, Sd) UCL								
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!	NONE										
Alternative UCL	NONE										

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls										
Variable:	Thallium										
Raw Statistics											
Number of Observations	137										
Number of Missing Data	0										
Number of Valid Observations	137										
Number of Distinct Observations	13										
Minimum	1.1										
Maximum	22										
Mean	3.633942										
Standard Deviation	3.009702										
Variance	9.058306										
Coefficient of Variation	0.82822										
Skewness	3.918213										
Too Few Distinct Observations?	NO										
Normal Statistics											
Lilliefors Test Statisitic	0.341149										
Lilliefors 5% Critical Value	0.075696										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Normality Test Result	NOT NORMAL		Data not normal at 5% significance level								
95% Student's-t UCL	4.059794										
Gamma Statistics											
k hat	2.486531										
k star (bias corrected)	2.436948										
Theta hat	1.46145										
Theta star	1.491185										
nu hat	681.3096										
nu star	667.7238										
5% Approximate Chi Square Value	608.7606										
Adjusted Level of Significance	0.048248										
Adjusted Chi Square Value	608.1688										
Anderson-Darling Test Statistic	10.69851										
Anderson-Darling 5% Critical Value	0.762467										
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA		Data not gamma distributed at 5% significance level								
Kolmogrov-Smirnov Test Statistic	0.242696										
Kolmogrov-Smirnov 5% Critical Value	0.08071										
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA		Data not gamma distributed at 5% significance level								
5% Gamma Test Result	NOT GAMMA		Data not gamma distributed at 5% significance level								
95% Approximate Gamma UCL	3.985917										
95% Adjusted Gamma UCL	3.989796										
Lognormal Statistics											
Minimum of log data	0.09531										
Maximum of log data	3.091042										
Mean of log data	1.07596										
Standard Deviation of log data	0.637606										
Variance of log data	0.406541										
Lilliefors Test Statisitic	0.277823										
Lilliefors 5% Critical Value	0.075696										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Lognormality Test Result	NOT LOGNORMAL		Data not lognormal at 5% significance level								
MLE Mean	3.593873										
MLE Standard Deviation	2.545353										
MLE Coefficient of Variation	0.708248										
MLE Skewness	2.480012										
MLE Median	2.932807										
MLE 80% Quantile	5.026565										
MLE 90% Quantile	6.654434										
MLE 95% Quantile	8.371404										
MLE 99% Quantile	12.92329										
MVU Estimate of Median	2.928458										
MVU Estimate of Mean	3.58749										
MVU Estimate of Standard Deviation	2.523065										
MVU Estimate of SE of Mean	0.213071										
95% H-UCL	3.986995										
95% Chebyshev (MVUE) UCL	4.516247										
97.5% Chebyshev (MVUE) UCL	4.918121										
99% Chebyshev (MVUE) UCL	5.707524										
Non-parametric Statisitics											
95% CLT UCL	4.056893										
95% Adjusted-CLT UCL	4.148868										
95% Modified-t UCL	4.07414										
95% Jackknife UCL	4.059794										
95% Chebyshev (Mean, Sd) UCL	4.754772										
97.5% Chebyshev (Mean, Sd) UCL	5.239757										
99% Chebyshev (Mean, Sd) UCL	6.192414										
Bootstrap Statistics											
Number of Bootstrap Runs	2000										
95% Standard Bootstrap UCL	4.056342										
95% Bootstrap-t UCL	4.193071										
95% Hall's Bootstrap UCL	4.241034										
95% Percentile Bootstrap UCL	4.089781										
95% BCA Bootstrap UCL	4.116058										
Recommendations											
Human Inspection Recommended?	NO										
Appropriate Distribution	NON-PARAMETRIC										
1st Recommended UCL	4.754772		95% Chebyshev (Mean, Sd) UCL								
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!	NONE										
Alternative UCL	NONE										

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls	
Variable:	Vanadium	
Raw Statistics		
Number of Observations	137	
Number of Missing Data	0	
Number of Valid Observations	137	
Number of Distinct Observations	50	
Minimum	0.2	
Maximum	215	
Mean	7.686095	
Standard Deviation	23.92044	
Variance	572.1876	
Coefficient of Variation	3.112171	
Skewness	6.150705	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.377156	
Lilliefors 5% Critical Value	0.075696	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	11.07067	
Gamma Statistics		
k hat	0.427435	
k star (bias corrected)	0.422942	
Theta hat	17.98189	
Theta star	18.17294	
nu hat	117.1173	
nu star	115.886	
5% Approximate Chi Square Value	92.02746	
Adjusted Level of Significance	0.048248	
Adjusted Chi Square Value	91.80287	
Anderson-Darling Test Statistic	18.63541	
Anderson-Darling 5% Critical Value	0.837068	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.333127	
Kolmogrov-Smirnov 5% Critical Value	0.08532	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	9.678752	
95% Adjusted Gamma UCL	9.70243	
Lognormal Statistics		
Minimum of log data	-1.609438	
Maximum of log data	5.370638	
Mean of log data	0.51621	
Standard Deviation of log data	1.444497	
Variance of log data	2.086572	
Lilliefors Test Statisitic	0.315813	
Lilliefors 5% Critical Value	0.075696	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	4.756427	
MLE Standard Deviation	12.63568	
MLE Coefficient of Variation	2.656549	
MLE Skewness	26.71758	
MLE Median	1.675666	
MLE 80% Quantile	5.679202	
MLE 90% Quantile	10.72298	
MLE 95% Quantile	18.0367	
MLE 99% Quantile	48.23627	
MVU Estimate of Median	1.662953	
MVU Estimate of Mean	4.684495	
MVU Estimate of Standard Deviation	11.67137	
MVU Estimate of SE of Mean	0.798427	
95% H-UCL	6.567275	
95% Chebyshev (MVUE) UCL	8.164757	
97.5% Chebyshev (MVUE) UCL	9.670669	
99% Chebyshev (MVUE) UCL	12.62874	
Non-parametric Statisitics		
95% CLT UCL	11.04762	
95% Adjusted-CLT UCL	12.19512	
95% Modified-t UCL	11.24966	
95% Jackknife UCL	11.07067	
95% Chebyshev (Mean, Sd) UCL	16.59421	
97.5% Chebyshev (Mean, Sd) UCL	20.44876	
99% Chebyshev (Mean, Sd) UCL	28.02027	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	11.04766	
95% Bootstrap-t UCL	13.40704	
95% Hall's Bootstrap UCL	20.16408	
95% Percentile Bootstrap UCL	11.35434	
95% BCA Bootstrap UCL	12.78212	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	20.44876	97.5% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Study Area-gw-121304.xls	
Variable:	Zinc	
Raw Statistics		
Number of Observations	133	
Number of Missing Data	0	
Number of Valid Observations	133	
Number of Distinct Observations	99	
Minimum	1.6	
Maximum	8560	
Mean	232.1508	
Standard Deviation	902.7691	
Variance	814992.1	
Coefficient of Variation	3.888719	
Skewness	7.013784	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.399214	
Lilliefors 5% Critical Value	0.076826	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	361.8199	
Gamma Statistics		
k hat	0.281939	
k star (bias corrected)	0.280592	
Theta hat	823.4084	
Theta star	827.3612	
nu hat	74.99572	
nu star	74.63742	
5% Approximate Chi Square Value	55.73682	
Adjusted Level of Significance	0.048195	
Adjusted Chi Square Value	55.5587	
Anderson-Darling Test Statistic	11.43915	
Anderson-Darling 5% Critical Value	0.876224	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.22319	
Kolmogrov-Smirnov 5% Critical Value	0.08818	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	310.8741	
95% Adjusted Gamma UCL	311.8707	
Lognormal Statistics		
Minimum of log data	0.470004	
Maximum of log data	9.054855	
Mean of log data	2.976708	
Standard Deviation of log data	2.088042	
Variance of log data	4.35992	
Lilliefors Test Statisitic	0.114972	
Lilliefors 5% Critical Value	0.076826	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	173.5851	
MLE Standard Deviation	1525.682	
MLE Coefficient of Variation	8.789246	
MLE Skewness	705.3445	
MLE Median	19.62312	
MLE 80% Quantile	114.5606	
MLE 90% Quantile	287.1034	
MLE 95% Quantile	608.829	
MLE 99% Quantile	2523.732	
MVU Estimate of Median	19.30406	
MVU Estimate of Mean	165.1319	
MVU Estimate of Standard Deviation	1157.273	
MVU Estimate of SE of Mean	49.19581	
95% H-UCL	318.2509	
95% Chebyshev (MVUE) UCL	379.5715	
97.5% Chebyshev (MVUE) UCL	472.3597	
99% Chebyshev (MVUE) UCL	654.6241	
Non-parametric Statisitics		
95% CLT UCL	360.9099	
95% Adjusted-CLT UCL	411.7795	
95% Modified-t UCL	369.7546	
95% Jackknife UCL	361.8199	
95% Chebyshev (Mean, Sd) UCL	573.3654	
97.5% Chebyshev (Mean, Sd) UCL	721.0093	
99% Chebyshev (Mean, Sd) UCL	1011.027	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	361.406	
95% Bootstrap-t UCL	489.5361	
95% Hall's Bootstrap UCL	826.7548	
95% Percentile Bootstrap UCL	375.7545	
95% BCA Bootstrap UCL	430.765	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	1011.027	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-gw-121304.xls	
Variable:	1,4-Dichlorobenzene	
Raw Statistics		
Number of Observations	46	
Number of Missing Data	0	
Number of Valid Observations	46	
Number of Distinct Observations	7	
Minimum	0.125	
Maximum	5	
Mean	0.502609	
Standard Deviation	0.729495	
Variance	0.532163	
Coefficient of Variation	1.451418	
Skewness	5.621689	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.334361	
Shapiro-Wilk 5% Critical Value	0.945	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.683245	
Gamma Statistics		
k hat	1.924716	
k star (bias corrected)	1.813683	
Theta hat	0.261134	
Theta star	0.27712	
nu hat	177.0738	
nu star	166.8589	
5% Approximate Chi Square Value	137.9842	
Adjusted Level of Significance	0.044783	
Adjusted Chi Square Value	137.1359	
Anderson-Darling Test Statistic	6.147386	
Anderson-Darling 5% Critical Value	0.762017	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.36348	
Kolmogrov-Smirnov 5% Critical Value	0.132235	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.607785	
95% Adjusted Gamma UCL	0.611545	
Lognormal Statistics		
Minimum of log data	-2.079442	
Maximum of log data	1.609438	
Mean of log data	-0.969672	
Standard Deviation of log data	0.588447	
Variance of log data	0.34627	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.721804	
Shapiro-Wilk 5% Critical Value	0.945	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.450888	
MLE Standard Deviation	0.290038	
MLE Coefficient of Variation	0.64326	
MLE Skewness	2.195952	
MLE Median	0.379207	
MLE 80% Quantile	0.623482	
MLE 90% Quantile	0.807738	
MLE 95% Quantile	0.998324	
MLE 99% Quantile	1.490416	
MVU Estimate of Median	0.377783	
MVU Estimate of Mean	0.448922	
MVU Estimate of Standard Deviation	0.284022	
MVU Estimate of SE of Mean	0.041569	
95% H-UCL	0.535152	
95% Chebyshev (MVUE) UCL	0.630115	
97.5% Chebyshev (MVUE) UCL	0.708518	
99% Chebyshev (MVUE) UCL	0.862524	
Non-parametric Statisitics		
95% CLT UCL	0.679526	
95% Adjusted-CLT UCL	0.774786	
95% Modified-t UCL	0.698103	
95% Jackknife UCL	0.683245	
95% Chebyshev (Mean, Sd) UCL	0.971444	
97.5% Chebyshev (Mean, Sd) UCL	1.174309	
99% Chebyshev (Mean, Sd) UCL	1.572799	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.680178	
95% Bootstrap-t UCL	1.337191	
95% Hall's Bootstrap UCL	1.576193	
95% Percentile Bootstrap UCL	0.702174	
95% BCA Bootstrap UCL	0.832609	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.971444	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-B+T-011705.xls	
Variable:	Benzene	
Raw Statistics		
Number of Observations	141	
Number of Missing Data	0	
Number of Valid Observations	141	
Number of Distinct Observations	35	
Minimum	0.25	
Maximum	69000	
Mean	999.6448	
Standard Deviation	6308.195	
Variance	39793321	
Coefficient of Variation	6.310436	
Skewness	9.465199	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.457962	
Lilliefors 5% Critical Value	0.074615	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1879.287	
Gamma Statistics		
k hat	0.124537	
k star (bias corrected)	0.126615	
Theta hat	8026.908	
Theta star	7895.145	
nu hat	35.11935	
nu star	35.70547	
5% Approximate Chi Square Value	23.02948	
Adjusted Level of Significance	0.048298	
Adjusted Chi Square Value	22.92447	
Anderson-Darling Test Statistic	35.5877	
Anderson-Darling 5% Critical Value	1.019213	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.425263	
Kolmogrov-Smirnov 5% Critical Value	0.090622	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	1549.874	
95% Adjusted Gamma UCL	1556.973	
Lognormal Statistics		
Minimum of log data	-1.386294	
Maximum of log data	11.14186	
Mean of log data	0.571658	
Standard Deviation of log data	2.912573	
Variance of log data	8.483082	
Lilliefors Test Statisitic	0.407727	
Lilliefors 5% Critical Value	0.074615	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	123.1249	
MLE Standard Deviation	8558.132	
MLE Coefficient of Variation	69.50771	
MLE Skewness	336022.6	
MLE Median	1.771202	
MLE 80% Quantile	20.75491	
MLE 90% Quantile	74.76238	
MLE 95% Quantile	213.3302	
MLE 99% Quantile	1550.455	
MVU Estimate of Median	1.718703	
MVU Estimate of Mean	106.3799	
MVU Estimate of Standard Deviation	3700.449	
MVU Estimate of SE of Mean	50.67296	
95% H-UCL	358.0182	
95% Chebyshev (MVUE) UCL	327.2582	
97.5% Chebyshev (MVUE) UCL	422.8325	
99% Chebyshev (MVUE) UCL	610.5695	
Non-parametric Statisitics		
95% CLT UCL	1873.466	
95% Adjusted-CLT UCL	2325.943	
95% Modified-t UCL	1949.864	
95% Jackknife UCL	1879.287	
95% Chebyshev (Mean, Sd) UCL	3315.292	
97.5% Chebyshev (Mean, Sd) UCL	4317.274	
99% Chebyshev (Mean, Sd) UCL	6285.474	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1847.512	
95% Bootstrap-t UCL	3715.64	
95% Hall's Bootstrap UCL	4523.673	
95% Percentile Bootstrap UCL	1940.565	
95% BCA Bootstrap UCL	2633.86	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	6285.474	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-gw-121304.xls	
Variable:	Chlorobenzene	
Raw Statistics		
Number of Observations	49	
Number of Missing Data	0	
Number of Valid Observations	49	
Number of Distinct Observations	6	
Minimum	0.25	
Maximum	19	
Mean	0.897959	
Standard Deviation	2.733339	
Variance	7.471142	
Coefficient of Variation	3.043946	
Skewness	6.375911	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.239459	
Shapiro-Wilk 5% Critical Value	0.947	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1.552877	
Gamma Statistics		
k hat	0.808487	
k star (bias corrected)	0.772594	
Theta hat	1.110666	
Theta star	1.162266	
nu hat	79.23176	
nu star	75.71417	
5% Approximate Chi Square Value	56.66867	
Adjusted Level of Significance	0.045102	
Adjusted Chi Square Value	56.16902	
Anderson-Darling Test Statistic	10.18375	
Anderson-Darling 5% Critical Value	0.789514	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.454912	
Kolmogrov-Smirnov 5% Critical Value	0.131373	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	1.19975	
95% Adjusted Gamma UCL	1.210422	
Lognormal Statistics		
Minimum of log data	-1.386294	
Maximum of log data	2.944439	
Mean of log data	-0.840691	
Standard Deviation of log data	0.796339	
Variance of log data	0.634156	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.613664	
Shapiro-Wilk 5% Critical Value	0.947	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.592377	
MLE Standard Deviation	0.55741	
MLE Coefficient of Variation	0.940973	
MLE Skewness	3.656084	
MLE Median	0.431413	
MLE 80% Quantile	0.845536	
MLE 90% Quantile	1.20034	
MLE 95% Quantile	1.598854	
MLE 99% Quantile	2.749981	
MVU Estimate of Median	0.42863	
MVU Estimate of Mean	0.587439	
MVU Estimate of Standard Deviation	0.535487	
MVU Estimate of SE of Mean	0.074743	
95% H-UCL	0.755626	
95% Chebyshev (MVUE) UCL	0.913238	
97.5% Chebyshev (MVUE) UCL	1.054211	
99% Chebyshev (MVUE) UCL	1.331126	
Non-parametric Statisitics		
95% CLT UCL	1.540237	
95% Adjusted-CLT UCL	1.920269	
95% Modified-t UCL	1.612154	
95% Jackknife UCL	1.552877	
95% Chebyshev (Mean, Sd) UCL	2.600009	
97.5% Chebyshev (Mean, Sd) UCL	3.336487	
99% Chebyshev (Mean, Sd) UCL	4.783156	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1.531487	
95% Bootstrap-t UCL	6.533848	
95% Hall's Bootstrap UCL	4.354662	
95% Percentile Bootstrap UCL	1.627551	
95% BCA Bootstrap UCL	2.122449	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	2.600009	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-gw-121304.xls	
Variable:	Chloroform	
Raw Statistics		
Number of Observations	49	
Number of Missing Data	0	
Number of Valid Observations	49	
Number of Distinct Observations	5	
Minimum	0.25	
Maximum	5	
Mean	0.570408	
Standard Deviation	0.842363	
Variance	0.709575	
Coefficient of Variation	1.476772	
Skewness	4.607773	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.347629	
Shapiro-Wilk 5% Critical Value	0.947	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.772241	
Gamma Statistics		
k hat	1.702781	
k star (bias corrected)	1.612134	
Theta hat	0.334986	
Theta star	0.353822	
nu hat	166.8725	
nu star	157.9892	
5% Approximate Chi Square Value	129.9254	
Adjusted Level of Significance	0.045102	
Adjusted Chi Square Value	129.1554	
Anderson-Darling Test Statistic	7.709325	
Anderson-Darling 5% Critical Value	0.765357	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.40201	
Kolmogrov-Smirnov 5% Critical Value	0.128571	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.693616	
95% Adjusted Gamma UCL	0.697751	
Lognormal Statistics		
Minimum of log data	-1.386294	
Maximum of log data	1.609438	
Mean of log data	-0.882914	
Standard Deviation of log data	0.624456	
Variance of log data	0.389945	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.650272	
Shapiro-Wilk 5% Critical Value	0.947	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.502609	
MLE Standard Deviation	0.347092	
MLE Coefficient of Variation	0.690579	
MLE Skewness	2.401075	
MLE Median	0.413576	
MLE 80% Quantile	0.700999	
MLE 90% Quantile	0.922665	
MLE 95% Quantile	1.155248	
MLE 99% Quantile	1.767507	
MVU Estimate of Median	0.411933	
MVU Estimate of Mean	0.500252	
MVU Estimate of Standard Deviation	0.339335	
MVU Estimate of SE of Mean	0.048024	
95% H-UCL	0.600332	
95% Chebyshev (MVUE) UCL	0.709584	
97.5% Chebyshev (MVUE) UCL	0.800162	
99% Chebyshev (MVUE) UCL	0.978085	
Non-parametric Statisitics		
95% CLT UCL	0.768346	
95% Adjusted-CLT UCL	0.852986	
95% Modified-t UCL	0.785443	
95% Jackknife UCL	0.772241	
95% Chebyshev (Mean, Sd) UCL	1.094947	
97.5% Chebyshev (Mean, Sd) UCL	1.321916	
99% Chebyshev (Mean, Sd) UCL	1.767751	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.76535	
95% Bootstrap-t UCL	1.468726	
95% Hall's Bootstrap UCL	1.715209	
95% Percentile Bootstrap UCL	0.794898	
95% BCA Bootstrap UCL	0.87551	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	1.094947	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-gw-121304.xls	
Variable:	Methyl tert-Butyl Ether	
Raw Statistics		
Number of Observations	23	
Number of Missing Data	0	
Number of Valid Observations	23	
Number of Distinct Observations	11	
Minimum	0.1	
Maximum	4000	
Mean	174.4111	
Standard Deviation	833.9494	
Variance	695471.5	
Coefficient of Variation	4.781516	
Skewness	4.795827	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.216123	
Shapiro-Wilk 5% Critical Value	0.914	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	473.0061	
Gamma Statistics		
k hat	0.133533	
k star (bias corrected)	0.145101	
Theta hat	1306.129	
Theta star	1201.997	
nu hat	6.142512	
nu star	6.674648	
5% Approximate Chi Square Value	1.993241	
Adjusted Level of Significance	0.0389	
Adjusted Chi Square Value	1.813497	
Anderson-Darling Test Statistic	7.519488	
Anderson-Darling 5% Critical Value	0.920414	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.483378	
Kolmogrov-Smirnov 5% Critical Value	0.203477	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	584.0399	
95% Adjusted Gamma UCL	641.9268	
Lognormal Statistics		
Minimum of log data	-2.302585	
Maximum of log data	8.29405	
Mean of log data	-0.690682	
Standard Deviation of log data	2.125342	
Variance of log data	4.517077	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.522631	
Shapiro-Wilk 5% Critical Value	0.914	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	4.796359	
MLE Standard Deviation	45.64551	
MLE Coefficient of Variation	9.516701	
MLE Skewness	890.4547	
MLE Median	0.501234	
MLE 80% Quantile	3.019925	
MLE 90% Quantile	7.693551	
MLE 95% Quantile	16.53543	
MLE 99% Quantile	70.30642	
MVU Estimate of Median	0.454169	
MVU Estimate of Mean	3.701546	
MVU Estimate of Standard Deviation	15.17772	
MVU Estimate of SE of Mean	2.097822	
95% H-UCL	33.43936	
95% Chebyshev (MVUE) UCL	12.84574	
97.5% Chebyshev (MVUE) UCL	16.80244	
99% Chebyshev (MVUE) UCL	24.57462	
Non-parametric Statisitics		
95% CLT UCL	460.4354	
95% Adjusted-CLT UCL	646.2397	
95% Modified-t UCL	501.9878	
95% Jackknife UCL	473.0061	
95% Chebyshev (Mean, Sd) UCL	932.382	
97.5% Chebyshev (Mean, Sd) UCL	1260.357	
99% Chebyshev (Mean, Sd) UCL	1904.599	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	451.4035	
95% Bootstrap-t UCL	391882.2	
95% Hall's Bootstrap UCL	249947.4	
95% Percentile Bootstrap UCL	522.2198	
95% BCA Bootstrap UCL	696.1376	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	1904.599	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-gw-121304.xls	
Variable:	Tetrachloroethene	
Raw Statistics		
Number of Observations	49	
Number of Missing Data	0	
Number of Valid Observations	49	
Number of Distinct Observations	4	
Minimum	0.25	
Maximum	5	
Mean	0.48102	
Standard Deviation	0.670467	
Variance	0.449526	
Coefficient of Variation	1.393843	
Skewness	6.631424	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.26245	
Shapiro-Wilk 5% Critical Value	0.947	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.641667	
Gamma Statistics		
k hat	2.421385	
k star (bias corrected)	2.286743	
Theta hat	0.198655	
Theta star	0.210352	
nu hat	237.2958	
nu star	224.1008	
5% Approximate Chi Square Value	190.4447	
Adjusted Level of Significance	0.045102	
Adjusted Chi Square Value	189.5068	
Anderson-Darling Test Statistic	7.131252	
Anderson-Darling 5% Critical Value	0.759993	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.370922	
Kolmogrov-Smirnov 5% Critical Value	0.127903	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.566028	
95% Adjusted Gamma UCL	0.568829	
Lognormal Statistics		
Minimum of log data	-1.386294	
Maximum of log data	1.609438	
Mean of log data	-0.952327	
Standard Deviation of log data	0.506192	
Variance of log data	0.25623	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.619885	
Shapiro-Wilk 5% Critical Value	0.947	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.438581	
MLE Standard Deviation	0.237016	
MLE Coefficient of Variation	0.540417	
MLE Skewness	1.779079	
MLE Median	0.385842	
MLE 80% Quantile	0.591795	
MLE 90% Quantile	0.739434	
MLE 95% Quantile	0.887239	
MLE 99% Quantile	1.252418	
MVU Estimate of Median	0.384835	
MVU Estimate of Mean	0.437299	
MVU Estimate of Standard Deviation	0.233695	
MVU Estimate of SE of Mean	0.033245	
95% H-UCL	0.503355	
95% Chebyshev (MVUE) UCL	0.58221	
97.5% Chebyshev (MVUE) UCL	0.644913	
99% Chebyshev (MVUE) UCL	0.768081	
Non-parametric Statisitics		
95% CLT UCL	0.638566	
95% Adjusted-CLT UCL	0.735521	
95% Modified-t UCL	0.65679	
95% Jackknife UCL	0.641667	
95% Chebyshev (Mean, Sd) UCL	0.89852	
97.5% Chebyshev (Mean, Sd) UCL	1.079173	
99% Chebyshev (Mean, Sd) UCL	1.434029	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.89852	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-B+T-011705.xls	
Variable:	Toluene	
Raw Statistics		
Number of Observations	141	
Number of Missing Data	0	
Number of Valid Observations	141	
Number of Distinct Observations	28	
Minimum	0.1	
Maximum	230	
Mean	8.643298	
Standard Deviation	32.05285	
Variance	1027.385	
Coefficient of Variation	3.708405	
Skewness	4.694195	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.451476	
Lilliefors 5% Critical Value	0.074615	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	13.11289	
Gamma Statistics		
k hat	0.286432	
k star (bias corrected)	0.285066	
Theta hat	30.17571	
Theta star	30.32033	
nu hat	80.7739	
nu star	80.38864	
5% Approximate Chi Square Value	60.72576	
Adjusted Level of Significance	0.048298	
Adjusted Chi Square Value	60.55016	
Anderson-Darling Test Statistic	36.78202	
Anderson-Darling 5% Critical Value	0.874338	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.485656	
Kolmogrov-Smirnov 5% Critical Value	0.085857	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	11.44198	
95% Adjusted Gamma UCL	11.47516	
Lognormal Statistics		
Minimum of log data	-2.302585	
Maximum of log data	5.438079	
Mean of log data	-0.268881	
Standard Deviation of log data	1.532474	
Variance of log data	2.348475	
Lilliefors Test Statisitic	0.43387	
Lilliefors 5% Critical Value	0.074615	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	2.472814	
MLE Standard Deviation	7.609517	
MLE Coefficient of Variation	3.077271	
MLE Skewness	38.37231	
MLE Median	0.764234	
MLE 80% Quantile	2.790049	
MLE 90% Quantile	5.475851	
MLE 95% Quantile	9.507093	
MLE 99% Quantile	26.99503	
MVU Estimate of Median	0.757896	
MVU Estimate of Mean	2.42943	
MVU Estimate of Standard Deviation	6.932299	
MVU Estimate of SE of Mean	0.445016	
95% H-UCL	3.505052	
95% Chebyshev (MVUE) UCL	4.369211	
97.5% Chebyshev (MVUE) UCL	5.208556	
99% Chebyshev (MVUE) UCL	6.857286	
Non-parametric Statisitics		
95% CLT UCL	13.08331	
95% Adjusted-CLT UCL	14.22353	
95% Modified-t UCL	13.29074	
95% Jackknife UCL	13.11289	
95% Chebyshev (Mean, Sd) UCL	20.40943	
97.5% Chebyshev (Mean, Sd) UCL	25.50065	
99% Chebyshev (Mean, Sd) UCL	35.50136	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	13.01536	
95% Bootstrap-t UCL	14.47655	
95% Hall's Bootstrap UCL	14.27665	
95% Percentile Bootstrap UCL	13.57631	
95% BCA Bootstrap UCL	15.12844	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	25.50065	97.5% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-gw-121304.xls	
Variable:	Trichloroethene	
Raw Statistics		
Number of Observations	49	
Number of Missing Data	0	
Number of Valid Observations	49	
Number of Distinct Observations	8	
Minimum	0.15	
Maximum	5	
Mean	0.553571	
Standard Deviation	0.757383	
Variance	0.573629	
Coefficient of Variation	1.368176	
Skewness	5.018548	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.369921	
Shapiro-Wilk 5% Critical Value	0.947	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.735043	
Gamma Statistics		
k hat	1.88184	
k star (bias corrected)	1.780231	
Theta hat	0.294165	
Theta star	0.310955	
nu hat	184.4203	
nu star	174.4626	
5% Approximate Chi Square Value	144.9099	
Adjusted Level of Significance	0.045102	
Adjusted Chi Square Value	144.0952	
Anderson-Darling Test Statistic	6.504155	
Anderson-Darling 5% Critical Value	0.763591	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.374632	
Kolmogrov-Smirnov 5% Critical Value	0.128347	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.666466	
95% Adjusted Gamma UCL	0.670234	
Lognormal Statistics		
Minimum of log data	-1.89712	
Maximum of log data	1.609438	
Mean of log data	-0.88	
Standard Deviation of log data	0.616329	
Variance of log data	0.379861	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.740218	
Shapiro-Wilk 5% Critical Value	0.947	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.501541	
MLE Standard Deviation	0.340931	
MLE Coefficient of Variation	0.679766	
MLE Skewness	2.353405	
MLE Median	0.414783	
MLE 80% Quantile	0.698233	
MLE 90% Quantile	0.915745	
MLE 95% Quantile	1.143234	
MLE 99% Quantile	1.739471	
MVU Estimate of Median	0.413178	
MVU Estimate of Mean	0.499258	
MVU Estimate of Standard Deviation	0.333534	
MVU Estimate of SE of Mean	0.047224	
95% H-UCL	0.597337	
95% Chebyshev (MVUE) UCL	0.705105	
97.5% Chebyshev (MVUE) UCL	0.794175	
99% Chebyshev (MVUE) UCL	0.969136	
Non-parametric Statisitics		
95% CLT UCL	0.731541	
95% Adjusted-CLT UCL	0.814426	
95% Modified-t UCL	0.747971	
95% Jackknife UCL	0.735043	
95% Chebyshev (Mean, Sd) UCL	1.025194	
97.5% Chebyshev (Mean, Sd) UCL	1.229265	
99% Chebyshev (Mean, Sd) UCL	1.630124	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.728762	
95% Bootstrap-t UCL	1.291868	
95% Hall's Bootstrap UCL	1.591672	
95% Percentile Bootstrap UCL	0.738061	
95% BCA Bootstrap UCL	0.838878	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	1.025194	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-gw-121304.xls	
Variable:	Vinyl Chloride	
Raw Statistics		
Number of Observations	49	
Number of Missing Data	0	
Number of Valid Observations	49	
Number of Distinct Observations	4	
Minimum	0.25	
Maximum	5	
Mean	0.5	
Standard Deviation	0.678924	
Variance	0.460938	
Coefficient of Variation	1.357848	
Skewness	6.331083	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.298527	
Shapiro-Wilk 5% Critical Value	0.947	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.662672	
Gamma Statistics		
k hat	2.313987	
k star (bias corrected)	2.18592	
Theta hat	0.216077	
Theta star	0.228737	
nu hat	226.7707	
nu star	214.2201	
5% Approximate Chi Square Value	181.3413	
Adjusted Level of Significance	0.045102	
Adjusted Chi Square Value	180.4268	
Anderson-Darling Test Statistic	6.839257	
Anderson-Darling 5% Critical Value	0.760613	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.371762	
Kolmogrov-Smirnov 5% Critical Value	0.127978	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.590654	
95% Adjusted Gamma UCL	0.593648	
Lognormal Statistics		
Minimum of log data	-1.386294	
Maximum of log data	1.609438	
Mean of log data	-0.924519	
Standard Deviation of log data	0.532445	
Variance of log data	0.283498	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.656448	
Shapiro-Wilk 5% Critical Value	0.947	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.457138	
MLE Standard Deviation	0.261715	
MLE Coefficient of Variation	0.572508	
MLE Skewness	1.905174	
MLE Median	0.396722	
MLE 80% Quantile	0.622132	
MLE 90% Quantile	0.786371	
MLE 95% Quantile	0.952517	
MLE 99% Quantile	1.368819	
MVU Estimate of Median	0.395576	
MVU Estimate of Mean	0.455643	
MVU Estimate of Standard Deviation	0.257618	
MVU Estimate of SE of Mean	0.036615	
95% H-UCL	0.52915	
95% Chebyshev (MVUE) UCL	0.615244	
97.5% Chebyshev (MVUE) UCL	0.684304	
99% Chebyshev (MVUE) UCL	0.819958	
Non-parametric Statisitics		
95% CLT UCL	0.659533	
95% Adjusted-CLT UCL	0.753264	
95% Modified-t UCL	0.677293	
95% Jackknife UCL	0.662672	
95% Chebyshev (Mean, Sd) UCL	0.922766	
97.5% Chebyshev (Mean, Sd) UCL	1.105697	
99% Chebyshev (Mean, Sd) UCL	1.465029	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.922766	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-gw-121304.xls	
Variable:	bis(2-Ethylhexyl)phthalate	
Raw Statistics		
Number of Observations	19	
Number of Missing Data	0	
Number of Valid Observations	19	
Number of Distinct Observations	2	
Minimum	1	
Maximum	10	
Mean	1.473684	
Standard Deviation	2.064742	
Variance	4.263158	
Coefficient of Variation	1.401075	
Skewness	4.358899	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.244011	
Shapiro-Wilk 5% Critical Value	0.901	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	2.295083	
Gamma Statistics		
k hat	2.02649	
k star (bias corrected)	1.741606	
Theta hat	0.72721	
Theta star	0.846164	
nu hat	77.00663	
nu star	66.18102	
5% Approximate Chi Square Value	48.4571	
Adjusted Level of Significance	0.03687	
Adjusted Chi Square Value	47.13191	
Anderson-Darling Test Statistic	6.984471	
Anderson-Darling 5% Critical Value	0.751723	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.556012	
Kolmogrov-Smirnov 5% Critical Value	0.200808	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	2.012707	
95% Adjusted Gamma UCL	2.069297	
Lognormal Statistics		
Minimum of log data	0	
Maximum of log data	2.302585	
Mean of log data	0.121189	
Standard Deviation of log data	0.528249	
Variance of log data	0.279047	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.244011	
Shapiro-Wilk 5% Critical Value	0.901	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	1.297854	
MLE Standard Deviation	0.736319	
MLE Coefficient of Variation	0.567336	
MLE Skewness	1.884615	
MLE Median	1.128838	
MLE 80% Quantile	1.763957	
MLE 90% Quantile	2.225516	
MLE 95% Quantile	2.691662	
MLE 99% Quantile	3.857026	
MVU Estimate of Median	1.120576	
MVU Estimate of Mean	1.287251	
MVU Estimate of Standard Deviation	0.709343	
MVU Estimate of SE of Mean	0.162142	
95% H-UCL	1.67374	
95% Chebyshev (MVUE) UCL	1.994011	
97.5% Chebyshev (MVUE) UCL	2.299827	
99% Chebyshev (MVUE) UCL	2.900542	
Non-parametric Statisitics		
95% CLT UCL	2.252825	
95% Adjusted-CLT UCL	2.758964	
95% Modified-t UCL	2.37403	
95% Jackknife UCL	2.295083	
95% Chebyshev (Mean, Sd) UCL	3.538426	
97.5% Chebyshev (Mean, Sd) UCL	4.431841	
99% Chebyshev (Mean, Sd) UCL	6.186783	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/A	Not enough distinct data error
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	3.538426	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-gw-121304.xls	
Variable:	Naphthalene	
Raw Statistics		
Number of Observations	19	
Number of Missing Data	0	
Number of Valid Observations	19	
Number of Distinct Observations	4	
Minimum	0.45	
Maximum	7	
Mean	1.063158	
Standard Deviation	1.771522	
Variance	3.138289	
Coefficient of Variation	1.666283	
Skewness	2.981067	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.384001	
Shapiro-Wilk 5% Critical Value	0.901	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1.767907	
Gamma Statistics		
k hat	1.08402	
k star (bias corrected)	0.947947	
Theta hat	0.980755	
Theta star	1.121537	
nu hat	41.19277	
nu star	36.02198	
5% Approximate Chi Square Value	23.28414	
Adjusted Level of Significance	0.03687	
Adjusted Chi Square Value	22.38982	
Anderson-Darling Test Statistic	5.778993	
Anderson-Darling 5% Critical Value	0.767165	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.535126	
Kolmogrov-Smirnov 5% Critical Value	0.20394	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	1.64477	
95% Adjusted Gamma UCL	1.710467	
Lognormal Statistics		
Minimum of log data	-0.798508	
Maximum of log data	1.94591	
Mean of log data	-0.466332	
Standard Deviation of log data	0.794274	
Variance of log data	0.630871	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.4174	
Shapiro-Wilk 5% Critical Value	0.901	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.859936	
MLE Standard Deviation	0.806346	
MLE Coefficient of Variation	0.937681	
MLE Skewness	3.637497	
MLE Median	0.627299	
MLE 80% Quantile	1.227315	
MLE 90% Quantile	1.740738	
MLE 95% Quantile	2.316941	
MLE 99% Quantile	3.979468	
MVU Estimate of Median	0.616962	
MVU Estimate of Mean	0.842139	
MVU Estimate of Standard Deviation	0.734591	
MVU Estimate of SE of Mean	0.165758	
95% H-UCL	1.333912	
95% Chebyshev (MVUE) UCL	1.564662	
97.5% Chebyshev (MVUE) UCL	1.877299	
99% Chebyshev (MVUE) UCL	2.491412	
Non-parametric Statisitics		
95% CLT UCL	1.731651	
95% Adjusted-CLT UCL	2.028643	
95% Modified-t UCL	1.814232	
95% Jackknife UCL	1.767907	
95% Chebyshev (Mean, Sd) UCL	2.83468	
97.5% Chebyshev (Mean, Sd) UCL	3.601219	
99% Chebyshev (Mean, Sd) UCL	5.106936	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	2.83468	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-gw-121304.xls	
Variable:	Antimony	
Raw Statistics		
Number of Observations	44	
Number of Missing Data	0	
Number of Valid Observations	44	
Number of Distinct Observations	10	
Minimum	0.75	
Maximum	49.7	
Mean	3.264773	
Standard Deviation	7.355923	
Variance	54.1096	
Coefficient of Variation	2.253119	
Skewness	6.141425	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.285662	
Shapiro-Wilk 5% Critical Value	0.944	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	5.128991	
Gamma Statistics		
k hat	1.057407	
k star (bias corrected)	1.000462	
Theta hat	3.087528	
Theta star	3.263264	
nu hat	93.05179	
nu star	88.04068	
5% Approximate Chi Square Value	67.40491	
Adjusted Level of Significance	0.044545	
Adjusted Chi Square Value	66.79268	
Anderson-Darling Test Statistic	4.80379	
Anderson-Darling 5% Critical Value	0.776118	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.364394	
Kolmogrov-Smirnov 5% Critical Value	0.137074	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	4.264271	
95% Adjusted Gamma UCL	4.303358	
Lognormal Statistics		
Minimum of log data	-0.287682	
Maximum of log data	3.906005	
Mean of log data	0.640818	
Standard Deviation of log data	0.825719	
Variance of log data	0.681811	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.788138	
Shapiro-Wilk 5% Critical Value	0.944	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	2.669053	
MLE Standard Deviation	2.638797	
MLE Coefficient of Variation	0.988664	
MLE Skewness	3.932368	
MLE Median	1.898033	
MLE 80% Quantile	3.813511	
MLE 90% Quantile	5.484175	
MLE 95% Quantile	7.382596	
MLE 99% Quantile	12.95446	
MVU Estimate of Median	1.883381	
MVU Estimate of Mean	2.642049	
MVU Estimate of Standard Deviation	2.514028	
MVU Estimate of SE of Mean	0.369336	
95% H-UCL	3.506961	
95% Chebyshev (MVUE) UCL	4.251946	
97.5% Chebyshev (MVUE) UCL	4.94855	
99% Chebyshev (MVUE) UCL	6.316893	
Non-parametric Statisitics		
95% CLT UCL	5.088828	
95% Adjusted-CLT UCL	6.185898	
95% Modified-t UCL	5.300111	
95% Jackknife UCL	5.128991	
95% Chebyshev (Mean, Sd) UCL	8.098561	
97.5% Chebyshev (Mean, Sd) UCL	10.19015	
99% Chebyshev (Mean, Sd) UCL	14.29866	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	5.038411	
95% Bootstrap-t UCL	13.10267	
95% Hall's Bootstrap UCL	13.97223	
95% Percentile Bootstrap UCL	5.25	
95% BCA Bootstrap UCL	6.694318	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	8.098561	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-gw-121304.xls										
Variable:	Arsenic										
Raw Statistics											
Number of Observations	107										
Number of Missing Data	0										
Number of Valid Observations	107										
Number of Distinct Observations	101										
Minimum	0.1										
Maximum	24432.5										
Mean	561.6878										
Standard Deviation	2978.76										
Variance	8873012										
Coefficient of Variation	5.303231										
Skewness	6.977										
Too Few Distinct Observations?	NO										
Normal Statistics											
Lilliefors Test Statisitic	0.455164										
Lilliefors 5% Critical Value	0.085653										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level									
95% Student's-t UCL	1039.529										
Gamma Statistics											
k hat	0.206435										
k star (bias corrected)	0.206877										
Theta hat	2720.9										
Theta star	2715.078										
nu hat	44.177										
nu star	44.27173										
5% Approximate Chi Square Value	30.00887										
Adjusted Level of Significance	0.047757										
Adjusted Chi Square Value	29.84878										
Anderson-Darling Test Statistic	9.727222										
Anderson-Darling 5% Critical Value	0.909566										
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level									
Kolmogrov-Smirnov Test Statistic	0.231806										
Kolmogrov-Smirnov 5% Critical Value	0.096954										
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level									
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level									
95% Approximate Gamma UCL	828.6514										
95% Adjusted Gamma UCL	833.0957										
Lognormal Statistics											
Minimum of log data	-2.302585										
Maximum of log data	10.10367										
Mean of log data	2.783653										
Standard Deviation of log data	2.656995										
Variance of log data	7.05962										
Lilliefors Test Statisitic	0.08908										
Lilliefors 5% Critical Value	0.085653										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level									
MLE Mean	551.9529										
MLE Standard Deviation	18823.15										
MLE Coefficient of Variation	34.10282										
MLE Skewness	39763.98										
MLE Median	16.17801										
MLE 80% Quantile	152.7516										
MLE 90% Quantile	491.7108										
MLE 95% Quantile	1279.736										
MLE 99% Quantile	7815.17										
MVU Estimate of Median	15.65286										
MVU Estimate of Mean	480.9963										
MVU Estimate of Standard Deviation	8807.14										
MVU Estimate of SE of Mean	222.2617										
95% H-UCL	1590.99										
95% Chebyshev (MVUE) UCL	1449.813										
97.5% Chebyshev (MVUE) UCL	1869.02										
99% Chebyshev (MVUE) UCL	2692.472										
Non-parametric Statisitics											
95% CLT UCL	1035.352										
95% Adjusted-CLT UCL	1242.892										
95% Modified-t UCL	1071.9										
95% Jackknife UCL	1039.529										
95% Chebyshev (Mean, Sd) UCL	1816.91										
97.5% Chebyshev (Mean, Sd) UCL	2360.045										
99% Chebyshev (Mean, Sd) UCL	3426.929										
Bootstrap Statistics											
Number of Bootstrap Runs	2000										
95% Standard Bootstrap UCL	1040.456										
95% Bootstrap-t UCL	2587.671										
95% Hall's Bootstrap UCL	2914.781										
95% Percentile Bootstrap UCL	1082.005										
95% BCA Bootstrap UCL	1368.175										
Recommendations											
Human Inspection Recommended?	NO										
Appropriate Distribution	NON-PARAMETRIC										
1st Recommended UCL	3426.929	99% Chebyshev (Mean, Sd) UCL									
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!	NONE										
Alternative UCL	NONE										

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-gw-121304.xls	
Variable:	Barium	
Raw Statistics		
Number of Observations	44	
Number of Missing Data	0	
Number of Valid Observations	44	
Number of Distinct Observations	43	
Minimum	17	
Maximum	1540	
Mean	115.3227	
Standard Deviation	231.5583	
Variance	53619.27	
Coefficient of Variation	2.007916	
Skewness	5.680962	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.382198	
Shapiro-Wilk 5% Critical Value	0.944	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	174.0068	
Gamma Statistics		
k hat	0.976341	
k star (bias corrected)	0.924924	
Theta hat	118.1173	
Theta star	124.6835	
nu hat	85.918	
nu star	81.39329	
5% Approximate Chi Square Value	61.6001	
Adjusted Level of Significance	0.044545	
Adjusted Chi Square Value	61.01611	
Anderson-Darling Test Statistic	2.380405	
Anderson-Darling 5% Critical Value	0.77841	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.201664	
Kolmogrov-Smirnov 5% Critical Value	0.137377	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	152.3779	
95% Adjusted Gamma UCL	153.8364	
Lognormal Statistics		
Minimum of log data	2.833213	
Maximum of log data	7.339538	
Mean of log data	4.154857	
Standard Deviation of log data	0.937147	
Variance of log data	0.878245	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.933484	
Shapiro-Wilk 5% Critical Value	0.944	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	98.88717	
MLE Standard Deviation	117.2833	
MLE Coefficient of Variation	1.186032	
MLE Skewness	5.226452	
MLE Median	63.74286	
MLE 80% Quantile	140.7164	
MLE 90% Quantile	212.5317	
MLE 95% Quantile	297.8125	
MLE 99% Quantile	563.7784	
MVU Estimate of Median	63.10973	
MVU Estimate of Mean	97.51472	
MVU Estimate of Standard Deviation	109.7398	
MVU Estimate of SE of Mean	15.88298	
95% H-UCL	136.9896	
95% Chebyshev (MVUE) UCL	166.747	
97.5% Chebyshev (MVUE) UCL	196.7039	
99% Chebyshev (MVUE) UCL	255.5484	
Non-parametric Statisitics		
95% CLT UCL	172.7425	
95% Adjusted-CLT UCL	204.688	
95% Modified-t UCL	178.9896	
95% Jackknife UCL	174.0068	
95% Chebyshev (Mean, Sd) UCL	267.4864	
97.5% Chebyshev (Mean, Sd) UCL	333.3277	
99% Chebyshev (Mean, Sd) UCL	462.6602	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	169.7866	
95% Bootstrap-t UCL	292.8517	
95% Hall's Bootstrap UCL	379.6616	
95% Percentile Bootstrap UCL	176.6841	
95% BCA Bootstrap UCL	227.4602	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	267.4864	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-gw-121304.xls	
Variable:	Cadmium	
Raw Statistics		
Number of Observations	44	
Number of Missing Data	0	
Number of Valid Observations	44	
Number of Distinct Observations	19	
Minimum	0.15	
Maximum	19.95	
Mean	1.425114	
Standard Deviation	3.681783	
Variance	13.55552	
Coefficient of Variation	2.583501	
Skewness	3.865713	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.39597	
Shapiro-Wilk 5% Critical Value	0.944	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	2.358191	
Gamma Statistics		
k hat	0.499834	
k star (bias corrected)	0.480906	
Theta hat	2.851172	
Theta star	2.963392	
nu hat	43.98542	
nu star	42.31975	
5% Approximate Chi Square Value	28.40378	
Adjusted Level of Significance	0.044545	
Adjusted Chi Square Value	28.01632	
Anderson-Darling Test Statistic	8.802276	
Anderson-Darling 5% Critical Value	0.8134	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.418078	
Kolmogrov-Smirnov 5% Critical Value	0.140963	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	2.123325	
95% Adjusted Gamma UCL	2.15269	
Lognormal Statistics		
Minimum of log data	-1.89712	
Maximum of log data	2.993229	
Mean of log data	-0.916598	
Standard Deviation of log data	1.221088	
Variance of log data	1.491055	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.680878	
Shapiro-Wilk 5% Critical Value	0.944	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.842763	
MLE Standard Deviation	1.563496	
MLE Coefficient of Variation	1.855204	
MLE Skewness	11.95081	
MLE Median	0.399877	
MLE 80% Quantile	1.122122	
MLE 90% Quantile	1.920336	
MLE 95% Quantile	2.980502	
MLE 99% Quantile	6.845916	
MVU Estimate of Median	0.393156	
MVU Estimate of Mean	0.819264	
MVU Estimate of Standard Deviation	1.366656	
MVU Estimate of SE of Mean	0.186059	
95% H-UCL	1.367563	
95% Chebyshev (MVUE) UCL	1.630277	
97.5% Chebyshev (MVUE) UCL	1.981202	
99% Chebyshev (MVUE) UCL	2.670528	
Non-parametric Statisitics		
95% CLT UCL	2.338089	
95% Adjusted-CLT UCL	2.683722	
95% Modified-t UCL	2.412103	
95% Jackknife UCL	2.358191	
95% Chebyshev (Mean, Sd) UCL	3.844519	
97.5% Chebyshev (Mean, Sd) UCL	4.891397	
99% Chebyshev (Mean, Sd) UCL	6.947788	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	2.326192	
95% Bootstrap-t UCL	3.565369	
95% Hall's Bootstrap UCL	2.968749	
95% Percentile Bootstrap UCL	2.391136	
95% BCA Bootstrap UCL	2.806477	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	6.947788	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-gw-121304.xls	
Variable:	Chromium	
Raw Statistics		
Number of Observations	108	
Number of Missing Data	0	
Number of Valid Observations	108	
Number of Distinct Observations	41	
Minimum	0.25	
Maximum	538	
Mean	15.79139	
Standard Deviation	61.91955	
Variance	3834.031	
Coefficient of Variation	3.921096	
Skewness	7.175998	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.40091	
Lilliefors 5% Critical Value	0.085255	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	25.67737	
Gamma Statistics		
k hat	0.427656	
k star (bias corrected)	0.42195	
Theta hat	36.92543	
Theta star	37.42481	
nu hat	92.37374	
nu star	91.14114	
5% Approximate Chi Square Value	70.12332	
Adjusted Level of Significance	0.047778	
Adjusted Chi Square Value	69.87515	
Anderson-Darling Test Statistic	12.62038	
Anderson-Darling 5% Critical Value	0.836389	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.340184	
Kolmogrov-Smirnov 5% Critical Value	0.093301	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	20.52449	
95% Adjusted Gamma UCL	20.59738	
Lognormal Statistics		
Minimum of log data	-1.386294	
Maximum of log data	6.287859	
Mean of log data	1.237175	
Standard Deviation of log data	1.450325	
Variance of log data	2.103443	
Lilliefors Test Statisitic	0.243377	
Lilliefors 5% Critical Value	0.085255	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	9.864043	
MLE Standard Deviation	26.45759	
MLE Coefficient of Variation	2.682226	
MLE Skewness	27.34351	
MLE Median	3.445864	
MLE 80% Quantile	11.73645	
MLE 90% Quantile	22.21666	
MLE 95% Quantile	37.44823	
MLE 99% Quantile	100.5476	
MVU Estimate of Median	3.412467	
MVU Estimate of Mean	9.673965	
MVU Estimate of Standard Deviation	23.9367	
MVU Estimate of SE of Mean	1.851621	
95% H-UCL	14.29753	
95% Chebyshev (MVUE) UCL	17.74499	
97.5% Chebyshev (MVUE) UCL	21.23733	
99% Chebyshev (MVUE) UCL	28.09736	
Non-parametric Statisitics		
95% CLT UCL	25.59177	
95% Adjusted-CLT UCL	29.98787	
95% Modified-t UCL	26.36307	
95% Jackknife UCL	25.67737	
95% Chebyshev (Mean, Sd) UCL	41.76263	
97.5% Chebyshev (Mean, Sd) UCL	53.00041	
99% Chebyshev (Mean, Sd) UCL	75.07485	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	25.7133	
95% Bootstrap-t UCL	55.1737	
95% Hall's Bootstrap UCL	67.54669	
95% Percentile Bootstrap UCL	26.87907	
95% BCA Bootstrap UCL	31.04907	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	53.00041	97.5% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-gw-121304.xls										
Variable:	Lead										
Raw Statistics											
Number of Observations	108										
Number of Missing Data	0										
Number of Valid Observations	108										
Number of Distinct Observations	24										
Minimum	0.55										
Maximum	801										
Mean	34.06227										
Standard Deviation	104.1486										
Variance	10846.93										
Coefficient of Variation	3.057595										
Skewness	5.930124										
Too Few Distinct Observations?	NO										
Normal Statistics											
Lilliefors Test Statisitic	0.442983										
Lilliefors 5% Critical Value	0.085255										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level									
95% Student's-t UCL	50.69047										
Gamma Statistics											
k hat	0.489839										
k star (bias corrected)	0.482406										
Theta hat	69.53761										
Theta star	70.60918										
nu hat	105.8053										
nu star	104.1996										
5% Approximate Chi Square Value	81.64021										
Adjusted Level of Significance	0.047778										
Adjusted Chi Square Value	81.37155										
Anderson-Darling Test Statistic	10.30804										
Anderson-Darling 5% Critical Value	0.821116										
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level									
Kolmogrov-Smirnov Test Statistic	0.373343										
Kolmogrov-Smirnov 5% Critical Value	0.09255										
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level									
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level									
95% Approximate Gamma UCL	43.4746										
95% Adjusted Gamma UCL	43.61814										
Lognormal Statistics											
Minimum of log data	-0.597837										
Maximum of log data	6.685861										
Mean of log data	2.227332										
Standard Deviation of log data	1.496479										
Variance of log data	2.239449										
Lilliefors Test Statisitic	0.246353										
Lilliefors 5% Critical Value	0.085255										
Shapiro-Wilk Test Statisitic	N/A										
Shapiro-Wilk 5% Critical Value	N/A										
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level									
MLE Mean	28.41895										
MLE Standard Deviation	82.30784										
MLE Coefficient of Variation	2.896231										
MLE Skewness	32.98273										
MLE Median	9.275083										
MLE 80% Quantile	32.84686										
MLE 90% Quantile	63.45347										
MLE 95% Quantile	108.7486										
MLE 99% Quantile	301.3105										
MVU Estimate of Median	9.179409										
MVU Estimate of Mean	27.81813										
MVU Estimate of Standard Deviation	73.7033										
MVU Estimate of SE of Mean	5.567129										
95% H-UCL	41.98714										
95% Chebyshev (MVUE) UCL	52.08468										
97.5% Chebyshev (MVUE) UCL	62.58484										
99% Chebyshev (MVUE) UCL	83.21036										
Non-parametric Statisitics											
95% CLT UCL	50.54651										
95% Adjusted-CLT UCL	56.65697										
95% Modified-t UCL	51.64358										
95% Jackknife UCL	50.69047										
95% Chebyshev (Mean, Sd) UCL	77.74587										
97.5% Chebyshev (Mean, Sd) UCL	96.6478										
99% Chebyshev (Mean, Sd) UCL	133.777										
Bootstrap Statistics											
Number of Bootstrap Runs	2000										
95% Standard Bootstrap UCL	50.75098										
95% Bootstrap-t UCL	75.11397										
95% Hall's Bootstrap UCL	100.3539										
95% Percentile Bootstrap UCL	51.80278										
95% BCA Bootstrap UCL	55.95347										
Recommendations											
Human Inspection Recommended?	NO										
Appropriate Distribution	NON-PARAMETRIC										
1st Recommended UCL	96.6478	97.5% Chebyshev (Mean, Sd) UCL									
2nd Recommended UCL											
3rd Recommended UCL											
Recommended UCL > Max Data Value											
Recommendation Warning!	NONE										
Alternative UCL	NONE										

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-gw-121304.xls	
Variable:	Manganese	
Raw Statistics		
Number of Observations	44	
Number of Missing Data	0	
Number of Valid Observations	44	
Number of Distinct Observations	44	
Minimum	10.15	
Maximum	6770	
Mean	1209.765	
Standard Deviation	1316.013	
Variance	1731889	
Coefficient of Variation	1.087825	
Skewness	2.031061	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.800381	
Shapiro-Wilk 5% Critical Value	0.944	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1543.283	
Gamma Statistics		
k hat	0.817796	
k star (bias corrected)	0.777189	
Theta hat	1479.299	
Theta star	1556.591	
nu hat	71.96606	
nu star	68.39262	
5% Approximate Chi Square Value	50.35399	
Adjusted Level of Significance	0.044545	
Adjusted Chi Square Value	49.82876	
Anderson-Darling Test Statistic	0.233234	
Anderson-Darling 5% Critical Value	0.786234	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.080259	
Kolmogrov-Smirnov 5% Critical Value	0.138242	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	1643.146	
95% Adjusted Gamma UCL	1660.466	
Lognormal Statistics		
Minimum of log data	2.317474	
Maximum of log data	8.820256	
Mean of log data	6.374549	
Standard Deviation of log data	1.463145	
Variance of log data	2.140793	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.940383	
Shapiro-Wilk 5% Critical Value	0.944	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	1711.192	
MLE Standard Deviation	4688.222	
MLE Coefficient of Variation	2.739741	
MLE Skewness	28.7842	
MLE Median	586.7209	
MLE 80% Quantile	2020.109	
MLE 90% Quantile	3845.621	
MLE 95% Quantile	6512.134	
MLE 99% Quantile	17638.23	
MVU Estimate of Median	572.6123	
MVU Estimate of Mean	1632.125	
MVU Estimate of Standard Deviation	3740.252	
MVU Estimate of SE of Mean	468.9636	
95% H-UCL	3269.39	
95% Chebyshev (MVUE) UCL	3676.29	
97.5% Chebyshev (MVUE) UCL	4560.802	
99% Chebyshev (MVUE) UCL	6298.254	
Non-parametric Statisitics		
95% CLT UCL	1536.098	
95% Adjusted-CLT UCL	1601.008	
95% Modified-t UCL	1553.408	
95% Jackknife UCL	1543.283	
95% Chebyshev (Mean, Sd) UCL	2074.555	
97.5% Chebyshev (Mean, Sd) UCL	2448.75	
99% Chebyshev (Mean, Sd) UCL	3183.784	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1529.577	
95% Bootstrap-t UCL	1643.366	
95% Hall's Bootstrap UCL	1702.077	
95% Percentile Bootstrap UCL	1556.092	
95% BCA Bootstrap UCL	1596.093	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	1643.146	95% Approximate Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-gw-121304.xls	
Variable:	Mercury	
Raw Statistics		
Number of Observations	108	
Number of Missing Data	0	
Number of Valid Observations	108	
Number of Distinct Observations	24	
Minimum	0.015	
Maximum	4.2	
Mean	0.159745	
Standard Deviation	0.488654	
Variance	0.238783	
Coefficient of Variation	3.058958	
Skewness	6.231209	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	0.420694	
Lilliefors 5% Critical Value	0.085255	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.237763	
Gamma Statistics		
k hat	0.555151	
k star (bias corrected)	0.545903	
Theta hat	0.287751	
Theta star	0.292626	
nu hat	119.9127	
nu star	117.9151	
5% Approximate Chi Square Value	93.83779	
Adjusted Level of Significance	0.047778	
Adjusted Chi Square Value	93.54895	
Anderson-Darling Test Statistic	16.08365	
Anderson-Darling 5% Critical Value	0.813437	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.378082	
Kolmogrov-Smirnov 5% Critical Value	0.092068	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.200734	
95% Adjusted Gamma UCL	0.201353	
Lognormal Statistics		
Minimum of log data	-4.199705	
Maximum of log data	1.435085	
Mean of log data	-2.960147	
Standard Deviation of log data	1.133306	
Variance of log data	1.284382	
Lilliefors Test Statisitic	0.263305	
Lilliefors 5% Critical Value	0.085255	
Shapiro-Wilk Test Statisitic	N/A	
Shapiro-Wilk 5% Critical Value	N/A	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.098475	
MLE Standard Deviation	0.159165	
MLE Coefficient of Variation	1.616303	
MLE Skewness	9.0714	
MLE Median	0.051811	
MLE 80% Quantile	0.134997	
MLE 90% Quantile	0.222273	
MLE 95% Quantile	0.334252	
MLE 99% Quantile	0.723194	
MVU Estimate of Median	0.051504	
MVU Estimate of Mean	0.097533	
MVU Estimate of Standard Deviation	0.151677	
MVU Estimate of SE of Mean	0.013286	
95% H-UCL	0.127006	
95% Chebyshev (MVUE) UCL	0.155447	
97.5% Chebyshev (MVUE) UCL	0.180506	
99% Chebyshev (MVUE) UCL	0.22973	
Non-parametric Statisitics		
95% CLT UCL	0.237088	
95% Adjusted-CLT UCL	0.267213	
95% Modified-t UCL	0.242462	
95% Jackknife UCL	0.237763	
95% Chebyshev (Mean, Sd) UCL	0.364704	
97.5% Chebyshev (Mean, Sd) UCL	0.45339	
99% Chebyshev (Mean, Sd) UCL	0.627596	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.236562	
95% Bootstrap-t UCL	0.318588	
95% Hall's Bootstrap UCL	0.486007	
95% Percentile Bootstrap UCL	0.246019	
95% BCA Bootstrap UCL	0.273218	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	0.45339	97.5% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-gw-121304.xls	
Variable:	Selenium	
Raw Statistics		
Number of Observations	44	
Number of Missing Data	0	
Number of Valid Observations	44	
Number of Distinct Observations	15	
Minimum	0.95	
Maximum	40.8	
Mean	3.334659	
Standard Deviation	6.230169	
Variance	38.81501	
Coefficient of Variation	1.868308	
Skewness	5.402167	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.37748	
Shapiro-Wilk 5% Critical Value	0.944	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	4.913576	
Gamma Statistics		
k hat	1.146844	
k star (bias corrected)	1.083802	
Theta hat	2.907682	
Theta star	3.076816	
nu hat	100.9223	
nu star	95.37457	
5% Approximate Chi Square Value	73.8455	
Adjusted Level of Significance	0.044545	
Adjusted Chi Square Value	73.20332	
Anderson-Darling Test Statistic	4.373196	
Anderson-Darling 5% Critical Value	0.774367	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.318133	
Kolmogrov-Smirnov 5% Critical Value	0.136803	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	4.306853	
95% Adjusted Gamma UCL	4.344634	
Lognormal Statistics		
Minimum of log data	-0.051293	
Maximum of log data	3.708682	
Mean of log data	0.708775	
Standard Deviation of log data	0.807969	
Variance of log data	0.652815	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.813223	
Shapiro-Wilk 5% Critical Value	0.944	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	2.81562	
MLE Standard Deviation	2.702027	
MLE Coefficient of Variation	0.959656	
MLE Skewness	3.762754	
MLE Median	2.031502	
MLE 80% Quantile	4.020915	
MLE 90% Quantile	5.737456	
MLE 95% Quantile	7.67436	
MLE 99% Quantile	13.30463	
MVU Estimate of Median	2.016485	
MVU Estimate of Mean	2.788609	
MVU Estimate of Standard Deviation	2.580732	
MVU Estimate of SE of Mean	0.379882	
95% H-UCL	3.670141	
95% Chebyshev (MVUE) UCL	4.444478	
97.5% Chebyshev (MVUE) UCL	5.160974	
99% Chebyshev (MVUE) UCL	6.568391	
Non-parametric Statisitics		
95% CLT UCL	4.87956	
95% Adjusted-CLT UCL	5.696887	
95% Modified-t UCL	5.041063	
95% Jackknife UCL	4.913576	
95% Chebyshev (Mean, Sd) UCL	7.428682	
97.5% Chebyshev (Mean, Sd) UCL	9.200169	
99% Chebyshev (Mean, Sd) UCL	12.67991	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	4.886778	
95% Bootstrap-t UCL	8.209721	
95% Hall's Bootstrap UCL	10.94958	
95% Percentile Bootstrap UCL	5.054545	
95% BCA Bootstrap UCL	5.715909	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	7.428682	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-gw-121304.xls	
Variable:	Thallium	
Raw Statistics		
Number of Observations	44	
Number of Missing Data	0	
Number of Valid Observations	44	
Number of Distinct Observations	6	
Minimum	1.1	
Maximum	4.4	
Mean	3.030682	
Standard Deviation	1.416359	
Variance	2.006072	
Coefficient of Variation	0.46734	
Skewness	-0.193867	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.719474	
Shapiro-Wilk 5% Critical Value	0.944	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	3.389631	
Gamma Statistics		
k hat	3.937681	
k star (bias corrected)	3.684354	
Theta hat	0.769662	
Theta star	0.822582	
nu hat	346.5159	
nu star	324.2232	
5% Approximate Chi Square Value	283.4967	
Adjusted Level of Significance	0.044545	
Adjusted Chi Square Value	282.2097	
Anderson-Darling Test Statistic	5.232003	
Anderson-Darling 5% Critical Value	0.752944	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.306779	
Kolmogrov-Smirnov 5% Critical Value	0.133874	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	3.466062	
95% Adjusted Gamma UCL	3.481869	
Lognormal Statistics		
Minimum of log data	0.09531	
Maximum of log data	1.481605	
Mean of log data	0.976468	
Standard Deviation of log data	0.545953	
Variance of log data	0.298065	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.734535	
Shapiro-Wilk 5% Critical Value	0.944	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	3.08176	
MLE Standard Deviation	1.816015	
MLE Coefficient of Variation	0.589279	
MLE Skewness	1.972462	
MLE Median	2.655063	
MLE 80% Quantile	4.211416	
MLE 90% Quantile	5.354934	
MLE 95% Quantile	6.51796	
MLE 99% Quantile	9.453222	
MVU Estimate of Median	2.646085	
MVU Estimate of Mean	3.069904	
MVU Estimate of Standard Deviation	1.782764	
MVU Estimate of SE of Mean	0.267288	
95% H-UCL	3.618147	
95% Chebyshev (MVUE) UCL	4.234986	
97.5% Chebyshev (MVUE) UCL	4.739118	
99% Chebyshev (MVUE) UCL	5.729388	
Non-parametric Statisitics		
95% CLT UCL	3.381898	
95% Adjusted-CLT UCL	3.37523	
95% Modified-t UCL	3.388591	
95% Jackknife UCL	3.389631	
95% Chebyshev (Mean, Sd) UCL	3.961412	
97.5% Chebyshev (Mean, Sd) UCL	4.364139	
99% Chebyshev (Mean, Sd) UCL	5.15522	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	3.386126	
95% Bootstrap-t UCL	3.399171	
95% Hall's Bootstrap UCL	3.364378	
95% Percentile Bootstrap UCL	3.375	
95% BCA Bootstrap UCL	3.372727	
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	3.961412	95% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-gw-121304.xls	
Variable:	Vanadium	
Raw Statistics		
Number of Observations	44	
Number of Missing Data	0	
Number of Valid Observations	44	
Number of Distinct Observations	21	
Minimum	0.2	
Maximum	21.1	
Mean	2.928636	
Standard Deviation	4.675168	
Variance	21.8572	
Coefficient of Variation	1.596364	
Skewness	2.725933	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.567836	
Shapiro-Wilk 5% Critical Value	0.944	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	4.113468	
Gamma Statistics		
k hat	0.801366	
k star (bias corrected)	0.761879	
Theta hat	3.654557	
Theta star	3.843968	
nu hat	70.52017	
nu star	67.04531	
5% Approximate Chi Square Value	49.19778	
Adjusted Level of Significance	0.044545	
Adjusted Chi Square Value	48.67895	
Anderson-Darling Test Statistic	3.854491	
Anderson-Darling 5% Critical Value	0.787045	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.312198	
Kolmogrov-Smirnov 5% Critical Value	0.138332	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	3.991061	
95% Adjusted Gamma UCL	4.033598	
Lognormal Statistics		
Minimum of log data	-1.609438	
Maximum of log data	3.049273	
Mean of log data	0.334102	
Standard Deviation of log data	1.128971	
Variance of log data	1.274576	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.882582	
Shapiro-Wilk 5% Critical Value	0.944	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	2.641615	
MLE Standard Deviation	4.240746	
MLE Coefficient of Variation	1.605361	
MLE Skewness	8.953395	
MLE Median	1.396686	
MLE 80% Quantile	3.625829	
MLE 90% Quantile	5.958569	
MLE 95% Quantile	8.946479	
MLE 99% Quantile	19.2997	
MVU Estimate of Median	1.376596	
MVU Estimate of Mean	2.582034	
MVU Estimate of Standard Deviation	3.804793	
MVU Estimate of SE of Mean	0.530472	
95% H-UCL	4.056086	
95% Chebyshev (MVUE) UCL	4.894307	
97.5% Chebyshev (MVUE) UCL	5.894829	
99% Chebyshev (MVUE) UCL	7.860162	
Non-parametric Statisitics		
95% CLT UCL	4.087943	
95% Adjusted-CLT UCL	4.397428	
95% Modified-t UCL	4.161742	
95% Jackknife UCL	4.113468	
95% Chebyshev (Mean, Sd) UCL	6.000824	
97.5% Chebyshev (Mean, Sd) UCL	7.330162	
99% Chebyshev (Mean, Sd) UCL	9.941389	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	4.061122	
95% Bootstrap-t UCL	4.840822	
95% Hall's Bootstrap UCL	4.339534	
95% Percentile Bootstrap UCL	4.155682	
95% BCA Bootstrap UCL	4.363636	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	9.941389	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Study Area-gw-121304.xls	
Variable:	Zinc	
Raw Statistics		
Number of Observations	43	
Number of Missing Data	0	
Number of Valid Observations	43	
Number of Distinct Observations	34	
Minimum	1.6	
Maximum	4055	
Mean	255.0337	
Standard Deviation	730.907	
Variance	534225	
Coefficient of Variation	2.865923	
Skewness	4.20017	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.401922	
Shapiro-Wilk 5% Critical Value	0.943	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	442.5079	
Gamma Statistics		
k hat	0.280384	
k star (bias corrected)	0.276326	
Theta hat	909.5872	
Theta star	922.9443	
nu hat	24.11303	
nu star	23.76406	
5% Approximate Chi Square Value	13.66766	
Adjusted Level of Significance	0.044419	
Adjusted Chi Square Value	13.40079	
Anderson-Darling Test Statistic	3.204254	
Anderson-Darling 5% Critical Value	0.868879	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.214762	
Kolmogrov-Smirnov 5% Critical Value	0.147083	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	443.4288	
95% Adjusted Gamma UCL	452.2596	
Lognormal Statistics		
Minimum of log data	0.470004	
Maximum of log data	8.307706	
Mean of log data	3.05478	
Standard Deviation of log data	2.279163	
Variance of log data	5.194585	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.905845	
Shapiro-Wilk 5% Critical Value	0.943	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	284.8812	
MLE Standard Deviation	3814.572	
MLE Coefficient of Variation	13.39004	
MLE Skewness	2440.915	
MLE Median	21.21652	
MLE 80% Quantile	145.5723	
MLE 90% Quantile	396.8287	
MLE 95% Quantile	901.449	
MLE 99% Quantile	4256.121	
MVU Estimate of Median	19.97127	
MVU Estimate of Mean	235.9006	
MVU Estimate of Standard Deviation	1550.13	
MVU Estimate of SE of Mean	120.9742	
95% H-UCL	1182.085	
95% Chebyshev (MVUE) UCL	763.2148	
97.5% Chebyshev (MVUE) UCL	991.384	
99% Chebyshev (MVUE) UCL	1439.578	
Non-parametric Statisitics		
95% CLT UCL	438.3728	
95% Adjusted-CLT UCL	514.6581	
95% Modified-t UCL	454.4069	
95% Jackknife UCL	442.5079	
95% Chebyshev (Mean, Sd) UCL	740.8865	
97.5% Chebyshev (Mean, Sd) UCL	951.1154	
99% Chebyshev (Mean, Sd) UCL	1364.069	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	434.9387	
95% Bootstrap-t UCL	753.1605	
95% Hall's Bootstrap UCL	1063.499	
95% Percentile Bootstrap UCL	449.5814	
95% BCA Bootstrap UCL	541.4593	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	1364.069	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Class A-121304.xls	
Variable:	Arsenic	
Raw Statistics		
Number of Observations	21	
Number of Missing Data	0	
Number of Valid Observations	21	
Number of Distinct Observations	7	
Minimum	0.575	
Maximum	68.8	
Mean	5.405952	
Standard Deviation	14.88159	
Variance	221.4619	
Coefficient of Variation	2.752817	
Skewness	4.253692	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.34598	
Shapiro-Wilk 5% Critical Value	0.908	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	11.00685	
Gamma Statistics		
k hat	0.503963	
k star (bias corrected)	0.463715	
Theta hat	10.72688	
Theta star	11.65793	
nu hat	21.16646	
nu star	19.47601	
5% Approximate Chi Square Value	10.46433	
Adjusted Level of Significance	0.0383	
Adjusted Chi Square Value	9.958036	
Anderson-Darling Test Statistic	4.478469	
Anderson-Darling 5% Critical Value	0.804934	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.455647	
Kolmogrov-Smirnov 5% Critical Value	0.200305	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	10.06146	
95% Adjusted Gamma UCL	10.57301	
Lognormal Statistics		
Minimum of log data	-0.553385	
Maximum of log data	4.231204	
Mean of log data	0.428669	
Standard Deviation of log data	1.24139	
Variance of log data	1.54105	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.612981	
Shapiro-Wilk 5% Critical Value	0.908	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	3.317443	
MLE Standard Deviation	6.354868	
MLE Coefficient of Variation	1.915592	
MLE Skewness	12.77602	
MLE Median	1.535213	
MLE 80% Quantile	4.382609	
MLE 90% Quantile	7.567449	
MLE 95% Quantile	11.8314	
MLE 99% Quantile	27.55388	
MVU Estimate of Median	1.479814	
MVU Estimate of Mean	3.126234	
MVU Estimate of Standard Deviation	4.902663	
MVU Estimate of SE of Mean	0.986954	
95% H-UCL	7.440571	
95% Chebyshev (MVUE) UCL	7.428267	
97.5% Chebyshev (MVUE) UCL	9.28976	
99% Chebyshev (MVUE) UCL	12.9463	
Non-parametric Statisitics		
95% CLT UCL	10.7475	
95% Adjusted-CLT UCL	13.9684	
95% Modified-t UCL	11.50925	
95% Jackknife UCL	11.00685	
95% Chebyshev (Mean, Sd) UCL	19.56117	
97.5% Chebyshev (Mean, Sd) UCL	25.68615	
99% Chebyshev (Mean, Sd) UCL	37.71748	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	10.56842	
95% Bootstrap-t UCL	30.35221	
95% Hall's Bootstrap UCL	28.52377	
95% Percentile Bootstrap UCL	11.68452	
95% BCA Bootstrap UCL	15.52143	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	37.71748	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Class A-121304.xls	
Variable:	Cadmium	
Raw Statistics		
Number of Observations	18	
Number of Missing Data	0	
Number of Valid Observations	18	
Number of Distinct Observations	11	
Minimum	0.15	
Maximum	2.6	
Mean	0.621667	
Standard Deviation	0.743363	
Variance	0.552588	
Coefficient of Variation	1.195758	
Skewness	2.01756	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.676055	
Shapiro-Wilk 5% Critical Value	0.897	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	0.926467	
Gamma Statistics		
k hat	1.094299	
k star (bias corrected)	0.948953	
Theta hat	0.568096	
Theta star	0.655108	
nu hat	39.39477	
nu star	34.1623	
5% Approximate Chi Square Value	21.79197	
Adjusted Level of Significance	0.03574	
Adjusted Chi Square Value	20.84521	
Anderson-Darling Test Statistic	1.355086	
Anderson-Darling 5% Critical Value	0.764648	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.249504	
Kolmogrov-Smirnov 5% Critical Value	0.209023	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	0.974559	
95% Adjusted Gamma UCL	1.018823	
Lognormal Statistics		
Minimum of log data	-1.89712	
Maximum of log data	0.955511	
Mean of log data	-0.997422	
Standard Deviation of log data	1.001661	
Variance of log data	1.003324	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.831237	
Shapiro-Wilk 5% Critical Value	0.897	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	0.609108	
MLE Standard Deviation	0.800539	
MLE Coefficient of Variation	1.314281	
MLE Skewness	6.213042	
MLE Median	0.368829	
MLE 80% Quantile	0.859832	
MLE 90% Quantile	1.336043	
MLE 95% Quantile	1.916135	
MLE 99% Quantile	3.790285	
MVU Estimate of Median	0.358677	
MVU Estimate of Mean	0.585795	
MVU Estimate of Standard Deviation	0.675443	
MVU Estimate of SE of Mean	0.153521	
95% H-UCL	1.16136	
95% Chebyshev (MVUE) UCL	1.254977	
97.5% Chebyshev (MVUE) UCL	1.544532	
99% Chebyshev (MVUE) UCL	2.113307	
Non-parametric Statisitics		
95% CLT UCL	0.909865	
95% Adjusted-CLT UCL	0.998895	
95% Modified-t UCL	0.940354	
95% Jackknife UCL	0.926467	
95% Chebyshev (Mean, Sd) UCL	1.385399	
97.5% Chebyshev (Mean, Sd) UCL	1.715867	
99% Chebyshev (Mean, Sd) UCL	2.365007	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	0.900757	
95% Bootstrap-t UCL	1.222446	
95% Hall's Bootstrap UCL	2.369616	
95% Percentile Bootstrap UCL	0.916667	
95% BCA Bootstrap UCL	1.0075	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	2.365007	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Class A-121304.xls	
Variable:	Chromium	
Raw Statistics		
Number of Observations	21	
Number of Missing Data	0	
Number of Valid Observations	21	
Number of Distinct Observations	12	
Minimum	0.45	
Maximum	20.5	
Mean	2.078095	
Standard Deviation	4.325041	
Variance	18.70598	
Coefficient of Variation	2.081252	
Skewness	4.239126	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.391175	
Shapiro-Wilk 5% Critical Value	0.908	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	3.705886	
Gamma Statistics		
k hat	0.813698	
k star (bias corrected)	0.729201	
Theta hat	2.55389	
Theta star	2.849823	
nu hat	34.17531	
nu star	30.62646	
5% Approximate Chi Square Value	18.98395	
Adjusted Level of Significance	0.0383	
Adjusted Chi Square Value	18.28	
Anderson-Darling Test Statistic	2.310158	
Anderson-Darling 5% Critical Value	0.779457	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.240927	
Kolmogrov-Smirnov 5% Critical Value	0.196403	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	3.352553	
95% Adjusted Gamma UCL	3.481657	
Lognormal Statistics		
Minimum of log data	-0.798508	
Maximum of log data	3.020425	
Mean of log data	0.003698	
Standard Deviation of log data	1.011827	
Variance of log data	1.023793	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.792638	
Shapiro-Wilk 5% Critical Value	0.908	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	1.674634	
MLE Standard Deviation	2.236582	
MLE Coefficient of Variation	1.335565	
MLE Skewness	6.388986	
MLE Median	1.003705	
MLE 80% Quantile	2.360071	
MLE 90% Quantile	3.683617	
MLE 95% Quantile	5.302364	
MLE 99% Quantile	10.56141	
MVU Estimate of Median	0.979508	
MVU Estimate of Mean	1.617629	
MVU Estimate of Standard Deviation	1.918174	
MVU Estimate of SE of Mean	0.401849	
95% H-UCL	3.002166	
95% Chebyshev (MVUE) UCL	3.369247	
97.5% Chebyshev (MVUE) UCL	4.127173	
99% Chebyshev (MVUE) UCL	5.615973	
Non-parametric Statisitics		
95% CLT UCL	3.63051	
95% Adjusted-CLT UCL	4.563394	
95% Modified-t UCL	3.851397	
95% Jackknife UCL	3.705886	
95% Chebyshev (Mean, Sd) UCL	6.192029	
97.5% Chebyshev (Mean, Sd) UCL	7.972132	
99% Chebyshev (Mean, Sd) UCL	11.4688	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	3.575757	
95% Bootstrap-t UCL	8.261466	
95% Hall's Bootstrap UCL	9.012058	
95% Percentile Bootstrap UCL	3.837619	
95% BCA Bootstrap UCL	4.997143	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	11.4688	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Class A-121304.xls	
Variable:	Manganese	
Raw Statistics		
Number of Observations	18	
Number of Missing Data	0	
Number of Valid Observations	18	
Number of Distinct Observations	18	
Minimum	7.6	
Maximum	8550	
Mean	1011.281	
Standard Deviation	2072.508	
Variance	4295288	
Coefficient of Variation	2.049389	
Skewness	3.248017	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.522792	
Shapiro-Wilk 5% Critical Value	0.897	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1861.069	
Gamma Statistics		
k hat	0.441169	
k star (bias corrected)	0.404678	
Theta hat	2292.273	
Theta star	2498.975	
nu hat	15.8821	
nu star	14.56842	
5% Approximate Chi Square Value	6.96116	
Adjusted Level of Significance	0.03574	
Adjusted Chi Square Value	6.46096	
Anderson-Darling Test Statistic	0.603156	
Anderson-Darling 5% Critical Value	0.812467	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.170177	
Kolmogrov-Smirnov 5% Critical Value	0.216777	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	2116.422	
95% Adjusted Gamma UCL	2280.274	
Lognormal Statistics		
Minimum of log data	2.028148	
Maximum of log data	9.053687	
Mean of log data	5.450607	
Standard Deviation of log data	1.89745	
Variance of log data	3.600318	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.984096	
Shapiro-Wilk 5% Critical Value	0.897	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	1409.184	
MLE Standard Deviation	8409.167	
MLE Coefficient of Variation	5.967401	
MLE Skewness	230.4006	
MLE Median	232.8995	
MLE 80% Quantile	1157.425	
MLE 90% Quantile	2667.324	
MLE 95% Quantile	5281.224	
MLE 99% Quantile	19227.12	
MVU Estimate of Median	210.622	
MVU Estimate of Mean	1123.72	
MVU Estimate of Standard Deviation	3328.583	
MVU Estimate of SE of Mean	603.9471	
95% H-UCL	9581.454	
95% Chebyshev (MVUE) UCL	3756.264	
97.5% Chebyshev (MVUE) UCL	4895.368	
99% Chebyshev (MVUE) UCL	7132.918	
Non-parametric Statisitics		
95% CLT UCL	1814.783	
95% Adjusted-CLT UCL	2214.38	
95% Modified-t UCL	1923.398	
95% Jackknife UCL	1861.069	
95% Chebyshev (Mean, Sd) UCL	3140.58	
97.5% Chebyshev (Mean, Sd) UCL	4061.929	
99% Chebyshev (Mean, Sd) UCL	5871.742	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1790.99	
95% Bootstrap-t UCL	4682.214	
95% Hall's Bootstrap UCL	4750.792	
95% Percentile Bootstrap UCL	1925.567	
95% BCA Bootstrap UCL	2409.781	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	2280.274	95% Adjusted Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Class A-121304.xls	
Variable:	Thallium	
Raw Statistics		
Number of Observations	18	
Number of Missing Data	0	
Number of Valid Observations	18	
Number of Distinct Observations	3	
Minimum	1.5	
Maximum	7.6	
Mean	1.922222	
Standard Deviation	1.46028	
Variance	2.132418	
Coefficient of Variation	0.759683	
Skewness	3.890838	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.331848	
Shapiro-Wilk 5% Critical Value	0.897	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	2.52098	
Gamma Statistics		
k hat	4.34874	
k star (bias corrected)	3.660987	
Theta hat	0.442018	
Theta star	0.525056	
nu hat	156.5546	
nu star	131.7955	
5% Approximate Chi Square Value	106.2699	
Adjusted Level of Significance	0.03574	
Adjusted Chi Square Value	104.0707	
Anderson-Darling Test Statistic	5.488984	
Anderson-Darling 5% Critical Value	0.74272	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.519322	
Kolmogrov-Smirnov 5% Critical Value	0.204422	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	2.383933	
95% Adjusted Gamma UCL	2.434309	
Lognormal Statistics		
Minimum of log data	0.405465	
Maximum of log data	2.028148	
Mean of log data	0.534122	
Standard Deviation of log data	0.406969	
Variance of log data	0.165624	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.368299	
Shapiro-Wilk 5% Critical Value	0.897	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	1.853238	
MLE Standard Deviation	0.786544	
MLE Coefficient of Variation	0.424416	
MLE Skewness	1.349698	
MLE Median	1.70595	
MLE 80% Quantile	2.40611	
MLE 90% Quantile	2.877948	
MLE 95% Quantile	3.332046	
MLE 99% Quantile	4.396164	
MVU Estimate of Median	1.698118	
MVU Estimate of Mean	1.844143	
MVU Estimate of Standard Deviation	0.769071	
MVU Estimate of SE of Mean	0.181036	
95% H-UCL	2.244913	
95% Chebyshev (MVUE) UCL	2.633259	
97.5% Chebyshev (MVUE) UCL	2.97471	
99% Chebyshev (MVUE) UCL	3.645425	
Non-parametric Statisitics		
95% CLT UCL	2.488367	
95% Adjusted-CLT UCL	2.825644	
95% Modified-t UCL	2.573588	
95% Jackknife UCL	2.52098	
95% Chebyshev (Mean, Sd) UCL	3.422518	
97.5% Chebyshev (Mean, Sd) UCL	4.071696	
99% Chebyshev (Mean, Sd) UCL	5.346883	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	N/R	Not enough distinct data warning
95% Bootstrap-t UCL	N/R	Not enough distinct data warning
95% Hall's Bootstrap UCL	N/R	Not enough distinct data warning
95% Percentile Bootstrap UCL	N/R	Not enough distinct data warning
95% BCA Bootstrap UCL	N/R	Not enough distinct data warning
Recommendations		
Human Inspection Recommended?	YES	Users must select one of the recommended UCLS
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	2.52098	95% Student's-t UCL
2nd Recommended UCL	2.573588	95% Modified-t UCL
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Class A-121304.xls	
Variable:	Arsenic	
Raw Statistics		
Number of Observations	11	
Number of Missing Data	0	
Number of Valid Observations	11	
Number of Distinct Observations	6	
Minimum	0.575	
Maximum	68.8	
Mean	9.179545	
Standard Deviation	20.2127	
Variance	408.5531	
Coefficient of Variation	2.201928	
Skewness	3.07384	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.486116	
Shapiro-Wilk 5% Critical Value	0.85	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	20.22533	
Gamma Statistics		
k hat	0.456857	
k star (bias corrected)	0.392866	
Theta hat	20.09282	
Theta star	23.36561	
nu hat	10.05085	
nu star	8.643045	
5% Approximate Chi Square Value	3.112091	
Adjusted Level of Significance	0.02783	
Adjusted Chi Square Value	2.595989	
Anderson-Darling Test Statistic	1.585238	
Anderson-Darling 5% Critical Value	0.789507	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.373652	
Kolmogrov-Smirnov 5% Critical Value	0.270529	
Kolmogrov-Smirnov 5% Gamma Test Result	NOT KS GAMMA	Data not gamma distributed at 5% significance level
5% Gamma Test Result	NOT GAMMA	Data not gamma distributed at 5% significance level
95% Approximate Gamma UCL	25.49386	
95% Adjusted Gamma UCL	30.56224	
Lognormal Statistics		
Minimum of log data	-0.553385	
Maximum of log data	4.231204	
Mean of log data	0.806863	
Standard Deviation of log data	1.573379	
Variance of log data	2.475523	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.761632	
Shapiro-Wilk 5% Critical Value	0.85	
5% Lognormality Test Result	NOT LOGNORMAL	Data not lognormal at 5% significance level
MLE Mean	7.726254	
MLE Standard Deviation	25.4942	
MLE Coefficient of Variation	3.299685	
MLE Skewness	45.82576	
MLE Median	2.240867	
MLE 80% Quantile	8.468627	
MLE 90% Quantile	16.92269	
MLE 95% Quantile	29.8168	
MLE 99% Quantile	87.05528	
MVU Estimate of Median	2.000227	
MVU Estimate of Mean	6.324663	
MVU Estimate of Standard Deviation	11.91748	
MVU Estimate of SE of Mean	3.228753	
95% H-UCL	62.85122	
95% Chebyshev (MVUE) UCL	20.39847	
97.5% Chebyshev (MVUE) UCL	26.48822	
99% Chebyshev (MVUE) UCL	38.45035	
Non-parametric Statisitics		
95% CLT UCL	19.20387	
95% Adjusted-CLT UCL	25.23909	
95% Modified-t UCL	21.1667	
95% Jackknife UCL	20.22533	
95% Chebyshev (Mean, Sd) UCL	35.74423	
97.5% Chebyshev (Mean, Sd) UCL	47.23879	
99% Chebyshev (Mean, Sd) UCL	69.81764	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	18.54087	
95% Bootstrap-t UCL	56.85651	
95% Hall's Bootstrap UCL	55.63927	
95% Percentile Bootstrap UCL	20.52045	
95% BCA Bootstrap UCL	26.57273	
Recommendations		
Human Inspection Recommended?	YES	
Appropriate Distribution	NON-PARAMETRIC	
1st Recommended UCL	69.81764	99% Chebyshev (Mean, Sd) UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value	YES	Recommended UCL exceeds the maximum data value
Recommendation Warning!	NONE	
Alternative UCL	YES	Cosider using 95% or 97.5% Chebyshev (Mean, Sd) UCL

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Class A-121304.xls	
Variable:	Chromium	
Raw Statistics		
Number of Observations	11	
Number of Missing Data	0	
Number of Valid Observations	11	
Number of Distinct Observations	9	
Minimum	0.45	
Maximum	20.5	
Mean	3.226364	
Standard Deviation	5.829935	
Variance	33.98815	
Coefficient of Variation	1.806968	
Skewness	3.114847	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.504384	
Shapiro-Wilk 5% Critical Value	0.85	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	6.412293	
Gamma Statistics		
k hat	0.762672	
k star (bias corrected)	0.615277	
Theta hat	4.230342	
Theta star	5.243761	
nu hat	16.77879	
nu star	13.53609	
5% Approximate Chi Square Value	6.25389	
Adjusted Level of Significance	0.02783	
Adjusted Chi Square Value	5.467323	
Anderson-Darling Test Statistic	0.991757	
Anderson-Darling 5% Critical Value	0.761964	
Anderson-Darling 5% Gamma Test Result	NOT AD GAMMA	Data not gamma distributed at 5% significance level
Kolmogrov-Smirnov Test Statistic	0.251612	
Kolmogrov-Smirnov 5% Critical Value	0.26481	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	APPROX GAMMA	Data follow approximate gamma distribution at 5% significance level
95% Approximate Gamma UCL	6.983228	
95% Adjusted Gamma UCL	7.987883	
Lognormal Statistics		
Minimum of log data	-0.798508	
Maximum of log data	3.020425	
Mean of log data	0.388214	
Standard Deviation of log data	1.158353	
Variance of log data	1.341782	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.883347	
Shapiro-Wilk 5% Critical Value	0.85	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	2.883788	
MLE Standard Deviation	4.847728	
MLE Coefficient of Variation	1.681028	
MLE Skewness	9.793425	
MLE Median	1.474345	
MLE 80% Quantile	3.923649	
MLE 90% Quantile	6.531898	
MLE 95% Quantile	9.911588	
MLE 99% Quantile	21.81381	
MVU Estimate of Median	1.386677	
MVU Estimate of Mean	2.638631	
MVU Estimate of Standard Deviation	3.405952	
MVU Estimate of SE of Mean	0.984868	
95% H-UCL	9.742599	
95% Chebyshev (MVUE) UCL	6.93157	
97.5% Chebyshev (MVUE) UCL	8.789128	
99% Chebyshev (MVUE) UCL	12.43794	
Non-parametric Statisitics		
95% CLT UCL	6.117674	
95% Adjusted-CLT UCL	7.881631	
95% Modified-t UCL	6.687434	
95% Jackknife UCL	6.412293	
95% Chebyshev (Mean, Sd) UCL	10.8884	
97.5% Chebyshev (Mean, Sd) UCL	14.20377	
99% Chebyshev (Mean, Sd) UCL	20.71617	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	5.958546	
95% Bootstrap-t UCL	16.62432	
95% Hall's Bootstrap UCL	16.80069	
95% Percentile Bootstrap UCL	6.59	
95% BCA Bootstrap UCL	8.531818	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	6.983228	95% Approximate Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

Data File	J:\NE\WELLSG&H\ISRT\HHRA\Attachments\6H-UCLs\ProUCLv3.0 results\GW-Shallow Class A-121304.xls	
Variable:	Manganese	
Raw Statistics		
Number of Observations	8	
Number of Missing Data	0	
Number of Valid Observations	8	
Number of Distinct Observations	8	
Minimum	72.4	
Maximum	3530	
Mean	1003.175	
Standard Deviation	1165.34	
Variance	1358017	
Coefficient of Variation	1.161652	
Skewness	1.793281	
Too Few Distinct Observations?	NO	
Normal Statistics		
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.784545	
Shapiro-Wilk 5% Critical Value	0.818	
5% Normality Test Result	NOT NORMAL	Data not normal at 5% significance level
95% Student's-t UCL	1783.76	
Gamma Statistics		
k hat	0.965582	
k star (bias corrected)	0.686822	
Theta hat	1038.933	
Theta star	1460.604	
nu hat	15.44931	
nu star	10.98915	
5% Approximate Chi Square Value	4.568111	
Adjusted Level of Significance	0.01946	
Adjusted Chi Square Value	3.579733	
Anderson-Darling Test Statistic	0.214101	
Anderson-Darling 5% Critical Value	0.736826	
Anderson-Darling 5% Gamma Test Result	AD GAMMA	Data follow gamma distribution at 5% signifcance level.
Kolmogrov-Smirnov Test Statistic	0.170264	
Kolmogrov-Smirnov 5% Critical Value	0.301818	
Kolmogrov-Smirnov 5% Gamma Test Result	KS GAMMA	Data follow gamma distribution at 5% signifcance level
5% Gamma Test Result	GAMMA	Data follow gamma distribution at 5% signifcance level
95% Approximate Gamma UCL	2413.261	
95% Adjusted Gamma UCL	3079.572	
Lognormal Statistics		
Minimum of log data	4.282206	
Maximum of log data	8.169053	
Mean of log data	6.310649	
Standard Deviation of log data	1.240721	
Variance of log data	1.539387	
Lilliefors Test Statisitic	N/R	Shapiro Wilk method yields a more accurate result
Lilliefors 5% Critical Value	N/R	Shapiro Wilk method yields a more accurate result
Shapiro-Wilk Test Statisitic	0.989847	
Shapiro-Wilk 5% Critical Value	0.818	
5% Lognormality Test Result	LOGNORMAL	Data are lognormal at 5% significance level
MLE Mean	1188.376	
MLE Standard Deviation	2274.035	
MLE Coefficient of Variation	1.913566	
MLE Skewness	12.74767	
MLE Median	550.402	
MLE 80% Quantile	1570.356	
MLE 90% Quantile	2710.734	
MLE 95% Quantile	4237.1	
MLE 99% Quantile	9863.19	
MVU Estimate of Median	499.3883	
MVU Estimate of Mean	1033.384	
MVU Estimate of Standard Deviation	1356.098	
MVU Estimate of SE of Mean	461.5287	
95% H-UCL	8274.487	
95% Chebyshev (MVUE) UCL	3045.141	
97.5% Chebyshev (MVUE) UCL	3915.63	
99% Chebyshev (MVUE) UCL	5625.536	
Non-parametric Statisitics		
95% CLT UCL	1680.871	
95% Adjusted-CLT UCL	1959.991	
95% Modified-t UCL	1827.297	
95% Jackknife UCL	1783.76	
95% Chebyshev (Mean, Sd) UCL	2799.085	
97.5% Chebyshev (Mean, Sd) UCL	3576.176	
99% Chebyshev (Mean, Sd) UCL	5102.622	
Bootstrap Statistics		
Number of Bootstrap Runs	2000	
95% Standard Bootstrap UCL	1628.255	
95% Bootstrap-t UCL	3450.413	
95% Hall's Bootstrap UCL	5044	
95% Percentile Bootstrap UCL	1688.8	
95% BCA Bootstrap UCL	1931.375	
Recommendations		
Human Inspection Recommended?	NO	
Appropriate Distribution	GAMMA	
1st Recommended UCL	2413.261	95% Approximate Gamma UCL
2nd Recommended UCL		
3rd Recommended UCL		
Recommended UCL > Max Data Value		
Recommendation Warning!	NONE	
Alternative UCL	NONE	

APPENDIX 6I

DERMAL APPENDIX

Dermal Worksheet
Intermediate Variables for Calculating DA(event)
INDUSTRI-PLEX SUPERFUND SITE

Chemical of Potential Concern	Media	Dermal Absorption Fraction (soil)	FA	Kp		T(event)		Tau		T*		B
			Value	Value	Units	Value	Units	Value	Units	Value	Units	Value
Teenager - Rec. User												
Trichloroethene	Surface Water	--	1	1.2E-02	cm/hr	1	hr/event	0.57	hr	1.37	hr	0.0513
Trichloroethene	Surface Water	--	1	1.2E-02	cm/hr	0.5	hr/event	0.57	hr	1.37	hr	0.0513
Trichloroethene	Surface Water	--	1	1.2E-02	cm/hr	2.5	hr/event	0.57	hr	1.37	hr	0.0513
Ethylhexyl)phthalate	Surface Water	--	1	2.5E-02	cm/hr	2.5	hr/event	16.27	hr	39.05	hr	0.1896
Ethylhexyl)phthalate	Surface Water	--	1	2.5E-02	cm/hr	0.5	hr/event	16.27	hr	39.05	hr	0.1896
Industrial Worker												
1,1-Dichloroethene	Groundwater	--	1	1.2E-02	cm/hr	1	hr/event	0.37	hr	0.88	hr	0.0441
1,2-Dichloroethane	Groundwater	--	1	4.2E-03	cm/hr	1	hr/event	0.38	hr	0.90	hr	0.0161
1,4-Dichlorobenzene	Groundwater	--	1	4.2E-02	cm/hr	1	hr/event	0.70	hr	1.68	hr	0.1957
Acetone	Groundwater	--	1	5.1E-04	cm/hr	1	hr/event	0.22	hr	0.53	hr	0.0015
Benzene	Groundwater	--	1	1.5E-02	cm/hr	1	hr/event	0.29	hr	0.69	hr	0.0505
Chlorobenzene	Groundwater	--	1	2.8E-02	cm/hr	1	hr/event	0.45	hr	1.08	hr	0.1152
Chloroethane	Groundwater	--	1	6.1E-03	cm/hr	1	hr/event	0.24	hr	0.58	hr	0.0188
Chloroform	Groundwater	--	1	6.8E-03	cm/hr	1	hr/event	0.49	hr	1.18	hr	0.0287
cis-1,2-Dichloroethene	Groundwater	--	1	1.1E-02	cm/hr	1	hr/event	0.37	hr	0.88	hr	0.0415
Methyl tert-Butyl Ether	Groundwater	--	1	2.1E-03	cm/hr	1	hr/event	0.33	hr	0.79	hr	0.0076
Tetrachloroethene	Groundwater	--	1	3.3E-02	cm/hr	1	hr/event	0.89	hr	2.14	hr	0.1655
Toluene	Groundwater	--	1	3.1E-02	cm/hr	1	hr/event	0.34	hr	0.83	hr	0.1147
Trichloroethene	Groundwater	--	1	1.2E-02	cm/hr	1	hr/event	0.57	hr	1.37	hr	0.0513
Vinyl Chloride	Groundwater	--	1	5.6E-03	cm/hr	1	hr/event	0.24	hr	0.57	hr	0.0170
Xylene, total	Groundwater	--	1	4.7E-02	cm/hr	1	hr/event	0.41	hr	0.99	hr	0.1865
2,4-Dichlorophenol	Groundwater	--	1	2.1E-02	cm/hr	1	hr/event	0.86	hr	2.06	hr	0.1012
2-Methylphenol	Groundwater	--	1	7.7E-03	cm/hr	1	hr/event	0.42	hr	1.02	hr	0.0306
Ethylhexyl)phthalate	Groundwater	--	0.8	2.5E-02	cm/hr	1	hr/event	16.27	hr	39.05	hr	0.1896
Naphthalene	Groundwater	--	1	4.7E-02	cm/hr	1	hr/event	0.55	hr	1.32	hr	0.2031
Pentachlorophenol	Groundwater	--	0.9	3.9E-01	cm/hr	1	hr/event	3.26	hr	13.56	hr	2.4673
1,1-Dichloroethene	Groundwater	--	1	1.2E-02	cm/hr	0.5	hr/event	0.37	hr	0.88	hr	0.0441
1,2-Dichloroethane	Groundwater	--	1	4.2E-03	cm/hr	0.5	hr/event	0.38	hr	0.90	hr	0.0161
1,4-Dichlorobenzene	Groundwater	--	1	4.2E-02	cm/hr	0.5	hr/event	0.70	hr	1.68	hr	0.1957
Acetone	Groundwater	--	1	5.1E-04	cm/hr	0.5	hr/event	0.22	hr	0.53	hr	0.0015
Benzene	Groundwater	--	1	1.5E-02	cm/hr	0.5	hr/event	0.29	hr	0.69	hr	0.0505
Chlorobenzene	Groundwater	--	1	2.8E-02	cm/hr	0.5	hr/event	0.45	hr	1.08	hr	0.1152
Chloroethane	Groundwater	--	1	6.1E-03	cm/hr	0.5	hr/event	0.24	hr	0.58	hr	0.0188
Chloroform	Groundwater	--	1	6.8E-03	cm/hr	0.5	hr/event	0.49	hr	1.18	hr	0.0287
cis-1,2-Dichloroethene	Groundwater	--	1	1.1E-02	cm/hr	0.5	hr/event	0.37	hr	0.88	hr	0.0415
Methyl tert-Butyl Ether	Groundwater	--	1	2.1E-03	cm/hr	0.5	hr/event	0.33	hr	0.79	hr	0.0076
Tetrachloroethene	Groundwater	--	1	3.3E-02	cm/hr	0.5	hr/event	0.89	hr	2.14	hr	0.1655
Toluene	Groundwater	--	1	3.1E-02	cm/hr	0.5	hr/event	0.34	hr	0.83	hr	0.1147
Trichloroethene	Groundwater	--	1	1.2E-02	cm/hr	0.5	hr/event	0.57	hr	1.37	hr	0.0513
Vinyl Chloride	Groundwater	--	1	5.6E-03	cm/hr	0.5	hr/event	0.24	hr	0.57	hr	0.0170
Xylene, total	Groundwater	--	1	4.7E-02	cm/hr	0.5	hr/event	0.41	hr	0.99	hr	0.1865
2,4-Dichlorophenol	Groundwater	--	1	2.1E-02	cm/hr	0.5	hr/event	0.86	hr	2.06	hr	0.1012
2-Methylphenol	Groundwater	--	1	7.7E-03	cm/hr	0.5	hr/event	0.42	hr	1.02	hr	0.0306
Ethylhexyl)phthalate	Groundwater	--	0.8	2.5E-02	cm/hr	0.5	hr/event	16.27	hr	39.05	hr	0.1896
Naphthalene	Groundwater	--	1	4.7E-02	cm/hr	0.5	hr/event	0.55	hr	1.32	hr	0.2031
Pentachlorophenol	Groundwater	--	0.9	3.9E-01	cm/hr	0.5	hr/event	3.26	hr	13.56	hr	2.4673
Construction Worker												
1,4-Dichlorobenzene	Groundwater	--	1	4.2E-02	cm/hr	1	hr/event	0.70	hr	1.68	hr	0.1957
Benzene	Groundwater	--	1	1.5E-02	cm/hr	1	hr/event	0.29	hr	0.69	hr	0.0505
Chlorobenzene	Groundwater	--	1	2.8E-02	cm/hr	1	hr/event	0.45	hr	1.08	hr	0.1152
Chloroform	Groundwater	--	1	6.8E-03	cm/hr	1	hr/event	0.49	hr	1.18	hr	0.0287
Methyl tert-Butyl Ether	Groundwater	--	1	2.1E-03	cm/hr	1	hr/event	0.33	hr	0.79	hr	0.0076

Dermal Worksheet
Intermediate Variables for Calculating DA(event)
INDUSTRI-PLEX SUPERFUND SITE

Chemical of Potential Concern	Media	Dermal Absorption Fraction (soil)	FA	Kp		T(event)		Tau		T*		B
			Value	Value	Units	Value	Units	Value	Units	Value	Units	Value
Tetrachloroethene	Groundwater	--	1	3.3E-02	cm/hr	1	hr/event	0.89	hr	2.14	hr	0.1655
Toluene	Groundwater	--	1	3.1E-02	cm/hr	1	hr/event	0.34	hr	0.83	hr	0.1147
Trichloroethene	Groundwater	--	1	1.2E-02	cm/hr	1	hr/event	0.57	hr	1.37	hr	0.0513
Vinyl Chloride	Groundwater	--	1	5.6E-03	cm/hr	1	hr/event	0.24	hr	0.57	hr	0.0170
Ethylhexyl)phthalate	Groundwater	--	0.8	2.5E-02	cm/hr	1	hr/event	16.27	hr	39.05	hr	0.1896
Naphthalene	Groundwater	--	1	4.7E-02	cm/hr	1	hr/event	0.55	hr	1.32	hr	0.2031
1,4-Dichlorobenzene	Groundwater	--	1	4.2E-02	cm/hr	0.5	hr/event	0.70	hr	1.68	hr	0.1957
Benzene	Groundwater	--	1	1.5E-02	cm/hr	0.5	hr/event	0.29	hr	0.69	hr	0.0505
Chlorobenzene	Groundwater	--	1	2.8E-02	cm/hr	0.5	hr/event	0.45	hr	1.08	hr	0.1152
Chloroform	Groundwater	--	1	6.8E-03	cm/hr	0.5	hr/event	0.49	hr	1.18	hr	0.0287
Methyl tert-Butyl Ether	Groundwater	--	1	2.1E-03	cm/hr	0.5	hr/event	0.33	hr	0.79	hr	0.0076
Tetrachloroethene	Groundwater	--	1	3.3E-02	cm/hr	0.5	hr/event	0.89	hr	2.14	hr	0.1655
Toluene	Groundwater	--	1	3.1E-02	cm/hr	0.5	hr/event	0.34	hr	0.83	hr	0.1147
Trichloroethene	Groundwater	--	1	1.2E-02	cm/hr	0.5	hr/event	0.57	hr	1.37	hr	0.0513
Vinyl Chloride	Groundwater	--	1	5.6E-03	cm/hr	0.5	hr/event	0.24	hr	0.57	hr	0.0170
Ethylhexyl)phthalate	Groundwater	--	0.8	2.5E-02	cm/hr	0.5	hr/event	16.27	hr	39.05	hr	0.1896
Naphthalene	Groundwater	--	1	4.7E-02	cm/hr	0.5	hr/event	0.55	hr	1.32	hr	0.2031
Sediment/Soil												
Acenaphthylene	Sediment/Soil	0.13	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Benzo(a)anthracene	Sediment/Soil	0.13	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Benzo(a)pyrene	Sediment/Soil	0.13	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Benzo(b)fluoranthene	Sediment/Soil	0.13	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Benzo(g,h,i)perylene	Sediment/Soil	0.13	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Benzo(k)fluoranthene	Sediment/Soil	0.13	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Chrysene	Sediment/Soil	0.13	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Dibenz(a,h)anthracene	Sediment/Soil	0.13	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Indeno(1,2,3-cd)pyrene	Sediment/Soil	0.13	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Naphthalene	Sediment/Soil	0.13	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Pentachlorophenol	Sediment/Soil	0.25	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Phenanthrene	Sediment/Soil	0.13	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Pyrene	Sediment/Soil	0.13	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Arsenic	Sediment/Soil	0.03	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Cadmium	Sediment/Soil	0.001	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data

FA = Fraction Absorbed Water
Kp = Dermal Permeability Coefficient of Compound in Water

T(event) = Event Duration
Tau = Lag Time

T* = Time to Reach Steady-State
B = Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis

TABLE 1. DERMALLY ABSORBED DOSE CALCULATIONS - SURFACE WATER

(Variable Definitions follow Table)

Exposure Point	Timeframe	Receptor	Cancer/ Non-cancer	RME/ CT	A cm^2	t_event hr/event	EV event/day	EF days/yr	ED years	BW kg	AT days	Isc cm	IR cm^3/day	ABSGI	Chemical	CAS No.	MWT	logKow	Kp 95% LCI	Kp (cm/hr) predicted	Kp (cm/hr) measured	Kp 95% UCI
HB01-Baseflow	Current	Teenager	Non-cancer	RME	4500	1	1	26	6	57	2190	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
				CT	4500	0.5	1	26	2	57	730	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
			Cancer	RME	4500	1	1	26	6	57	25550	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
				CT	4500	0.5	1	26	2	57	25550	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
HB03-Baseflow	Current	Teenager	Non-cancer	RME	4500	1	1	26	6	57	2190	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
				CT	4500	0.5	1	26	2	57	730	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
			Cancer	RME	4500	1	1	26	6	57	25550	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
				CT	4500	0.5	1	26	2	57	25550	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
HB01-Baseflow	Future	Teenager	Non-cancer	RME	4500	2.5	1	52	6	57	2190	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
				CT	4500	0.5	1	26	2	57	730	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
			Cancer	RME	4500	2.5	1	52	6	57	25550	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
				CT	4500	0.5	1	26	2	57	25550	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
HB02-Baseflow	Future	Teenager	Non-cancer	RME	4500	2.5	1	52	6	57	2190	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
				CT	4500	0.5	1	26	2	57	730	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
			Cancer	RME	4500	2.5	1	52	6	57	25550	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
				CT	4500	0.5	1	26	2	57	25550	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
HB02-Storm Event	Future	Teenager	Non-cancer	RME	4500	2.5	1	52	6	57	2190	1.0E-03	2000	1	bis(2-Ethylhexyl)phthalate	117817	391.0	5.11	9.4E-04	2.5E-02	NA	6.6E-01
				CT	4500	0.5	1	26	2	57	730	1.0E-03	2000	1	bis(2-Ethylhexyl)phthalate	117817	391.0	5.11	9.4E-04	2.5E-02	NA	6.6E-01
			Cancer	RME	4500	2.5	1	52	6	57	25550	1.0E-03	2000	1	bis(2-Ethylhexyl)phthalate	117817	391.0	5.11	9.4E-04	2.5E-02	NA	6.6E-01
				CT	4500	0.5	1	26	2	57	25550	1.0E-03	2000	1	bis(2-Ethylhexyl)phthalate	117817	391.0	5.11	9.4E-04	2.5E-02	NA	6.6E-01
HB03-Baseflow	Future	Teenager	Non-cancer	RME	4500	2.5	1	52	6	57	2190	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
				CT	4500	0.5	1	26	2	57	730	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
			Cancer	RME	4500	2.5	1	52	6	57	25550	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
				CT	4500	0.5	1	26	2	57	25550	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
HB03-Storm Event	Future	Teenager	Non-cancer	RME	4500	2.5	1	52	6	57	2190	1.0E-03	2000	1	bis(2-Ethylhexyl)phthalate	117817	391.0	5.11	9.4E-04	2.5E-02	NA	6.6E-01
				CT	4500	0.5	1	26	2	57	730	1.0E-03	2000	1	bis(2-Ethylhexyl)phthalate	117817	391.0	5.11	9.4E-04	2.5E-02	NA	6.6E-01
			Cancer	RME	4500	2.5	1	52	6	57	25550	1.0E-03	2000	1	bis(2-Ethylhexyl)phthalate	117817	391.0	5.11	9.4E-04	2.5E-02	NA	6.6E-01
				CT	4500	0.5	1	26	2	57	25550	1.0E-03	2000	1	bis(2-Ethylhexyl)phthalate	117817	391.0	5.11	9.4E-04	2.5E-02	NA	6.6E-01
BE-2-Baseflow	Future	Teenager	Non-cancer	RME	4500	2.5	1	52	6	57	2190	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
				CT	4500	0.5	1	26	2	57	730	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
			Cancer	RME	4500	2.5	1	52	6	57	25550	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA
				CT	4500	0.5	1	26	2	57	25550	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA

TABLE 1. DERMALLY ABSORBED DOSE CALCULATIONS - SURFACE WATER

(Variable Definitions follow Table)

Exposure Point	Timeframe	Receptor	Cancer/ Non-cancer	RME/ CT	Derm/Drink Kp	Chem Assess	B	tau (hr)	t_star (hr)	FA for tau>3	Conc mg/cm3	DA_event mg/cm2-evt	DAD mg/kg-day	log(Ds/lsc)	Dsc/lsc	Dsc	b	c	t_star1 B>0.6	t_star3 B<=0.6
HB01-Baseflow	Current	Teenager	Non-cancer	RME	**5%**	N	0.0513	**0.57**	1.37	1.0	2.0E-06	**4.9E-08**	**2.7E-07**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
				CT	**4%**	N	0.0513	**0.57**	1.37	1.0	2.0E-06	**3.4E-08**	**1.9E-07**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
			Cancer	RME	**5%**	N	0.0513	**0.57**	1.37	1.0	2.0E-06	**4.9E-08**	**2.3E-08**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
				CT	**4%**	N	0.0513	**0.57**	1.37	1.0	2.0E-06	**3.4E-08**	**5.5E-09**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
HB03-Baseflow	Current	Teenager	Non-cancer	RME	**5%**	N	0.0513	**0.57**	1.37	1.0	1.8E-06	**4.5E-08**	**2.5E-07**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
				CT	**4%**	N	0.0513	**0.57**	1.37	1.0	1.8E-06	**3.2E-08**	**1.8E-07**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
			Cancer	RME	**5%**	N	0.0513	**0.57**	1.37	1.0	1.8E-06	**4.5E-08**	**2.2E-08**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
				CT	**4%**	N	0.0513	**0.57**	1.37	1.0	1.8E-06	**3.2E-08**	**5.1E-09**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
HB01-Baseflow	Future	Teenager	Non-cancer	RME	**9%**	N	0.0513	**0.57**	1.37	1.0	2.0E-06	**8.3E-08**	**9.4E-07**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
				CT	**4%**	N	0.0513	**0.57**	1.37	1.0	2.0E-06	**3.4E-08**	**1.9E-07**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
			Cancer	RME	**9%**	N	0.0513	**0.57**	1.37	1.0	2.0E-06	**8.3E-08**	**8.0E-08**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
				CT	**4%**	N	0.0513	**0.57**	1.37	1.0	2.0E-06	**3.4E-08**	**5.5E-09**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
HB02-Baseflow	Future	Teenager	Non-cancer	RME	**9%**	N	0.0513	**0.57**	1.37	1.0	1.8E-06	**7.7E-08**	**8.6E-07**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
				CT	**4%**	N	0.0513	**0.57**	1.37	1.0	1.8E-06	**3.2E-08**	**1.8E-07**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
			Cancer	RME	**9%**	N	0.0513	**0.57**	1.37	1.0	1.8E-06	**7.7E-08**	**7.4E-08**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
				CT	**4%**	N	0.0513	**0.57**	1.37	1.0	1.8E-06	**3.2E-08**	**5.1E-09**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
HB02-Storm Event	Future	Teenager	Non-cancer	RME	**79%**	Y	0.1896	**16.27**	39.05	0.8	1.2E-04	**4.2E-05**	**4.7E-04**	-4.99E+00	1.02E-05	**1.02E-08**	4.3E-01	4.7E-01	N/A	39.05
				CT	**35%**	Y	0.1896	**16.27**	39.05	0.8	2.4E-05	**3.8E-06**	**2.2E-05**	-4.99E+00	1.02E-05	**1.02E-08**	4.3E-01	4.7E-01	N/A	39.05
			Cancer	RME	**79%**	Y	0.1896	**16.27**	39.05	0.8	1.2E-04	**4.2E-05**	**4.1E-05**	-4.99E+00	1.02E-05	**1.02E-08**	4.3E-01	4.7E-01	N/A	39.05
				CT	**35%**	Y	0.1896	**16.27**	39.05	0.8	2.4E-05	**3.8E-06**	**6.2E-07**	-4.99E+00	1.02E-05	**1.02E-08**	4.3E-01	4.7E-01	N/A	39.05
HB03-Baseflow	Future	Teenager	Non-cancer	RME	**9%**	N	0.0513	**0.57**	1.37	1.0	1.8E-06	**7.7E-08**	**8.6E-07**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
				CT	**4%**	N	0.0513	**0.57**	1.37	1.0	1.8E-06	**3.2E-08**	**1.8E-07**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
			Cancer	RME	**9%**	N	0.0513	**0.57**	1.37	1.0	1.8E-06	**7.7E-08**	**7.4E-08**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
				CT	**4%**	N	0.0513	**0.57**	1.37	1.0	1.8E-06	**3.2E-08**	**5.1E-09**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
HB03-Storm Event	Future	Teenager	Non-cancer	RME	**79%**	Y	0.1896	**16.27**	39.05	0.8	1.2E-04	**4.2E-05**	**4.7E-04**	-4.99E+00	1.02E-05	**1.02E-08**	4.3E-01	4.7E-01	N/A	39.05
				CT	**35%**	Y	0.1896	**16.27**	39.05	0.8	2.4E-05	**3.8E-06**	**2.2E-05**	-4.99E+00	1.02E-05	**1.02E-08**	4.3E-01	4.7E-01	N/A	39.05
			Cancer	RME	**79%**	Y	0.1896	**16.27**	39.05	0.8	1.2E-04	**4.2E-05**	**4.1E-05**	-4.99E+00	1.02E-05	**1.02E-08**	4.3E-01	4.7E-01	N/A	39.05
				CT	**35%**	Y	0.1896	**16.27**	39.05	0.8	2.4E-05	**3.8E-06**	**6.2E-07**	-4.99E+00	1.02E-05	**1.02E-08**	4.3E-01	4.7E-01	N/A	39.05
BE-2-Baseflow	Future	Teenager	Non-cancer	RME	**9%**	N	0.0513	**0.57**	1.37	1.0	2.0E-06	**8.3E-08**	**9.4E-07**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
				CT	**4%**	N	0.0513	**0.57**	1.37	1.0	2.0E-06	**3.4E-08**	**1.9E-07**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
			Cancer	RME	**9%**	N	0.0513	**0.57**	1.37	1.0	2.0E-06	**8.3E-08**	**8.0E-08**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
				CT	**4%**	N	0.0513	**0.57**	1.37	1.0	2.0E-06	**3.4E-08**	**5.5E-09**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37

TABLE 2. DERMALLY ABSORBED DOSE CALCULATIONS - GROUNDWATER

(Variable Definitions follow Table)

Exposure Point	Timeframe	Receptor	Cancer/ Non-cancer	RME/ CT	A cm^2	t_event hr/event	EV event/day	EF days/yr	ED years	BW kg	AT days	Isc cm	IR cm^3/day	ABSGI	Chemical	CAS No.	MWT	logKow	Kp 95% LCI	Kp (cm/hr) predicted	Kp (cm/hr) measured	Kp 95% UCI	Derm/Drink Kp
Study Area	Future	Indust. Worker	Non-cancer	RME	3300	1	1	250	25	70	9125	1.0E-03	2000	1	1,1-Dichloroethene	75354	96.9	2.13	4.7E-04	1.2E-02	NA	2.9E-01	**3%**
					3300	1	1	250	25	70	9125	1.0E-03	2000	1	1,2-Dichloroethane	107062	99.0	1.48	1.7E-04	4.2E-03	NA	1.0E-01	**1%**
					3300	1	1	250	25	70	9125	1.0E-03	2000	1	1,4-Dichlorobenzene	106467	147.0	3.39	1.7E-03	4.2E-02	NA	1.1E+00	**16%**
					3300	1	1	250	25	70	9125	1.0E-03	2000	1	Acetone	67641	58.1	-0.24	NA	5.1E-04	5.7E-04	NA	**0%**
					3300	1	1	250	25	70	9125	1.0E-03	2000	1	Benzene	71432	78.1	2.13	5.9E-04	1.5E-02	NA	3.7E-01	**4%**
					3300	1	1	250	25	70	9125	1.0E-03	2000	1	Chlorobenzene	108907	112.6	2.84	1.1E-03	2.8E-02	NA	7.1E-01	**9%**
					3300	1	1	250	25	70	9125	1.0E-03	2000	1	Chloroethane	75003	64.5	1.43	2.4E-04	6.1E-03	NA	1.5E-01	**1%**
					3300	1	1	250	25	70	9125	1.0E-03	2000	1	Chloroform	67663	119.4	1.97	2.8E-04	6.8E-03	NA	1.7E-01	**2%**
					3300	1	1	250	25	70	9125	1.0E-03	2000	1	cis-1,2-Dichloroethene	156592	96.9	2.09	NA	1.1E-02	1.5E-02	NA	**3%**
					3300	1	1	250	25	70	9125	1.0E-03	2000	1	Methyl tert-Butyl Ether	1634044	88.2	0.94	NA	2.1E-03	2.6E-03	NA	**1%**
					3300	1	1	250	25	70	9125	1.0E-03	2000	1	Tetrachloroethene	127184	165.8	3.40	1.3E-03	3.3E-02	NA	8.4E-01	**14%**
					3300	1	1	250	25	70	9125	1.0E-03	2000	1	Toluene	108883	92.1	2.73	1.2E-03	3.1E-02	NA	7.8E-01	**9%**
					3300	1	1	250	25	70	9125	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA	**4%**
					3300	1	1	250	25	70	9125	1.0E-03	2000	1	Vinyl Chloride	75014	62.5	1.36	2.2E-04	5.6E-03	NA	1.4E-01	**1%**
					3300	1	1	250	25	70	9125	1.0E-03	2000	1	Xylene, total	1330207	106.2	3.12	NA	4.7E-02	7.0E-02	NA	**14%**
					3300	1	1	250	25	70	9125	1.0E-03	2000	1	2,4-Dichlorophenol	120832	163.0	3.06	1.2E-02	2.1E-02	6.0E-02	3.4E-02	**9%**
					3300	1	1	250	25	70	9125	1.0E-03	2000	1	2-Methylphenol	95487	108.1	1.95	4.8E-03	7.7E-03	1.6E-02	1.2E-02	**2%**
					3300	1	1	250	25	70	9125	1.0E-03	2000	1	bis(2-Ethylhexyl)phthalat	117817	391.0	5.11	9.4E-04	2.5E-02	NA	6.6E-01	**37%**
					3300	1	1	250	25	70	9125	1.0E-03	2000	1	Naphthalene	91203	128.2	3.30	1.8E-03	4.7E-02	NA	1.2E+00	**16%**
					3300	1	1	250	25	70	9125	1.0E-03	2000	1	Pentachlorophenol	87865	266.4	5.86	1.4E-02	3.9E-01	NA	1.1E+01	**291%**
				CT	3300	0.5	1	219	9	70	3285	1.0E-03	2000	1	1,1-Dichloroethene	75354	96.9	2.13	4.7E-04	1.2E-02	NA	2.9E-01	**2%**
					3300	0.5	1	219	9	70	3285	1.0E-03	2000	1	1,2-Dichloroethane	107062	99.0	1.48	1.7E-04	4.2E-03	NA	1.0E-01	**1%**
					3300	0.5	1	219	9	70	3285	1.0E-03	2000	1	1,4-Dichlorobenzene	106467	147.0	3.39	1.7E-03	4.2E-02	NA	1.1E+00	**11%**
					3300	0.5	1	219	9	70	3285	1.0E-03	2000	1	Acetone	67641	58.1	-0.24	NA	5.1E-04	5.7E-04	NA	**0%**
					3300	0.5	1	219	9	70	3285	1.0E-03	2000	1	Benzene	71432	78.1	2.13	5.9E-04	1.5E-02	NA	3.7E-01	**3%**
					3300	0.5	1	219	9	70	3285	1.0E-03	2000	1	Chlorobenzene	108907	112.6	2.84	1.1E-03	2.8E-02	NA	7.1E-01	**6%**
					3300	0.5	1	219	9	70	3285	1.0E-03	2000	1	Chloroethane	75003	64.5	1.43	2.4E-04	6.1E-03	NA	1.5E-01	**1%**
					3300	0.5	1	219	9	70	3285	1.0E-03	2000	1	Chloroform	67663	119.4	1.97	2.8E-04	6.8E-03	NA	1.7E-01	**2%**
					3300	0.5	1	219	9	70	3285	1.0E-03	2000	1	cis-1,2-Dichloroethene	156592	96.9	2.09	NA	1.1E-02	1.5E-02	NA	**2%**
					3300	0.5	1	219	9	70	3285	1.0E-03	2000	1	Methyl tert-Butyl Ether	1634044	88.2	0.94	NA	2.1E-03	2.6E-03	NA	**0%**
					3300	0.5	1	219	9	70	3285	1.0E-03	2000	1	Tetrachloroethene	127184	165.8	3.40	1.3E-03	3.3E-02	NA	8.4E-01	**10%**
					3300	0.5	1	219	9	70	3285	1.0E-03	2000	1	Toluene	108883	92.1	2.73	1.2E-03	3.1E-02	NA	7.8E-01	**6%**
					3300	0.5	1	219	9	70	3285	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA	**3%**
					3300	0.5	1	219	9	70	3285	1.0E-03	2000	1	Vinyl Chloride	75014	62.5	1.36	2.2E-04	5.6E-03	NA	1.4E-01	**1%**
					3300	0.5	1	219	9	70	3285	1.0E-03	2000	1	Xylene, total	1330207	106.2	3.12	NA	4.7E-02	7.0E-02	NA	**10%**
					3300	0.5	1	219	9	70	3285	1.0E-03	2000	1	2,4-Dichlorophenol	120832	163.0	3.06	1.2E-02	2.1E-02	6.0E-02	3.4E-02	**6%**
					3300	0.5	1	219	9	70	3285	1.0E-03	2000	1	2-Methylphenol	95487	108.1	1.95	4.8E-03	7.7E-03	1.6E-02	1.2E-02	**2%**
					3300	0.5	1	219	9	70	3285	1.0E-03	2000	1	bis(2-Ethylhexyl)phthalat	117817	391.0	5.11	9.4E-04	2.5E-02	NA	6.6E-01	**26%**
					3300	0.5	1	219	9	70	3285	1.0E-03	2000	1	Naphthalene	91203	128.2	3.30	1.8E-03	4.7E-02	NA	1.2E+00	**11%**
					3300	0.5	1	219	9	70	3285	1.0E-03	2000	1	Pentachlorophenol	87865	266.4	5.86	1.4E-02	3.9E-01	NA	1.1E+01	**206%**
			Cancer	RME	3300	1	1	250	25	70	25550	1.0E-03	2000	1	1,1-Dichloroethene	75354	96.9	2.13	4.7E-04	1.2E-02	NA	2.9E-01	**3%**
					3300	1	1	250	25	70	25550	1.0E-03	2000	1	1,2-Dichloroethane	107062	99.0	1.48	1.7E-04	4.2E-03	NA	1.0E-01	**1%**
					3300	1	1	250	25	70	25550	1.0E-03	2000	1	1,4-Dichlorobenzene	106467	147.0	3.39	1.7E-03	4.2E-02	NA	1.1E+00	**16%**
					3300	1	1	250	25	70	25550	1.0E-03	2000	1	Acetone	67641	58.1	-0.24	NA	5.1E-04	5.7E-04	NA	**0%**
					3300	1	1	250	25	70	25550	1.0E-03	2000	1	Benzene	71432	78.1	2.13	5.9E-04	1.5E-02	NA	3.7E-01	**4%**
					3300	1	1	250	25	70	25550	1.0E-03	2000	1	Chlorobenzene	108907	112.6	2.84	1.1E-03	2.8E-02	NA	7.1E-01	**9%**
					3300	1	1	250	25	70	25550	1.0E-03	2000	1	Chloroethane	75003	64.5	1.43	2.4E-04	6.1E-03	NA	1.5E-01	**1%**
					3300	1	1	250	25	70	25550	1.0E-03	2000	1	Chloroform	67663	119.4	1.97	2.8E-04	6.8E-03	NA	1.7E-01	**2%**
					3300	1	1	250	25	70	25550	1.0E-03	2000	1	cis-1,2-Dichloroethene	156592	96.9	2.09	NA	1.1E-02	1.5E-02	NA	**3%**
					3300	1	1	250	25	70	25550	1.0E-03	2000	1	Methyl tert-Butyl Ether	1634044	88.2	0.94	NA	2.1E-03	2.6E-03	NA	**1%**
					3300	1	1	250	25	70	25550	1.0E-03	2000	1	Tetrachloroethene	127184	165.8	3.40	1.3E-03	3.3E-02	NA	8.4E-01	**14%**
					3300	1	1	250	25	70	25550	1.0E-03	2000	1	Toluene	108883	92.1	2.73	1.2E-03	3.1E-02	NA	7.8E-01	**9%**
					3300	1	1	250	25	70	25550	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA	**4%**
					3300	1	1	250	25	70	25550	1.0E-03	2000	1	Vinyl Chloride	75014	62.5	1.36	2.2E-04	5.6E-03	NA	1.4E-01	**1%**
					3300	1	1	250	25	70	25550	1.0E-03	2000	1	Xylene, total	1330207	106.2	3.12	NA	4.7E-02	7.0E-02	NA	**14%**
					3300	1	1	250	25	70	25550	1.0E-03	2000	1	2,4-Dichlorophenol	120832	163.0	3.06	1.2E-02	2.1E-02	6.0E-02	3.4E-02	**9%**
					3300	1	1	250	25	70	25550	1.0E-03	2000	1	2-Methylphenol	95487	108.1	1.95	4.8E-03	7.7E-03	1.6E-02	1.2E-02	**2%**
					3300	1	1	250	25	70	25550	1.0E-03	2000	1	bis(2-Ethylhexyl)phthalat	117817	391.0	5.11	9.4E-04	2.5E-02	NA	6.6E-01	**37%**
					3300	1	1	250	25	70	25550	1.0E-03	2000	1	Naphthalene	91203	128.2	3.30	1.8E-03	4.7E-02	NA	1.2E+00	**16%**
					3300	1	1	250	25	70	25550	1.0E-03	2000	1	Pentachlorophenol	87865	266.4	5.86	1.4E-02	3.9E-01	NA	1.1E+01	**291%**
				CT	3300	0.5	1	219	9	70	25550	1.0E-03	2000	1	1,1-Dichloroethene	75354	96.9	2.13	4.7E-04	1.2E-02	NA	2.9E-01	**2%**
					3300	0.5	1	219	9	70	25550	1.0E-03	2000	1	1,2-Dichloroethane	107062	99.0	1.48	1.7E-04	4.2E-03	NA	1.0E-01	**1%**
					3300	0.5	1	219	9	70	25550	1.0E-03	2000	1	1,4-Dichlorobenzene	106467	147.0	3.39	1.7E-03	4.2E-02	NA	1.1E+00	**11%**

TABLE 2. DERMALLY ABSORBED DOSE CALCULATIONS - GROUNDWATER

(Variable Definitions follow Table)

Exposure Point	Timeframe	Receptor	Cancer/ Non-cancer	RME/ CT	Chem Assess	B	tau (hr)	t_star (hr)	FA for tau>3	Conc mg/cm3	DA_event mg/cm2-evt	DAD mg/kg-day	log(Ds/lsc)	Dsc/lsc	Dsc	b	c	t_star1 B>0.6	t_star3 B<=0.6
Study Area	Future	Indust. Worker	Non-cancer	RME	N	0.04	**0.37**	0.88	1.0	9.5E-07	**1.9E-08**	**6.2E-07**	-3.34E+00	4.54E-04	**4.54E-07**	3.3E-01	3.6E-01	N/A	0.88
					N	0.016	**0.38**	0.90	1.0	2.1E-06	**1.6E-08**	**5.1E-07**	-3.35E+00	4.42E-04	**4.42E-07**	3.1E-01	3.4E-01	N/A	0.90
					Y	0.196	**0.70**	1.68	1.0	8.5E-07	**8.2E-08**	**2.7E-06**	-3.62E+00	2.38E-04	**2.38E-07**	4.4E-01	4.7E-01	N/A	1.68
					N	0.002	**0.22**	0.53	1.0	8.2E-04	**6.0E-07**	**1.9E-05**	-3.13E+00	7.49E-04	**7.49E-07**	3.0E-01	3.3E-01	N/A	0.53
					N	0.051	**0.29**	0.69	1.0	2.4E-03	**5.5E-05**	**1.8E-03**	-3.24E+00	5.79E-04	**5.79E-07**	3.3E-01	3.7E-01	N/A	0.69
					N	0.115	**0.45**	1.08	1.0	2.8E-06	**1.5E-07**	**4.7E-06**	-3.43E+00	3.71E-04	**3.71E-07**	3.8E-01	4.1E-01	N/A	1.08
					N	0.019	**0.24**	0.58	1.0	2.1E-06	**1.9E-08**	**6.0E-07**	-3.16E+00	6.90E-04	**6.90E-07**	3.1E-01	3.5E-01	N/A	0.58
					N	0.029	**0.49**	1.18	1.0	7.4E-07	**9.8E-09**	**3.2E-07**	-3.47E+00	3.40E-04	**3.40E-07**	3.2E-01	3.5E-01	N/A	1.18
					N	0.042	**0.37**	0.88	1.0	2.6E-06	**5.0E-08**	**1.6E-06**	-3.34E+00	4.54E-04	**4.54E-07**	3.3E-01	3.6E-01	N/A	0.88
					N	0.008	**0.33**	0.79	1.0	4.1E-04	**1.4E-06**	**4.7E-05**	-3.29E+00	5.09E-04	**5.09E-07**	3.1E-01	3.4E-01	N/A	0.79
					Y	0.166	**0.89**	2.14	1.0	6.7E-07	**5.8E-08**	**1.9E-06**	-3.73E+00	1.87E-04	**1.87E-07**	4.1E-01	4.5E-01	N/A	2.14
					N	0.115	**0.34**	0.83	1.0	2.4E-04	**1.2E-05**	**4.0E-04**	-3.32E+00	4.83E-04	**4.83E-07**	3.8E-01	4.1E-01	N/A	0.83
					N	0.051	**0.57**	1.37	1.0	9.5E-06	**2.3E-07**	**7.4E-06**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
					N	0.017	**0.24**	0.57	1.0	6.5E-07	**5.4E-09**	**1.7E-07**	-3.15E+00	7.08E-04	**7.08E-07**	3.1E-01	3.4E-01	N/A	0.57
					Y	0.186	**0.41**	0.99	1.0	9.0E-06	**7.7E-07**	**2.5E-05**	-3.39E+00	4.03E-04	**4.03E-07**	4.3E-01	4.7E-01	N/A	0.99
					N	0.10	**0.86**	2.06	1.0	3.5E-06	**1.8E-07**	**5.9E-06**	-3.71E+00	1.94E-04	**1.94E-07**	3.7E-01	4.0E-01	N/A	2.06
					N	0.0	**0.42**	1.02	1.0	1.6E-05	**2.3E-07**	**7.3E-06**	-3.41E+00	3.93E-04	**3.93E-07**	3.2E-01	3.5E-01	N/A	1.02
					Y	0.2	**16.27**	39.05	0.8	1.9E-06	**4.2E-07**	**1.4E-05**	-4.99E+00	1.02E-05	**1.02E-08**	4.3E-01	4.7E-01	N/A	39.05
					Y	0.2	**0.55**	1.32	1.0	2.8E-05	**2.7E-06**	**8.7E-05**	-3.52E+00	3.03E-04	**3.03E-07**	4.4E-01	4.8E-01	N/A	1.32
					Y	2.5	**3.26**	13.56	0.9	1.9E-06	**3.3E-06**	**1.1E-04**	-4.29E+00	5.11E-05	**5.11E-08**	5.1E+00	2.6E+00	13.6	7.83
				CT	N	0.04	**0.37**	0.88	1.0	9.5E-07	**1.3E-08**	**3.7E-07**	-3.34E+00	4.54E-04	**4.54E-07**	3.3E-01	3.6E-01	N/A	0.88
					N	0.016	**0.38**	0.90	1.0	2.1E-06	**1.1E-08**	**3.0E-07**	-3.35E+00	4.42E-04	**4.42E-07**	3.1E-01	3.4E-01	N/A	0.90
					Y	0.196	**0.70**	1.68	1.0	8.5E-07	**5.8E-08**	**1.6E-06**	-3.62E+00	2.38E-04	**2.38E-07**	4.4E-01	4.7E-01	N/A	1.68
					N	0.002	**0.22**	0.53	1.0	8.2E-04	**3.9E-07**	**1.1E-05**	-3.13E+00	7.49E-04	**7.49E-07**	3.0E-01	3.3E-01	N/A	0.53
					N	0.051	**0.29**	0.69	1.0	2.4E-03	**3.7E-05**	**1.1E-03**	-3.24E+00	5.79E-04	**5.79E-07**	3.3E-01	3.7E-01	N/A	0.69
					N	0.115	**0.45**	1.08	1.0	2.8E-06	**1.0E-07**	**2.9E-06**	-3.43E+00	3.71E-04	**3.71E-07**	3.8E-01	4.1E-01	N/A	1.08
					N	0.019	**0.24**	0.58	1.0	2.1E-06	**1.2E-08**	**3.5E-07**	-3.16E+00	6.90E-04	**6.90E-07**	3.1E-01	3.5E-01	N/A	0.58
					N	0.029	**0.49**	1.18	1.0	7.4E-07	**7.0E-09**	**2.0E-07**	-3.47E+00	3.40E-04	**3.40E-07**	3.2E-01	3.5E-01	N/A	1.18
					N	0.042	**0.37**	0.88	1.0	2.6E-06	**3.4E-08**	**9.7E-07**	-3.34E+00	4.54E-04	**4.54E-07**	3.3E-01	3.6E-01	N/A	0.88
					N	0.008	**0.33**	0.79	1.0	4.1E-04	**9.8E-07**	**2.8E-05**	-3.29E+00	5.09E-04	**5.09E-07**	3.1E-01	3.4E-01	N/A	0.79
					Y	0.166	**0.89**	2.14	1.0	6.7E-07	**4.1E-08**	**1.2E-06**	-3.73E+00	1.87E-04	**1.87E-07**	4.1E-01	4.5E-01	N/A	2.14
					N	0.115	**0.34**	0.83	1.0	2.4E-04	**8.5E-06**	**2.4E-04**	-3.32E+00	4.83E-04	**4.83E-07**	3.8E-01	4.1E-01	N/A	0.83
					N	0.051	**0.57**	1.37	1.0	9.5E-06	**1.6E-07**	**4.6E-06**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
					N	0.017	**0.24**	0.57	1.0	6.5E-07	**3.5E-09**	**9.8E-08**	-3.15E+00	7.08E-04	**7.08E-07**	3.1E-01	3.4E-01	N/A	0.57
					N	0.186	**0.41**	0.99	1.0	9.0E-06	**5.3E-07**	**1.5E-05**	-3.39E+00	4.03E-04	**4.03E-07**	4.3E-01	4.7E-01	N/A	0.99
					N	0.10	**0.86**	2.06	1.0	3.5E-06	**1.3E-07**	**3.7E-06**	-3.71E+00	1.94E-04	**1.94E-07**	3.7E-01	4.0E-01	N/A	2.06
					N	0.0	**0.42**	1.02	1.0	1.6E-05	**1.6E-07**	**4.5E-06**	-3.41E+00	3.93E-04	**3.93E-07**	3.2E-01	3.5E-01	N/A	1.02
					Y	0.2	**16.27**	39.05	0.8	1.9E-06	**3.0E-07**	**8.4E-06**	-4.99E+00	1.02E-05	**1.02E-08**	4.3E-01	4.7E-01	N/A	39.05
					Y	0.2	**0.55**	1.32	1.0	2.8E-05	**1.9E-06**	**5.4E-05**	-3.52E+00	3.03E-04	**3.03E-07**	4.4E-01	4.8E-01	N/A	1.32
					Y	2.5	**3.26**	13.56	0.9	1.9E-06	**2.3E-06**	**6.6E-05**	-4.29E+00	5.11E-05	**5.11E-08**	5.1E+00	2.6E+00	13.6	7.83
			Cancer	RME	N	0.04	**0.37**	0.88	1.0	9.5E-07	**1.9E-08**	**2.2E-07**	-3.34E+00	4.54E-04	**4.54E-07**	3.3E-01	3.6E-01	N/A	0.88
					N	0.016	**0.38**	0.90	1.0	2.1E-06	**1.6E-08**	**1.8E-07**	-3.35E+00	4.42E-04	**4.42E-07**	3.1E-01	3.4E-01	N/A	0.90
					Y	0.196	**0.70**	1.68	1.0	8.5E-07	**8.2E-08**	**9.5E-07**	-3.62E+00	2.38E-04	**2.38E-07**	4.4E-01	4.7E-01	N/A	1.68
					N	0.002	**0.22**	0.53	1.0	8.2E-04	**6.0E-07**	**7.0E-06**	-3.13E+00	7.49E-04	**7.49E-07**	3.0E-01	3.3E-01	N/A	0.53
					N	0.051	**0.29**	0.69	1.0	2.4E-03	**5.5E-05**	**6.4E-04**	-3.24E+00	5.79E-04	**5.79E-07**	3.3E-01	3.7E-01	N/A	0.69
					N	0.115	**0.45**	1.08	1.0	2.8E-06	**1.5E-07**	**1.7E-06**	-3.43E+00	3.71E-04	**3.71E-07**	3.8E-01	4.1E-01	N/A	1.08
					N	0.019	**0.24**	0.58	1.0	2.1E-06	**1.9E-08**	**2.2E-07**	-3.16E+00	6.90E-04	**6.90E-07**	3.1E-01	3.5E-01	N/A	0.58
					N	0.029	**0.49**	1.18	1.0	7.4E-07	**9.8E-09**	**1.1E-07**	-3.47E+00	3.40E-04	**3.40E-07**	3.2E-01	3.5E-01	N/A	1.18
					N	0.042	**0.37**	0.88	1.0	2.6E-06	**5.0E-08**	**5.8E-07**	-3.34E+00	4.54E-04	**4.54E-07**	3.3E-01	3.6E-01	N/A	0.88
					N	0.008	**0.33**	0.79	1.0	4.1E-04	**1.4E-06**	**1.7E-05**	-3.29E+00	5.09E-04	**5.09E-07**	3.1E-01	3.4E-01	N/A	0.79
					Y	0.166	**0.89**	2.14	1.0	6.7E-07	**5.8E-08**	**6.7E-07**	-3.73E+00	1.87E-04	**1.87E-07**	4.1E-01	4.5E-01	N/A	2.14
					N	0.115	**0.34**	0.83	1.0	2.4E-04	**1.2E-05**	**1.4E-04**	-3.32E+00	4.83E-04	**4.83E-07**	3.8E-01	4.1E-01	N/A	0.83
					N	0.051	**0.57**	1.37	1.0	9.5E-06	**2.3E-07**	**2.7E-06**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
					N	0.017	**0.24**	0.57	1.0	6.5E-07	**5.4E-09**	**6.2E-08**	-3.15E+00	7.08E-04	**7.08E-07**	3.1E-01	3.4E-01	N/A	0.57
					Y	0.186	**0.41**	0.99	1.0	9.0E-06	**7.7E-07**	**8.9E-06**	-3.39E+00	4.03E-04	**4.03E-07**	4.3E-01	4.7E-01	N/A	0.99
					N	0.10	**0.86**	2.06	1.0	3.5E-06	**1.8E-07**	**2.1E-06**	-3.71E+00	1.94E-04	**1.94E-07**	3.7E-01	4.0E-01	N/A	2.06
					N	0.0	**0.42**	1.02	1.0	1.6E-05	**2.3E-07**	**2.6E-06**	-3.41E+00	3.93E-04	**3.93E-07**	3.2E-01	3.5E-01	N/A	1.02
					Y	0.2	**16.27**	39.05	0.8	1.9E-06	**4.2E-07**	**4.8E-06**	-4.99E+00	1.02E-05	**1.02E-08**	4.3E-01	4.7E-01	N/A	39.05
					Y	0.2	**0.55**	1.32	1.0	2.8E-05	**2.7E-06**	**3.1E-05**	-3.52E+00	3.03E-04	**3.03E-07**	4.4E-01	4.8E-01	N/A	1.32
					Y	2.5	**3.26**	13.56	0.9	1.9E-06	**3.3E-06**	**3.8E-05**	-4.29E+00	5.11E-05	**5.11E-08**	5.1E+00	2.6E+00	13.6	7.83
				CT	N	0.04	**0.37**	0.88	1.0	9.5E-07	**1.3E-08**	**4.8E-08**	-3.34E+00	4.54E-04	**4.54E-07**	3.3E-01	3.6E-01	N/A	0.88
					N	0.016	**0.38**	0.90	1.0	2.1E-06	**1.1E-08**	**3.9E-08**	-3.35E+00	4.42E-04	**4.42E-07**	3.1E-01	3.4E-01	N/A	0.90
					Y	0.196	**0.70**	1.68	1.0	8.5E-07	**5.8E-08**	**2.1E-07**	-3.62E+00	2.38E-04	**2.38E-07**	4.4E-01	4.7E-01	N/A	1.68

TABLE 2. DERMALLY ABSORBED DOSE CALCULATIONS - GROUNDWATER

(Variable Definitions follow Table)

Exposure Point	Timeframe	Receptor	Cancer/ Non-cancer	RME/ CT	A cm^2	t_event hr/event	EV event/day	EF days/yr	ED years	BW kg	AT days	Isc cm	IR cm^3/day	ABSGI	Chemical	CAS No.	MWT	logKow	Kp 95% LCI	Kp (cm/hr) predicted	Kp (cm/hr) measured	Kp 95% UCI	Derm/Drink Kp
					3300	0.5	1	219	9	70	25550	1.0E-03	2000	1	Acetone	67641	58.1	-0.24	NA	5.1E-04	5.7E-04	NA	**0%**
					3300	0.5	1	219	9	70	25550	1.0E-03	2000	1	Benzene	71432	78.1	2.13	5.9E-04	1.5E-02	NA	3.7E-01	**3%**
					3300	0.5	1	219	9	70	25550	1.0E-03	2000	1	Chlorobenzene	108907	112.6	2.84	1.1E-03	2.8E-02	NA	7.1E-01	**6%**
					3300	0.5	1	219	9	70	25550	1.0E-03	2000	1	Chloroethane	75003	64.5	1.43	2.4E-04	6.1E-03	NA	1.5E-01	**1%**
					3300	0.5	1	219	9	70	25550	1.0E-03	2000	1	Chloroform	67663	119.4	1.97	2.8E-04	6.8E-03	NA	1.7E-01	**2%**
					3300	0.5	1	219	9	70	25550	1.0E-03	2000	1	cis-1,2-Dichloroethene	156592	96.9	2.09	NA	1.1E-02	1.5E-02	NA	**2%**
					3300	0.5	1	219	9	70	25550	1.0E-03	2000	1	Methyl tert-Butyl Ether	1634044	88.2	0.94	NA	2.1E-03	2.6E-03	NA	**0%**
					3300	0.5	1	219	9	70	25550	1.0E-03	2000	1	Tetrachloroethene	127184	165.8	3.40	1.3E-03	3.3E-02	NA	8.4E-01	**10%**
					3300	0.5	1	219	9	70	25550	1.0E-03	2000	1	Toluene	108883	92.1	2.73	1.2E-03	3.1E-02	NA	7.8E-01	**6%**
					3300	0.5	1	219	9	70	25550	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA	**3%**
					3300	0.5	1	219	9	70	25550	1.0E-03	2000	1	Vinyl Chloride	75014	62.5	1.36	2.2E-04	5.6E-03	NA	1.4E-01	**1%**
					3300	0.5	1	219	9	70	25550	1.0E-03	2000	1	Xylene, total	1330207	106.2	3.12	NA	4.7E-02	7.0E-02	NA	**10%**
					3300	0.5	1	219	9	70	25550	1.0E-03	2000	1	2,4-Dichlorophenol	120832	163.0	3.06	1.2E-02	2.1E-02	6.0E-02	3.4E-02	**6%**
					3300	0.5	1	219	9	70	25550	1.0E-03	2000	1	2-Methylphenol	95487	108.1	1.95	4.8E-03	7.7E-03	1.6E-02	1.2E-02	**2%**
					3300	0.5	1	219	9	70	25550	1.0E-03	2000	1	bis(2-Ethylhexyl)phthalat	117817	391.0	5.11	9.4E-04	2.5E-02	NA	6.6E-01	**26%**
					3300	0.5	1	219	9	70	25550	1.0E-03	2000	1	Naphthalene	91203	128.2	3.30	1.8E-03	4.7E-02	NA	1.2E+00	**11%**
					3300	0.5	1	219	9	70	25550	1.0E-03	2000	1	Pentachlorophenol	87865	266.4	5.86	1.4E-02	3.9E-01	NA	1.1E+01	**206%**
Study Area	Future	Const. Worker	Non-cancer	RME	3300	1	1	125	1	70	365	1.0E-03	2000	1	1,4-Dichlorobenzene	106467	147.0	3.39	1.7E-03	4.2E-02	NA	1.1E+00	**16%**
					3300	1	1	125	1	70	365	1.0E-03	2000	1	Benzene	71432	78.1	2.13	5.9E-04	1.5E-02	NA	3.7E-01	**4%**
					3300	1	1	125	1	70	365	1.0E-03	2000	1	Chlorobenzene	108907	112.6	2.84	1.1E-03	2.8E-02	NA	7.1E-01	**9%**
					3300	1	1	125	1	70	365	1.0E-03	2000	1	Chloroform	67663	119.4	1.97	2.8E-04	6.8E-03	NA	1.7E-01	**2%**
					3300	1	1	125	1	70	365	1.0E-03	2000	1	Methyl tert-Butyl Ether	1634044	88.2	0.94	NA	2.1E-03	2.6E-03	NA	**1%**
					3300	1	1	125	1	70	365	1.0E-03	2000	1	Tetrachloroethene	127184	165.8	3.40	1.3E-03	3.3E-02	NA	8.4E-01	**14%**
					3300	1	1	125	1	70	365	1.0E-03	2000	1	Toluene	108883	92.1	2.73	1.2E-03	3.1E-02	NA	7.8E-01	**9%**
					3300	1	1	125	1	70	365	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA	**4%**
					3300	1	1	125	1	70	365	1.0E-03	2000	1	Vinyl Chloride	75014	62.5	1.36	2.2E-04	5.6E-03	NA	1.4E-01	**1%**
					3300	1	1	125	1	70	365	1.0E-03	2000	1	bis(2-Ethylhexyl)phthalat	117817	391.0	5.11	9.4E-04	2.5E-02	NA	6.6E-01	**37%**
					3300	1	1	125	1	70	365	1.0E-03	2000	1	Naphthalene	91203	128.2	3.30	1.8E-03	4.7E-02	NA	1.2E+00	**16%**
				CT	3300	0.5	1	40	1	70	365	1.0E-03	2000	1	1,4-Dichlorobenzene	106467	147.0	3.39	1.7E-03	4.2E-02	NA	1.1E+00	**11%**
					3300	0.5	1	40	1	70	365	1.0E-03	2000	1	Benzene	71432	78.1	2.13	5.9E-04	1.5E-02	NA	3.7E-01	**3%**
					3300	0.5	1	40	1	70	365	1.0E-03	2000	1	Chlorobenzene	108907	112.6	2.84	1.1E-03	2.8E-02	NA	7.1E-01	**6%**
					3300	0.5	1	40	1	70	365	1.0E-03	2000	1	Chloroform	67663	119.4	1.97	2.8E-04	6.8E-03	NA	1.7E-01	**2%**
					3300	0.5	1	40	1	70	365	1.0E-03	2000	1	Methyl tert-Butyl Ether	1634044	88.2	0.94	NA	2.1E-03	2.6E-03	NA	**0%**
					3300	0.5	1	40	1	70	365	1.0E-03	2000	1	Tetrachloroethene	127184	165.8	3.40	1.3E-03	3.3E-02	NA	8.4E-01	**10%**
					3300	0.5	1	40	1	70	365	1.0E-03	2000	1	Toluene	108883	92.1	2.73	1.2E-03	3.1E-02	NA	7.8E-01	**6%**
					3300	0.5	1	40	1	70	365	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA	**3%**
					3300	0.5	1	40	1	70	365	1.0E-03	2000	1	Vinyl Chloride	75014	62.5	1.36	2.2E-04	5.6E-03	NA	1.4E-01	**1%**
					3300	0.5	1	40	1	70	365	1.0E-03	2000	1	bis(2-Ethylhexyl)phthalat	117817	391.0	5.11	9.4E-04	2.5E-02	NA	6.6E-01	**26%**
					3300	0.5	1	40	1	70	365	1.0E-03	2000	1	Naphthalene	91203	128.2	3.30	1.8E-03	4.7E-02	NA	1.2E+00	**11%**
			Cancer	RME	3300	1	1	125	1	70	25550	1.0E-03	2000	1	1,4-Dichlorobenzene	106467	147.0	3.39	1.7E-03	4.2E-02	NA	1.1E+00	**16%**
					3300	1	1	125	1	70	25550	1.0E-03	2000	1	Benzene	71432	78.1	2.13	5.9E-04	1.5E-02	NA	3.7E-01	**4%**
					3300	1	1	125	1	70	25550	1.0E-03	2000	1	Chlorobenzene	108907	112.6	2.84	1.1E-03	2.8E-02	NA	7.1E-01	**9%**
					3300	1	1	125	1	70	25550	1.0E-03	2000	1	Chloroform	67663	119.4	1.97	2.8E-04	6.8E-03	NA	1.7E-01	**2%**
					3300	1	1	125	1	70	25550	1.0E-03	2000	1	Methyl tert-Butyl Ether	1634044	88.2	0.94	NA	2.1E-03	2.6E-03	NA	**1%**
					3300	1	1	125	1	70	25550	1.0E-03	2000	1	Tetrachloroethene	127184	165.8	3.40	1.3E-03	3.3E-02	NA	8.4E-01	**14%**
					3300	1	1	125	1	70	25550	1.0E-03	2000	1	Toluene	108883	92.1	2.73	1.2E-03	3.1E-02	NA	7.8E-01	**9%**
					3300	1	1	125	1	70	25550	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA	**4%**
					3300	1	1	125	1	70	25550	1.0E-03	2000	1	Vinyl Chloride	75014	62.5	1.36	2.2E-04	5.6E-03	NA	1.4E-01	**1%**
					3300	1	1	125	1	70	25550	1.0E-03	2000	1	bis(2-Ethylhexyl)phthalat	117817	391.0	5.11	9.4E-04	2.5E-02	NA	6.6E-01	**37%**
					3300	1	1	125	1	70	25550	1.0E-03	2000	1	Naphthalene	91203	128.2	3.30	1.8E-03	4.7E-02	NA	1.2E+00	**16%**
				CT	3300	0.5	1	40	1	70	25550	1.0E-03	2000	1	1,4-Dichlorobenzene	106467	147.0	3.39	1.7E-03	4.2E-02	NA	1.1E+00	**11%**
					3300	0.5	1	40	1	70	25550	1.0E-03	2000	1	Benzene	71432	78.1	2.13	5.9E-04	1.5E-02	NA	3.7E-01	**3%**
					3300	0.5	1	40	1	70	25550	1.0E-03	2000	1	Chlorobenzene	108907	112.6	2.84	1.1E-03	2.8E-02	NA	7.1E-01	**6%**
					3300	0.5	1	40	1	70	25550	1.0E-03	2000	1	Chloroform	67663	119.4	1.97	2.8E-04	6.8E-03	NA	1.7E-01	**2%**
					3300	0.5	1	40	1	70	25550	1.0E-03	2000	1	Methyl tert-Butyl Ether	1634044	88.2	0.94	NA	2.1E-03	2.6E-03	NA	**0%**
					3300	0.5	1	40	1	70	25550	1.0E-03	2000	1	Tetrachloroethene	127184	165.8	3.40	1.3E-03	3.3E-02	NA	8.4E-01	**10%**
					3300	0.5	1	40	1	70	25550	1.0E-03	2000	1	Toluene	108883	92.1	2.73	1.2E-03	3.1E-02	NA	7.8E-01	**6%**
					3300	0.5	1	40	1	70	25550	1.0E-03	2000	1	Trichloroethene	79016	131.4	2.42	NA	1.2E-02	1.6E-02	NA	**3%**
					3300	0.5	1	40	1	70	25550	1.0E-03	2000	1	Vinyl Chloride	75014	62.5	1.36	2.2E-04	5.6E-03	NA	1.4E-01	**1%**
					3300	0.5	1	40	1	70	25550	1.0E-03	2000	1	bis(2-Ethylhexyl)phthalat	117817	391.0	5.11	9.4E-04	2.5E-02	NA	6.6E-01	**26%**
					3300	0.5	1	40	1	70	25550	1.0E-03	2000	1	Naphthalene	91203	128.2	3.30	1.8E-03	4.7E-02	NA	1.2E+00	**11%**

TABLE 2. DERMALLY ABSORBED DOSE CALCULATIONS - GROUNDWATER

(Variable Definitions follow Table)

Exposure Point	Timeframe	Receptor	Cancer/ Non-cancer	RME/ CT	Chem Assess	B	tau (hr)	t_star (hr)	FA for tau>3	Conc mg/cm3	DA_event mg/cm2-evt	DAD mg/kg-day	log(Ds/lsc)	Dsc/lsc	Dsc	b	c	t_star1 B>0.6	t_star3 B<=0.6
					N	0.002	**0.22**	0.53	1.0	8.2E-04	**3.9E-07**	**1.4E-06**	-3.13E+00	7.49E-04	**7.49E-07**	3.0E-01	3.3E-01	N/A	0.53
					N	0.051	**0.29**	0.69	1.0	2.4E-03	**3.7E-05**	**1.4E-04**	-3.24E+00	5.79E-04	**5.79E-07**	3.3E-01	3.7E-01	N/A	0.69
					N	0.115	**0.45**	1.08	1.0	2.8E-06	**1.0E-07**	**3.8E-07**	-3.43E+00	3.71E-04	**3.71E-07**	3.8E-01	4.1E-01	N/A	1.08
					N	0.019	**0.24**	0.58	1.0	2.1E-06	**1.2E-08**	**4.4E-08**	-3.16E+00	6.90E-04	**6.90E-07**	3.1E-01	3.5E-01	N/A	0.58
					N	0.029	**0.49**	1.18	1.0	7.4E-07	**7.0E-09**	**2.5E-08**	-3.47E+00	3.40E-04	**3.40E-07**	3.2E-01	3.5E-01	N/A	1.18
					N	0.042	**0.37**	0.88	1.0	2.6E-06	**3.4E-08**	**1.2E-07**	-3.34E+00	4.54E-04	**4.54E-07**	3.3E-01	3.6E-01	N/A	0.88
					N	0.008	**0.33**	0.79	1.0	4.1E-04	**9.8E-07**	**3.6E-06**	-3.29E+00	5.09E-04	**5.09E-07**	3.1E-01	3.4E-01	N/A	0.79
					Y	0.166	**0.89**	2.14	1.0	6.7E-07	**4.1E-08**	**1.5E-07**	-3.73E+00	1.87E-04	**1.87E-07**	4.1E-01	4.5E-01	N/A	2.14
					N	0.115	**0.34**	0.83	1.0	2.4E-04	**8.5E-06**	**3.1E-05**	-3.32E+00	4.83E-04	**4.83E-07**	3.8E-01	4.1E-01	N/A	0.83
					N	0.051	**0.57**	1.37	1.0	9.5E-06	**1.6E-07**	**5.9E-07**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
					N	0.017	**0.24**	0.57	1.0	6.5E-07	**3.5E-09**	**1.3E-08**	-3.15E+00	7.08E-04	**7.08E-07**	3.1E-01	3.4E-01	N/A	0.57
					N	0.186	**0.41**	0.99	1.0	9.0E-06	**5.3E-07**	**1.9E-06**	-3.39E+00	4.03E-04	**4.03E-07**	4.3E-01	4.7E-01	N/A	0.99
					N	0.10	**0.86**	2.06	1.0	3.5E-06	**1.3E-07**	**4.7E-07**	-3.71E+00	1.94E-04	**1.94E-07**	3.7E-01	4.0E-01	N/A	2.06
					N	0.0	**0.42**	1.02	1.0	1.6E-05	**1.6E-07**	**5.8E-07**	-3.41E+00	3.93E-04	**3.93E-07**	3.2E-01	3.5E-01	N/A	1.02
					Y	0.2	**16.27**	39.05	0.8	1.9E-06	**3.0E-07**	**1.1E-06**	-4.99E+00	1.02E-05	**1.02E-08**	4.3E-01	4.7E-01	N/A	39.05
					Y	0.2	**0.55**	1.32	1.0	2.8E-05	**1.9E-06**	**7.0E-06**	-3.52E+00	3.03E-04	**3.03E-07**	4.4E-01	4.8E-01	N/A	1.32
					Y	2.5	**3.26**	13.56	0.9	1.9E-06	**2.3E-06**	**8.4E-06**	-4.29E+00	5.11E-05	**5.11E-08**	5.1E+00	2.6E+00	13.6	7.83
Study Area	Future	Const. Worker	Non-cancer	RME	Y	0.196	**0.70**	1.68	1.0	9.7E-07	**9.4E-08**	**1.5E-06**	-3.62E+00	2.38E-04	**2.38E-07**	4.4E-01	4.7E-01	N/A	1.68
					N	0.051	**0.29**	0.69	1.0	6.3E-03	**1.5E-04**	**2.3E-03**	-3.24E+00	5.79E-04	**5.79E-07**	3.3E-01	3.7E-01	N/A	0.69
					N	0.115	**0.45**	1.08	1.0	2.6E-06	**1.4E-07**	**2.2E-06**	-3.43E+00	3.71E-04	**3.71E-07**	3.8E-01	4.1E-01	N/A	1.08
					N	0.029	**0.49**	1.18	1.0	1.1E-06	**1.4E-08**	**2.3E-07**	-3.47E+00	3.40E-04	**3.40E-07**	3.2E-01	3.5E-01	N/A	1.18
					N	0.008	**0.33**	0.79	1.0	1.9E-03	**6.7E-06**	**1.1E-04**	-3.29E+00	5.09E-04	**5.09E-07**	3.1E-01	3.4E-01	N/A	0.79
					Y	0.166	**0.89**	2.14	1.0	3.2E-07	**2.8E-08**	**4.5E-07**	-3.73E+00	1.87E-04	**1.87E-07**	4.1E-01	4.5E-01	N/A	2.14
					N	0.115	**0.34**	0.83	1.0	2.6E-05	**1.3E-06**	**2.1E-05**	-3.32E+00	4.83E-04	**4.83E-07**	3.8E-01	4.1E-01	N/A	0.83
					N	0.051	**0.57**	1.37	1.0	1.0E-06	**2.5E-08**	**4.0E-07**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
					N	0.017	**0.24**	0.57	1.0	9.2E-07	**7.6E-09**	**1.2E-07**	-3.15E+00	7.08E-04	**7.08E-07**	3.1E-01	3.4E-01	N/A	0.57
					Y	0.2	**16.27**	39.05	0.8	3.5E-06	**7.9E-07**	**1.3E-05**	-4.99E+00	1.02E-05	**1.02E-08**	4.3E-01	4.7E-01	N/A	39.05
					Y	0.2	**0.55**	1.32	1.0	2.8E-06	**2.7E-07**	**4.4E-06**	-3.52E+00	3.03E-04	**3.03E-07**	4.4E-01	4.8E-01	N/A	1.32
				CT	Y	0.196	**0.70**	1.68	1.0	9.7E-07	**6.7E-08**	**3.4E-07**	-3.62E+00	2.38E-04	**2.38E-07**	4.4E-01	4.7E-01	N/A	1.68
					N	0.051	**0.29**	0.69	1.0	6.3E-03	**9.8E-05**	**5.1E-04**	-3.24E+00	5.79E-04	**5.79E-07**	3.3E-01	3.7E-01	N/A	0.69
					N	0.115	**0.45**	1.08	1.0	2.6E-06	**9.6E-08**	**5.0E-07**	-3.43E+00	3.71E-04	**3.71E-07**	3.8E-01	4.1E-01	N/A	1.08
					N	0.029	**0.49**	1.18	1.0	1.1E-06	**1.0E-08**	**5.3E-08**	-3.47E+00	3.40E-04	**3.40E-07**	3.2E-01	3.5E-01	N/A	1.18
					N	0.008	**0.33**	0.79	1.0	1.9E-03	**4.5E-06**	**2.3E-05**	-3.29E+00	5.09E-04	**5.09E-07**	3.1E-01	3.4E-01	N/A	0.79
					Y	0.166	**0.89**	2.14	1.0	3.2E-07	**2.0E-08**	**1.0E-07**	-3.73E+00	1.87E-04	**1.87E-07**	4.1E-01	4.5E-01	N/A	2.14
					N	0.115	**0.34**	0.83	1.0	2.6E-05	**9.1E-07**	**4.7E-06**	-3.32E+00	4.83E-04	**4.83E-07**	3.8E-01	4.1E-01	N/A	0.83
					N	0.051	**0.57**	1.37	1.0	1.0E-06	**1.8E-08**	**9.1E-08**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
					N	0.017	**0.24**	0.57	1.0	9.2E-07	**4.9E-09**	**2.5E-08**	-3.15E+00	7.08E-04	**7.08E-07**	3.1E-01	3.4E-01	N/A	0.57
					Y	0.2	**16.27**	39.05	0.8	3.5E-06	**5.6E-07**	**2.9E-06**	-4.99E+00	1.02E-05	**1.02E-08**	4.3E-01	4.7E-01	N/A	39.05
					Y	0.2	**0.55**	1.32	1.0	2.8E-06	**1.9E-07**	**9.9E-07**	-3.52E+00	3.03E-04	**3.03E-07**	4.4E-01	4.8E-01	N/A	1.32
			Cancer	RME	Y	0.196	**0.70**	1.68	1.0	9.7E-07	**9.4E-08**	**2.2E-08**	-3.62E+00	2.38E-04	**2.38E-07**	4.4E-01	4.7E-01	N/A	1.68
					N	0.051	**0.29**	0.69	1.0	6.3E-03	**1.5E-04**	**3.4E-05**	-3.24E+00	5.79E-04	**5.79E-07**	3.3E-01	3.7E-01	N/A	0.69
					N	0.115	**0.45**	1.08	1.0	2.6E-06	**1.4E-07**	**3.1E-08**	-3.43E+00	3.71E-04	**3.71E-07**	3.8E-01	4.1E-01	N/A	1.08
					N	0.029	**0.49**	1.18	1.0	1.1E-06	**1.4E-08**	**3.3E-09**	-3.47E+00	3.40E-04	**3.40E-07**	3.2E-01	3.5E-01	N/A	1.18
					N	0.008	**0.33**	0.79	1.0	1.9E-03	**6.7E-06**	**1.5E-06**	-3.29E+00	5.09E-04	**5.09E-07**	3.1E-01	3.4E-01	N/A	0.79
					Y	0.166	**0.89**	2.14	1.0	3.2E-07	**2.8E-08**	**6.4E-09**	-3.73E+00	1.87E-04	**1.87E-07**	4.1E-01	4.5E-01	N/A	2.14
					N	0.115	**0.34**	0.83	1.0	2.6E-05	**1.3E-06**	**3.0E-07**	-3.32E+00	4.83E-04	**4.83E-07**	3.8E-01	4.1E-01	N/A	0.83
					N	0.051	**0.57**	1.37	1.0	1.0E-06	**2.5E-08**	**5.8E-09**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
					N	0.017	**0.24**	0.57	1.0	9.2E-07	**7.6E-09**	**1.7E-09**	-3.15E+00	7.08E-04	**7.08E-07**	3.1E-01	3.4E-01	N/A	0.57
					Y	0.2	**16.27**	39.05	0.8	3.5E-06	**7.9E-07**	**1.8E-07**	-4.99E+00	1.02E-05	**1.02E-08**	4.3E-01	4.7E-01	N/A	39.05
					Y	0.2	**0.55**	1.32	1.0	2.8E-06	**2.7E-07**	**6.2E-08**	-3.52E+00	3.03E-04	**3.03E-07**	4.4E-01	4.8E-01	N/A	1.32
				CT	Y	0.196	**0.70**	1.68	1.0	9.7E-07	**6.7E-08**	**4.9E-09**	-3.62E+00	2.38E-04	**2.38E-07**	4.4E-01	4.7E-01	N/A	1.68
					N	0.051	**0.29**	0.69	1.0	6.3E-03	**9.8E-05**	**7.2E-06**	-3.24E+00	5.79E-04	**5.79E-07**	3.3E-01	3.7E-01	N/A	0.69
					N	0.115	**0.45**	1.08	1.0	2.6E-06	**9.6E-08**	**7.1E-09**	-3.43E+00	3.71E-04	**3.71E-07**	3.8E-01	4.1E-01	N/A	1.08
					N	0.029	**0.49**	1.18	1.0	1.1E-06	**1.0E-08**	**7.5E-10**	-3.47E+00	3.40E-04	**3.40E-07**	3.2E-01	3.5E-01	N/A	1.18
					N	0.008	**0.33**	0.79	1.0	1.9E-03	**4.5E-06**	**3.3E-07**	-3.29E+00	5.09E-04	**5.09E-07**	3.1E-01	3.4E-01	N/A	0.79
					Y	0.166	**0.89**	2.14	1.0	3.2E-07	**2.0E-08**	**1.5E-09**	-3.73E+00	1.87E-04	**1.87E-07**	4.1E-01	4.5E-01	N/A	2.14
					N	0.115	**0.34**	0.83	1.0	2.6E-05	**9.1E-07**	**6.7E-08**	-3.32E+00	4.83E-04	**4.83E-07**	3.8E-01	4.1E-01	N/A	0.83
					N	0.051	**0.57**	1.37	1.0	1.0E-06	**1.8E-08**	**1.3E-09**	-3.54E+00	2.91E-04	**2.91E-07**	3.4E-01	3.7E-01	N/A	1.37
					N	0.017	**0.24**	0.57	1.0	9.2E-07	**4.9E-09**	**3.6E-10**	-3.15E+00	7.08E-04	**7.08E-07**	3.1E-01	3.4E-01	N/A	0.57
					Y	0.2	**16.27**	39.05	0.8	3.5E-06	**5.6E-07**	**4.1E-08**	-4.99E+00	1.02E-05	**1.02E-08**	4.3E-01	4.7E-01	N/A	39.05
					Y	0.2	**0.55**	1.32	1.0	2.8E-06	**1.9E-07**	**1.4E-08**	-3.52E+00	3.03E-04	**3.03E-07**	4.4E-01	4.8E-01	N/A	1.32

DERMAL ABSORPTION CALCULATION EXAMPLE

Note: This EPA spreadsheet utilized as basis for Tables 1 and 2 calculations.

FOR ORGANIC CHEMICALS IN WATER (updated on 11/99)

Worksheet to Calculate Dermal Absorption of Organic Chemicals from Aqueous Media (updated 11/99)

Enter the Following Exposure Conditions: for site specific conditions, change values in Cells G5-G18

Concentration (mg/L*L/1000 cm3):	Conc =	1.0E-03	mg/cm3 (default value for purpose of illustration)
Input site specific concentrations in Column marked "Conc"		= 1 mg/L (1 ppm)	= 1 ug/cm3 = 1000 ppb
Area exposed (cm2):	A =	4700.0	cm2
Event time (hr/event):	t_event =	1.0	hr/event
Event frequency (events/day):	EV =	1.0	event/day
Exposure frequency (days/year):	EF =	13.0	days/yr
Exposure duration (years):	ED =	10.0	years
Body weight (kg):	BW =	53.0	kg
Averaging time (days):	AT =	3650.0	days
for carcinogenic effects, AT=70 years (25,550 days)			
for noncarcinogenic effects, AT=ED (in days)			
Skin thickness (assumed to be 10 um):	lsc =	1.0E-03	cm

Default conditions for screening purposes:

Compare Dermal to Drinking: Adults showering for 35 minutes/day, compared to drinking 2L water/day

Dermal (mg/day) = DA_event * A * EV	IR =	2000.0	(cm3/day = L/day * 1000 cm3/L)
Drinking (mg/day) = Conc * IR * ABSIG	ABSGI =	1.0	(assumed 100% GI absorption)

IR: Ingestion rate of drinking water
ABSIG: Absorption fraction in GI tract

Refer to Appendix A for equations to evaluate DA_event and DAD

(*): outside of the Effective Prediction Domain (EPD) determined by the Flynn's measured Kp data

95% LCI and UCI are evaluated by Dr. Paul Pinsky in NCEA using SAS

	CHEMICAL	CAS No.	MWT	logKow	Kp 95% LCI	Kp (cm/hr) predicted	Kp (cm/hr) measured	Kp 95% UCI	Chemicals outside EPD (*)	Derm/ Drink Kp	Chem Assess	B	tau (hr)	t_star (hr)
17	Benzene	71432	78.1	2.13	5.9E-04	1.5E-02	NA	3.7E-01		**5%**	N	0.1	**0.29**	0.69

FA for tau>3	Conc (mg/cm3)	DA_event (mg/cm2-evt)	DAD (mg/kg-day)	log(Ds/lsc)	Dsc/lsc	Dsc	b	c	t_star1 B>0.6	t_star3 B<=0.6
1.0	4.1E-07	**9.5E-09**	**3.0E-08**	-3.24E+00	5.79E-04	**5.79E-07**	3.3E-01	3.7E-01	#NUM!	0.69

APPENDIX 6J

TOXICITY PROFILES FOR COPCs

INTRODUCTION

This appendix contains toxicity criteria and toxicity profiles for the chemicals selected as chemicals of potential concern (COPCs) for the Industri-Plex Superfund Site baseline human health risk assessment. The chronic oral toxicity criteria for COPCs are summarized in Tables 5.1 and 6.1. Inhalation toxicity criteria are summarized in Tables 5.2 and 6.2. Table 6J-1 presents the absolute oral bioavailability factors (i.e., oral to dermal adjustment factors) used to adjust the oral toxicity criteria for the COPCs evaluated in the dermal exposure pathways, as discussed in Section 3.0, subsection 3.4.3. Toxicity profiles for the COPCs are provided in the following pages.

VOLATILE ORGANICS

Acetone

Acetone is an organic solvent with a wide variety of uses in industry, the laboratory and home. It is produced in large quantities and may be released to the environment as stack emissions, fugitive emissions and in waste water in its production and use as a chemical intermediate and solvent. Due to it's volatile nature, most acetone used in solvents will ultimately be released into the air. In the atmosphere, acetone will be lost by photolysis and reaction with photochemically-produced hydroxyl radicals. Half-life estimates average 22 days and are shorter in the summer than winter. If released on soil, acetone will both volatilize and leach into the ground. If released to water, it will also be lost due to volatilization (half-life of 20 hours). Bioconcentration in aquatic organisms and adsorption to sediment should not be significant. (HSDB, 1995).

Occupational exposure to acetone will be via dermal contact and inhalation of the vapor. It is highly volatile and rapidly absorbed by the respiratory system. Small quantities may be absorbed through the skin. The general population is exposed to acetone in the atmosphere from sources such as auto exhaust, solvents, tobacco smoke and fireplaces, as well as dermal contact with acetone-containing consumer products. Because of its solubility in water, acetone is readily absorbed into the bloodstream and transported rapidly throughout the body (HSDB, 1995). Excretion is rapid for 8 hours after a single oral does but was not complete in 24 hours. The ratio of excretion was approximately 40-70% in breath, 15-30% in urine and 10% through skin (Clayton and Clayton, 1981).

Acute human exposure to high levels of acetone produces central nervous system depression and unconsciousness. Prolonged exposure may produce irritation of the respiratory tract, coughing, headache, drowsiness, loss of coordination and in severe cases, come (Clement Associates, 1985). Inhalation of 2000 ppm is fatal upon brief exposure (Arena, 1974). Prolonged or repeated dermal exposure causes skin irritation or contact dermatitis (HSDB, 1995). Other common symptoms associated with acetone exposure include bronchitis, gastritis, pharyngitis and conjunctivitis. Long-term exposure of rates to low levels of acetone produces increases in liver and kidney weights, as well as changes in red blood cell counts (HSDB, 1995).

Acetone significantly reduced the percentage of hatchability in developing chick embryos and caused a high embryonic mortality during the first week of incubation (Ameenuddin and Sunde, 1984). However, no adverse effects were noted in cultured rat embryos exposed to 0.1% acetone.

Acetone has not been tested in a carcinogenicity bioassay, but gave negative results in a skin painting study (Clement Associates, 1985). Acetone was not mutagenic in the Ames assay (Clement Associates, 1985) or in sister chromatid exchange assays (HSDB, 1995). No information is available on the carcinogenic effects of acetone in humane. Acetone is classified as a group D carcinogen.

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Arena, J.M. 1974. *Poisoning: Toxicology - Symptoms/Treatments.* Third edition, Springfield, Illinois: Charles C. Thomas, ed. P. 686.

Clement Associates, Inc. 1985. *Chemical, physical and biological properties of compounds present at hazardous waste site.* September, 1985.

HSDB. 1995. Hazardous Substances Data bank. TOXNET computer database, National Library of Medicine.

Benzene

Benzene is a clear, volatile, highly flammable, aromatic hydrocarbon which exists naturally and is produced by volcanoes and forest fires. Benzene is also a very common industrial solvent, produced from petroleum. It is used as a solvent for fats, inks, paints, plastics, rubber, in the extraction of oils from seeds and nuts, in photogravure printing, as a chemical intermediate and in the manufacture of detergents, explosives, pharmaceuticals and dyestuffs. It is also a component of gasoline and other petroleum-based fuels. Exposure to benzene can occur via inhalation, ingestion, especially of contaminated drinking water, and dermal contact (as in contact with liquid benzene found in gasoline) (Sittig, 1981; ATSDR, 2002).

Benzene is readily absorbed through ingestion, moderately absorbed through inhalation and poorly absorbed through intact skin. Once in the bloodstream, benzene is distributed throughout the body, with the concentration in any one compartment dependent on the degree of perfusion of tissues by blood. Since benzene is lipid-soluble, it accumulates in fat, but the rate of accumulation is slow since fat is poorly perfused. The metabolites of benzene are responsible for its toxic effects. These include phenol (which is either formed via an unstable benzene oxide precursor or directly from benzene), catechol, hydroquinone and conjugated phenolic compounds. The primary site of benzene metabolism is the liver via the cytochrome P450 mixed function oxidase system. Some benzene metabolism may also occurs in the bone marrow via the same enzyme system. Benzene is excreted either unchanged from the lungs or as metabolites in the urine (ATSDR, 2002).

Benzene targets its effects on the hemopoietic, immune and nervous systems (ATSDR, 2002). Exposure to benzene has produced irritation of the skin, eyes and upper respiratory tract. Acute exposure has produced central nervous system depression, headache, dizziness, nausea, convulsions, coma and death at extremely high concentrations (Sittig, 1981). Health effects in humans have been reported starting as low as 50 ppm via inhalation. Twenty-five ppm for 6 hrs had no obvious effects though benzene was detected in blood (Sandmeyer, 1981). Early autopsy reports found benzene-induced hemorrhages of the brain, pericardium, urinary tract, mucous membranes and skin (Sittig, 1981). Chronic exposure to benzene produces blood changes

involving an initial increase in levels of erythrocytes, leukocytes and thrombocytes, followed by aplastic anemia indicated by anemia, leukopenia and thrombocytopenia (Sittig, 1981).

The following effects have been produced experimentally in laboratory animals, following exposure to benzene: decreased leukocyte and/or erythrocyte counts, reduction in cellular immunity and bone marrow depression (reduced number of granulopoietic stem cells). Animal studies do not indicate that benzene is teratogenic, but the following fetotoxic effects have been found: reduced fetal weight, altered fetal hematopoiesis, fetal skeletal variations and increased resorptions in pregnant exposed animals. In addition, benzene has produced histopathological changes in ovaries and testes of test animals (ATSDR, 2002).

Benzene and its metabolites have been shown to be mutagenic in a number of in vitro and in vivo studies. Genotoxic effects produced experimentally include structural and numerical chromosome aberrations in humans, animals and cell cultures, and sister chromatid exchanges and micronuclei in vivo animal studies. Benzene exposure has been found to produce an increase in the number of chromosome aberrations associated with myelotoxicity (Sittig, 1981). In addition, sperm head abnormalities, inhibition of DNA and RNA synthesis, DNA binding and interference with cell cycle progression have been shown in vitro studies (ATSDR, 2002). The epidemiologic data indicate that benzene is leukemogenic. The evidence is most convincing for acute myelogenous and acute erythroleukemia, although a correlation has also been found with chronic leukemia. Benzene has been designated a group A human carcinogen (leukemogen) by inhalation. Although data are insufficient to validate the carcinogenicity of benzene via ingestion, it would not be unreasonable that benzene is carcinogenic via this route as well if present in sufficient quantities. The carcinogenicity of benzene via dermal exposure is considered to be lower since benzene is absorbed poorly through the skin (ATSDR, 2002).

Agency for Toxic Substances and Disease Registry (ATSDR) (2002) *Toxicological profile for benzene.* U.S. Public Health Service.

Sandmeyer, E.E. (1981) *Aromatic hydrocarbons.* In: Patty's Industrial Hygiene and Toxicology, Vol. 2, 3rd ed., Clayton G.D., Clayton F.E., eds. New York. Interscience Publishers. pp. 3253-3283.

Sittig, M. (1981) *Handbook of Toxic and Hazardous Chemicals.* Noyes Publications.

2-Butanone

2-Butanone, also known as methyl ethyl ketone (MEK), is primarily used as a solvent in protective coatings. It is also used as a solvent in adhesives, printing inks, paint removers, in the production of magnetic tapes, and in dewaxing lubricating oils (HSDB, 1994). 2-Butanone released to the environmental almost all eventually enters the air. However, since it does not adhere strongly to soil, it is subject to leaching to groundwater. It’s high vapor pressure and low Henry’s Law constant indicate that it can volatilize with ease (U.S. EPA, 1985).

Studies in humans and animals indicate that 2-butanone can be absorbed vial the lungs, skin, and gastrointestinal tract. The relative uptake through the lungs was about 53% for a 4-hour exposure to 200 ppm (HSDB, 1994). Oral studies demonstrate that peak blood levels are attained in 4 hours following an oral dose (U.S. EPA, 1985). 2-Butanone can be absorbed through intact human skin. Absorption is more rapid through moist skin than through dry skin, and the rate of percutaneous absorption has been estimated to range from 5 to 10 micrograms/cm^2/min (WHO, 1993). Once absorbed, 2-butanone is evenly and widely distributed through the body. It has been shown to cross the placenta and enter the human fetus (WHO, 1993). Experiments with guinea pigs and rats have shown that 2-butanone is metabolized via oxidative hydroxylation, forming 3-hydroxy-2-butanone, which is further reduced to 2,3-butanediol. It is also reversibly reduced to 2-butanol (U.S. EPA, 1985). The plasma half-life is humans has been estimated at 49-96 minutes with an apparent clearance rate of 0.6 L/minute (ATSDR, 2002).

Humans volunteers complained of mild nose and throat irritation when exposed to 100 ppm 2-butanone. Workers occupationally exposed to 300 to 500 ppm complained of headaches, nausea, and respiratory tract irritation. Workers exposed either via inhalation (300-600 ppm) or by skin contact developed numbness in the extremities and dermatitis. High concentrations produce central nervous system depression. Eye contact with the liquid causes painful irritation and can result in corneal injury (ATSDR, 2002). Oral LD50 values of 2737 mg/kg and 4050 mg/kg were reported for rats and mice, respectively. Inhalation LC50 values of 23,500 mg/m^3/8 hours and 40,000 mg/m^3/2 hours for mice were reported (U.S. EPA, 1985).

Dermatitis, gastrointestinal upset, loss of appetite, and neurological problems were reported by individuals occupationally exposed to 2-butanone (WHO, 1993). Male and female Fisher 344 rats were exposed to 0, 1250, 2500, or 5000 ppm 2-butanone by inhalation 6 hours/day, 5 days/week for 90 days. No treatment related differences in food consumption, eye effects, neurological function or in histopathologies were reported (U.S. EPA, 1985). However, increased absolute and relative liver weights and increased serum enzymes were reported at 5000 ppm and 2500 ppm, respectively. Increased absolute and relative liver weight, decreased body weight, increased relative kidney weight, decreased relative brain and spleen weights, and increased mean corpuscular hemoglobin were reported in Fisher 344 rats exposed to 5041 ppm for 6 hours/day, 5 days/week for 90 days (WHO, 1993). Male rats exposed to 10,000 ppm for 8 hours/day, 7 days/week developed severe upper respiratory tract irritation within a few days and died during the 7th week of exposure of bronchopneumonia (ATSDR, 2002).

No excess cancer incidence has been found in human workers occupationally exposed to 2-butanone (ATSDR, 2002). No information on the carcinogenicity of 2-butanone in animals were located. Results of four out of five short term mutagenicity assays (Ames assay, mouse lymphoma test, cell transformation assay, and the mouse micronucleus test) indicate that 2-butanone is not mutagenic. Results from the unscheduled DNA test was concluded to be positive (Cimino, 1985). 2-Butanone also tested negative in E. coli tester strains WP2 and WP2uvrA,

mitotic gene conversion assay, micronucleus test in hamsters. However, it was a stong inducer of aneuploidy in S. cerevisiae strain D61.M.

Animals studies indicate that exposure to high concentrations of 2-butanone is air during pregnancy can cause fetal toxicity and possibly adverse developmental effects. No information was located on developmental/reproductive toxicity in humans.

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Chlorobenzene

The chemical formula for chlorobenzene is C_6H_5Cl, and its molecular weight is 112.56 g/mol. Chlorobenzene occurs as a colorless flammable liquid, with low solubility in water. Chlorobenzene has an aromatic, almond-like odor, with an odor threshold of 1 to 8 mg/m^3. The vapor pressure for chlorobenzene is 8.8 mm Hg at 20 EC, and its log octanol/water partition coefficient (log K_{ow}) is 2.84. The primary uses of chlorobenzene are as a solvent for pesticide formulations, diisocyanate manufacture, and degreasing automobile parts and for the production of nitrochlorobenzene. In the past, chlorobenzene was used as an intermediate in phenol and DDT production (ATSDR, 2002).

Human exposure to chlorobenzene appears to be primarily occupational. In urban areas, chlorobenzene may be released to the ambient air during its manufacture and use. Chlorobenzene or its breakdown products can be detected in urine, exhaled breath, blood, and body fat to determine whether or not exposure has occurred. A child who ingested chlorobenzene became unconscious and cyanotic and had muscle spasms but recovered completely (ATSDR, 2002) Acute (short-term) inhalation exposure of cats to chlorobenzene produced narcosis, restlessness, tremors, and muscle spasms (HSDB, 1993). Acute animal tests, such as the LC_{50} and LD_{50} tests in rats, mice, rabbits, and guinea pigs, have demonstrated chlorobenzene to have low acute toxicity by inhalation and moderate acute toxicity from oral exposure (RTECS, 1993).

Chronic (long-term) exposure of humans to chlorobenzene affects the CNS. Signs of

neurotoxicity include numbness, cyanosis, hyperesthesia (increased sensation), and muscle spasms. Headaches and irritation of the mucosa of the upper respiratory tract and eyes have also been reported in humans chronically exposed via inhalation (USEPA, 1989). The CNS, liver, and kidneys have been affected in animals chronically exposed to chlorobenzene by inhalation (ATSDR, 2002). Chronic ingestion of chlorobenzene has resulted in damage to the kidneys and liver in animals (USEPA, 1989).

No information is available on the reproductive or developmental effects of chlorobenzene in humans. Chronic inhalation exposure of rats to chlorobenzene did not adversely affect reproductive performance or fertility. However, a slight increase in the incidence of degenerative testicular changes was observed. Chlorobenzene does not appear to be a developmental toxicant and did not produce structural malformations in rats and rabbits acutely exposed via inhalation (USEPA, 1989).

No information is available on the carcinogenic effects of chlorobenzene in humans.In a study of rats and mice exposed to chlorobenzene via gavage (experimentally placing the chemical in the stomach), an increased incidence of neoplastic nodules of the liver in male rats was observed but not in mice or female rats (ATSDR, 2002). EPA has classified chlorobenzene as a Group D, not classifiable as to human carcinogenicity.

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. *Toxicological Profile for Chlorobenzene*. U.S. Public Health Service.

U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD. 1993.

U.S. Department of Health and Human Services. Registry of Toxic Effects of Chemical Substances (RTECS, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD. 1993.

U.S. Environmental Protection Agency (USEPA). *Updated Health Effects Assessment for Chlorobenzene*. EPA/600/8-89/099. Environmental Criteria and Assessment Office, Office of Health and Environmental Assessment, Office of Research and Development, Cincinnati, OH. 1989.

Chloroethane

Chloroethane, also called ethyl chloride, is a colorless gas at room temperature and atmospheric pressure that is produced for use as an alkylating agent. It has a characteristically sharp odor that can be detected by scent at levels above 4 ppm. Chloroethane exists as a liquid in pressurized containers, but evaporates quickly when exposed to air. It was used predominantly for the manufacture of tetraethyl lead. Currently, its major use is as a blowing agent in foamed plastics.

Chloroethane is also used as a topical anesthetic, a refrigerant and in the manufacture of pharmaceuticals, dyes and other chemicals. It's previous use as a general anesthetic has been discontinued due to the risk of accidental death.

Most of the chloroethane released to the environment ends up in the atmosphere with smaller amounts entering groundwater as a result of passage through soil. Once in the atmosphere, it breaks down rapidly (half-life of 40 days) by reaction with other substances in the air. In groundwater, chloroethane changes slowly to ethanol and salt. Humans may be exposed to chloroethane from environmental , occupational and consumer sources.

Chloroethane can enter the body via inhalation of air containing chloroethane vapor. It may also enter the body through the skin although most of it quickly evaporates from the skin surface. When water containing chloroethane is ingested, it may enter into the bloodstream through the digestive tract. Once the cholorethane enters the body, it is excreted primarily through the lungs. Breakdown products of chloroethane (e.g., acetate) may exit via urine.

Brief exposure to high levels of chloroethane vapor can produce temporary feelings of drunkenness, lack of muscle coordination and un consciousness. Individuals have felt dizzy and suffered from decreased reaction times laong with experiencing stomach cramps, nausea, vomiting, and eye irritation. Workers exposed to chloroethane for longer periods of time (1.5 to 3 years) have experience decrease immune responsiveness and neurological effects such as jerking eye movements, inability to control voluntary muscle movements, difficulty in speaking, decreased reflexes, seizures, disorientation, memory loss and hallucinations.

It is not known whether chloroethane produces cancer in humans. However, long-term high-level inhalation exposure has been shown to produce cancer in mice. No studies ahve been performed demonstrating the ability of chloroethane to cause cancer when either ingested or applied to the skin. It is classified as a Group D carcinogen.

Agency for Toxic Substances and Dusease registry (ATSDR). 2002. *Toxicological profile for chloroethane.* U.S. Department of Health and Human Services.

Chloroform

Chloroform is a colorless, volatile liquid that is widely used as a general solvent and as an intermediate in the production of refrigerants, plastics, and pharmaceuticals (Torkelson and Rowe, 1976; IARC, 1976). Chloroform is rapidly absorbed from the lungs and the gastrointestinal tract, and to some extent through the skin. It is extensively metabolized in the body, with carbon dioxide as the major end product. The primary sites of metabolism are the liver and kidneys. Excretion of chloroform occurs primarily via the lungs, either as unchanged chloroform or as carbon dioxide (ATSDR, 2002).

Target organs for chloroform toxicity are the liver, kidneys, and central nervous system. Liver

effects (hepatomegaly, fatty liver, and hepatitis) were observed in individuals occupationally exposed to chloroform (Bomski *et al*., 1967). Several subchronic and chronic studies by the oral routes of exposure documented hepatotoxic effects in rats, mice, and dogs (Palmer *et al*., 1979; Munson *et al*., 1979; Heywood *et al*., 1979). Renal effects were reported in rats and mice following oral exposures (Roe *et al*., 1979; Reuber, 1976; Torkelson *et al*., 1976), but evidence for chloroform-induced renal toxicity in humans is sparse. Chloroform is a central nervous system depressant, inducing narcosis and anesthesia at high concentrations. Lower concentrations may cause irritability, lassitude, depression, gastrointestinal symptoms, and frequent and burning urination (ATSDR, 2002).

Developmental toxicity studies with rodents indicate that orally administered chloroform is toxic to dams and fetuses. Chloroform may cause sperm abnormalities in mice and gonadal atrophy in rats (Palmer *et al*, 1979; Reuber, 1979).

Epidemiological studies indicate a possible relationship between exposure to chloroform present in chlorinated drinking water and cancer of the bladder, large intestine, and rectum. Chloroform is one of several contaminants present in drinking water, but it has not been identified as the sole or primary cause of the excess cancer rate (ATSDR, 2002; U.S. EPA, 1985). In animal carcinogenicity studies, positive results included increased incidences of renal epithelial tumors in male rats, hepatocellular carcinomas in male and female mice, and kidney tumors in male mice (Jorgensen *et al*., 1985; Roe *et al*., 1979; NCI, 1976). Based on U.S. EPA guidelines, chloroform was assigned to weight-of-evidence Group B2, probable human carcinogen, on the basis of an increased incidence of several tumor types in rats and in three strains of mice.

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U.S. EPA. 1985. Health Assessment Document for Chloroform. Final Report. Office of Health and Environmental Assessment, Washington, DC. EPA/600/8-84/004F, NTIS PB86-105004/XAB.

Dichlorobenzenes

1,4-Dichlorobenzene, also referred to as para-DCB, p-DCB, paracide, Paramoth®, Parazene®, PDB, and Santochlor®, has a benzene ring with two chlorine atoms attached at the 1 and 4 carbon atoms; it does not occur naturally (ATSDR, 2002). Two additional isomers, 1,3-dichlorobenzene and 1,2-dichlorobenzene, also exist. 1,4-Dichlorobenzene is used to make mothballs, deodorant blocks used in restrooms, and in animal holding facilities to control odors (ATSDR, 2002). It also has applications in fumigants, insecticides, lacquers, paints, and seed disinfection products (Leber and Benya, 1994). Of the 1300 sites on the United States Environmental Protection Agency's National Priorities List, dichlorobenzenes have been identified on at least 244 sites. Drinking water samples from U.S. surface water sources, environmental hazardous waste sites, and food have been reported to contain dichlorobenzenes (ATSDR, 2002).

Detectable concentrations of dichlorobenzenes were found in adipose tissue and blood samples taken from Tokyo residents (Morita and Ohi, 1975; Morita *et al*., 1975). A national survey of various volatile organic chemicals demonstrated dichlorobenzenes in the three adipose tissues sampled. In addition, studies have shown that babies can receive dichlorobenzenes from mother's

milk (ATSDR, 2002). Dichlorobenzenes are absorbed by experimental animals via inhalation, gavage, or subcutaneous injection (Hawkins *et al*., 1980). Data from oral administration of 1,4-dichlorobenzene to rabbits indicated oxidation to 2,5-dichlorophenol, which was found in the urine as a conjugate of glucuronic and sulfuric acids (Azouz *et al*., 1955). Other metabolites identified in the blood and urine of rats were 2,5-dichlorophenyl methyl sulfoxide and 2,5-dichlorophenyl methyl sulfone.

Severe hypochromic, microcytic anemia with excessive polychromasia, marginal nuclear hypersegmentation of the neutrophils, and a small number of red blood cells with Heinz bodies developed in a pregnant woman (21 years old) who consumed 1–2 blocks of 1,4-dichlorobenzene toilet air freshener per week throughout her pregnancy (Campbell and Davidson, 1970). A 19-year-old female who consumed 4–5 moth pellets containing 1,4-dichlorobenzene on a daily basis for 2.5 years developed symmetrical, well-demarcated areas of increased pigmentation over various parts of her body, which disappeared over a 4-month period after discontinuing the ingestion (Frank and Cohen, 1961).

In rats, 13-week gavage studies resulted in decreased hematocrit levels, red blood cell counts, and hemoglobin concentrations at 300 mg/kg/day (NTP, 1987). Oral administration of 1200 and 1500 mg/kg/day resulted in degeneration and necrosis of rat hepatocytes. Increased incidences of hepatocellular degeneration and individual cell necrosis were observed in male and female mice gavaged with 600–1800 mg/kg/day.

Rats exposed via inhalation to 96–341 ppm of 1,4-dichlorobenzene intermittently for 5–7 months had cloudy swelling and degeneration of hepatic parenchymal cells in the central zone of the liver. Increased liver weights in the male and/or female rats occurred above 96 ppm (Hollingsworth *et al*., 1956). During a 2-generation study, adult rats exposed to 538 ppm exhibited tremors, ataxia, and hyperactivity; decreased grooming behavior; and an unkempt appearance (Tyl and Neeper-Bradley, 1989). Both generations of offspring in the 538 ppm group had lower body weights at lactation day 4, and average litter size and survival were decreased. Selected animals from the first filial generation still had reduced body weights at 5 weeks post-exposure.

No epidemiologic studies or case reports addressing the carcinogenicity of 1,4-dichlorobenzene in humans were available. In a 2-year study, female rats and male and female mice were gavaged with 300 and 600 mg/kg/day and male rats were gavaged with 150 and 300 mg/kg/day (NTP, 1987). Nephropathy, epithelial hyperplasia of the renal pelvis, mineralization of the collecting tubules in the renal medulla, and focal hyperplasia of the renal tubular epithelium were noted in male rats receiving 150 and 300 mg/kg/day. Female rats gavaged with 300 and 600 mg/kg/day had an increased incidence of nephropathy and minimal hyperplasia of the renal pelvis or tubules. The following tumors were described as being present in the animals: renal tubular adenocarcinomas in male rats (controls, 2%; low dose, 6%; high dose, 14%), a marginal increase in mononuclear cell leukemia in male rats (control, 10%; low dose, 14%; high dose, 22%), hepatocellular carcinomas in male mice (controls, 28%; low dose, 22.5%; high dose, 64%) and in female mice (controls, 10%; low dose, 10.4%; high dose, 38%), and hepatocellular adenomas in

male mice (controls, 10%; low dose, 26.2%; high dose, 32%) and in female mice (controls, 20%; low dose, 12.5%; high dose, 42%). In this NTP study, the tumor incidence in female controls was higher than the historical control. In both male and female mice, hepatocellular degeneration with resultant initiation of tissue repair was present. These findings resulted in a speculation by NTP (1987) that 1,4-dichlorobenzene was acting as a tumor promotor for liver tumors in male and female mice.

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Producers Association.

1,2-Dichloroethane

1,2-Dichloroethane (1,2-DCA or ethylene dichloride) is a clear, colorless, volatile liquid with a pleasant odor. Approximately 80% of 1,2-dichloroethane is used to produce vinyl chloride. It is also used to produce vinylidene chloride, 1,1,1- trichloroethane, TCE, PCE, aziridines and ethylene diamines. Minor applications include various solvent functions, use as a fumigant for grains, upholstery and carpets and as a lead-scavenging agent in gasoline (IRP, 1985).

1,2-DCA is readily absorbed through the lungs following inhalation exposure in both humans and animals (ATSDR, 2002). Absorption from the gastrointestinal tract is rapid and complete. Excretion of unmetabolized 1,2-DCA is almost exclusively via the lungs. However, metabolism and excretion of metabolites by other routes is extensive and dose related. Tissue distribution of 1,2-DCA is consistent with its lipophilic nature. It crosses the blood-brain and placental barriers and distributes into breast milk (U.S. EPA, 1985).

Short-term ingestion or inhalation of 1,2-DCA results in symptoms of CNS depression, gastrointestinal upset and systemic injury to the liver, kidneys and lungs (Clayton and Clayton, 1981). Long term exposure of workers to 1,2-DCA in an occupational environmment have been associated with loss of appetite, nausea, vomiting, epigastric pain, irritation of the mucous membrane, neurologic changes and liver and kidney impairment (IRP, 1985).

Acute inhalation exposure of a number of animal species to 1,2-DCA resulted in death in rats and guinea pigs at 400 ppm and in mice, rabbits and dogs at 1500 ppm (Heppel *et al*., 1945, 1946; Spencer *et al*., 1951). Liver and kidney effects were noted, as well as associated adverse effects to the respiratory and cardiovascular systems. A 15 percent increase in fat accumulation and an increase in liver triglycerides were observed in rats fed 80 mg/kg/day in the diet for 5 to 7 weeks (Alumot *et al*., 1976). No changes in liver weight was reported at this dose level. No hepatic effects were noted in the same study at 30 mg/kg/day. No hepatotoxicity was noted in mice administered up to 189 mg/kg/day in drinking water for 90 days (Munson *et al*., 1982). Chronic exposure of rats to 25 mg/kg/day in food for two years did not result in abnormalities in liver function as measured by transaminases and cholesterol values (Alumot *et al*., 1976). No dose-related reproductive effects were seen in mice fed 5-50 mg/kg/day in drinking water (Lane *et al*., 1982) or rats fed diets containing 12.5 or 25 mg/kg/day (Alumot *et al*., 1976). Intermittent exposure (7 hr/day) of female rats to 4.69 +/- 7 ppm of 1,2-DCA for 4 months prior to the mating period followed by inhalation exposure during pregnancy resulted in a statistically significant increase in embryo mortality (Vozavaya, 1977).

In-vivo exposure of mice to 1000 ppm of 1,2-DCA vapors for 4 hours or to a single nontoxic oral dose of 100 mg/kg resulted in irreversible DNA damage as revealed by single-stranded breaks in the hepatocytes of mice (Storer *et al*., 1984). 1,2-DCA has been found to be carcinogenic in rats and mice following oral gavage exposure (NCI, 1978). A dose of 47 mg/kg/day administered to

rats produced tumors at locations remote from the site of administration. Statistically significant increases in multiple tumor types (malignant and nonmalignant) were noted in treated animals of both species. An increased incidence of fibromas of the subcutaneous tissue and hemangiosarcomas of the spleen, liver, pancreas and adrenal gland was observed in male rats exposed to 47 or 95 mg/kg/day. Male rats exposed to 95 mg/kg/day were observed to have an increase in squamous-cell carcinomas of the forestomach, and female rats at this dosage had increased adenocarcinomans and fibroadenomas of the mammary gland.

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1,1-Dichloroethene

1,1-Dichloroethene, also known as vinylidene chloride, is a chemical used to make plastics and flame retardant coatings. It is a colorless liquid that evaporates quickly at room temperature. It has a mild sweet smell and burns quickly.

1-1-Dichloroethene enters the environment when it is released to the air during its production, or released to surface water or soil as a result of waste disposal. Most 1,1-dichloroethene evaporates quickly and mainly enters the environment through the air, although some enters into rivers and lakes. In air, it breaks down quickly (half-life of 4 days). It tends to break down slowly in water. It is not readily transferred to fish or birds, and only very small amounts enter the food chain. In soil, 1,1-dichloroethene either evaporates or percolates through soil and enters groundwater. Bacteria in soil and groundwater slowly transform it into other lass harmful substances.

1,1-Dichloroethene easily enters the body through the lungs, if present in air, or through the stomach and intestines, if contaminated materials are ingested. It can also penetrate through human skin. Following exposure, 1,1-dichloroethene partially leaves the body through the lungs. The remaining amount is broken down into other substances that then leave the body in urine within 1 to 2 days. Some of the breakdown products are more harmful than the parent compound.

Inhalation of high levels of 1,1-dichloroethene result in loss of breath and fainting. Prolonged inhalation exposures in humans and animals may result in adverse neurological effects and liver and kidney disease. Exposure of pregnant rats to 1,1-dichloroethene in air resulted in birth defects in the offspring. Oral exposures did not result in birth defects. Contact of 1,1-dichloroethene with skin and eyes can cause irritation.

The carcinogenic effects of 1,1-dichloroethene in humans is unknown. One study found that mice breathing 1,1-dichloroethene for one year developed kidney cancer. EPA has classified 1,1-dichloroethene as a group C carcinogen.

Agency for Toxic Substances and Dusease registry (ATSDR). 2002. *Toxicological profile for 1,1-dichloroethene.* U.S. Department of Health and Human Services.

1,2-Dichloroethene

1,2-Dichloroethene is a highly flammable, colorless liquid with a sharp, harsh odor. There are two isomers of 1,2-dichloroethene: cis- and trans-. Both forms may be present in a mixture, or the individual isomers may be used in their pure form. 1,2-Dichloroethene is used to produce solvents and in chemical mixtures. It enters the environment through industrial activity. It may be released from chemical factories during its manufacture, from landfills and hazardous waste sites, from chemical spills, from burning objects made of vinyl and from the breakdown of other chlorinated solvents.

1,2-Dichloroethene evaporates rapidly when exposed to air. It's half-life in air is 5 to 12 days. If present in soil, it may seep deeper into the soil and dissolve into groundwater. It's half-life in groundwater is 13 to 48 weeks. Small amounts of 1,2-dichloroethene may break down into vinyl chloride, a more hazardous chemical.

1,2-Dichloroethene enters the body through the lungs when contaminated air is breathed, through the stomach and intestines when contaminated food and water are ingested, or through the skin upon dermal contact with the chemical. Once absorbed, it rapidly distributes into blood and other tissues and is broken down into other compounds by the liver.

Inhalation of high levels of 1,2-dichloroethene can result in nausea, drowsiness, and fatigue. Higher levels can result in death. The lungs, liver and heart may be damaged after prolonged inhalation exposures. Oral doses have produced effects on the liver and blood (e.g., anemia). Animal studies suggest that exposure in utero may result in developmental delay. No studies have been done to determine the carcinogenic potential of 1,2-dichloroethene in humans or animals.

Agency for Toxic Substances and Dusease registry (ATSDR). 2002. *Toxicological profile for 1,2-dichloroethene.* U.S. Department of Health and Human Services.

4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)

4-Methyl-2-pentanone (also known as MIBK) is a clear liquid with a characteristic ketone odor. It is widely used as a solvent in paints, lacquers, varnishes, adhesives, and rubber cements. Due to its volatility, most exposures to MIBK are likely to be via inhalation. However, oral and dermal exposures may also occur. Due to its structure, MIBK is inferred to be readily absorbed into the body following any route of exposure. Once absorbed, MIBK is rapidly biotransformed (by oxidation and reduction reactions) to a secondary alcohol that is either eliminated (via kidney) as a glucuronide conjugate or further metabolized into carbon dioxide..

Targets for MIBK toxicity appear to be the central nervous system, gastrointestinal tract, liver, kidneys, fetus, and mucous membranes. Following high level exposures in animals, MIBK causes central nervous system depression including ataxia, sleepiness, and death. Lower level exposures

in humans have resulted in headache, weakness, dizziness, and insomnia. Gastrointestinal effects (noted following oral exposures) include nausea, vomiting, loss of appetite, heart burn, and intestinal pain. MIBK exposure has also shown to irritate the conjunctiva and mucous membranes of the nose and throat. MIBK may also produce dermatitis, with skin lesions varying from erythema to small areas of peeling.

Workers exposed to MIBK via air reported enlarged livers. This same effect was noted in laboratory rodents after inhalation exposures to MIBK. Short-term oral exposures in rats produced increased kidney weights and nephropathy; inhalation exposures resulted in degeneration of the proximal renal tubules and some reversible tubular necrosis. These effects were not noted in other species tested. Rats and mice, exposed during organogenesis, demonstrated maternal and fetal toxicity, but no teratogenicity.

Risk Assessment Information System (RAIS). 1995. *Toxicity Summary for Methyl Isobutyl Ketone*. http://risk.lsd.ornl.gov/tox/profiles/mibkrv_c.shtml. July 1995.

Methyl tert-butyl ether

The chemical formula for methyl *tert*-butyl ether is $C_5H_{12}O$, and its molecular weight is 88.15 g/mol. Methyl *tert*-butyl ether occurs as a colorless liquid, with a vapor pressure of 245 mm Hg at 25 EC. Methyl *tert*-butyl ether is used as an octane booster in unleaded gasoline. It is also used in the manufacture of isobutene (HSDB, 1993; Merck, 1989).

The general population may be exposed to methyl *tert*-butyl ether via the inhalation of air contaminated from its use as an octane booster or a pollution reducer in unleaded gasoline or by dermal contact. Workers may be occupationally exposed via inhalation or dermal contact. Acute (short-term) exposure of humans to methyl *tert*-butyl ether has occurred via injection into the gallbladder during its use as a medical treatment to dissolve cholesterol gallstones. Nausea, vomiting, and sleepiness have been observed; in one case renal failure was reported (HSDB, 1993). Acute inhalation exposure has resulted in ataxia and abnormal gait in rats. Acute animal tests, such as the LC_{50} and LD_{50} test in rats, have demonstrated methyl *tert*-butyl ether to have low acute toxicity via inhalation and moderate acute toxicity via ingestion (RTECS, 1993).

No information is available on the chronic (long-term) health effects of methyl *tert*-butyl ether in humans. Increased liver and kidney weights, decreased brain weight, swollen periocular tissue, and ataxia have been reported in rats following chronic inhalation exposure. Increased severity of spontaneous renal lesions and increased prostration (lying flat or exhaustion) were reported in females only. Increased liver, kidney, spleen, and adrenal weights; ataxia; and decreased brain weight, body weight, and body weight gain have been observed in mice chronically exposed to methyl *tert*-butyl ether by inhalation. Increased prostration was reported in females (HSDB, 1993).

No information is available on the reproductive or developmental effects of methyl *tert*-butyl ether in humans. In rats exposed via inhalation, reduced body weight and body weight gain in pups and decreased pup viability have been reported. A decreased number of viable implantations, increased maternal toxicity, dead fetuses, and late resorptions; and skeletal variations have been reported in mice exposed via inhalation (HSDB, 1993).

No information is available on the carcinogenic effects of methyl *tert*-butyl ether in humans or animals. EPA has not classified methyl *tert*-butyl ether with respect to potential carcinogenicity.

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Tetrachloroethene

Tetrachloroethene (PCE) is readily absorbed following inhalation and oral exposure (ATSDR, 2002). Tetrachloroethene vapors and liquid also can be absorbed through the skin (USEPA 1985a,b). The principal toxic effects of tetrachloroethene in humans and animals following acute and longer-term exposures include CNS depression and fatty infiltration of the liver and kidney with concomitant changes in serum enzyme activity levels indicative of tissue damage (U.S. EPA 1985a,b; Buben and O'Flaherty 1985). Mice subchronically exposed to tetrachloroethene did not show any adverse liver effects at 20 mg/kg/day (Buben and O'Flaherty 1985).

In an NCI (1977) bioassay, increased incidence of hepatocellular carcinoma were observed in both sexes of B6C3F1 mice administered tetrachloroethylene (386–1,072 mg/kg/day) in corn oil by gavage for 78 weeks. Tetrachloroethene is currently under review by the Carcinogen Risk Assessment Verification Endeavor (CRAVE) and estimates of cancer potency were withdrawn by USEPA (1995). However, the USEPA National Center for Environmental Assessment currently classifies tetrachloroethene as a Group B2/C carcinogen (Probable/Possible Human Carcinogen).

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. *Toxicological profile for tetrachloroethene.* Draft. U.S. Department of Health and Human Services. October.

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Toluene

Toluene is a clear, colorless organic liquid with a sweet smell and a high degree of lipid solubility. It is used as an industrial solvent/degreaser, as an intermediate in the manufacture of chemicals and pharmaceuticals, and is present as a component of gasoline and other fuels, paints, lacquers, adhesives, rubber and printing ink. Toluene is a volatile molecule with relatively low water solubility. It is flammable and may pose a fire hazard if handled improperly (ATSDR, 2002).

Toluene is readily absorbed by all routes of exposure (see section on Relative Absorption Factors). Once absorbed, it is rapidly distributed to all organ systems, including fetal tissue, with highest concentrations occurring in organs with high lipid content such as adipose tissue, brain and bone marrow. Toluene undergoes primarily oxidative metabolism to benzyl alcohol mediated by the mixed function oxidase enzyme system. Benzyl alcohol is further oxidized by alcohol and aldehyde dehydrogenase to produce benzoic acid which is primarily conjugated with glycine or glucuronic acid and excreted in urine as hippuric acids or benzoyl glucuronide. Toluene may also be excreted unchanged in exhaled air. Metabolism and excretion occurs rapidly, with the major portion occurring within 12 hours of exposure (Fishbein, 1985).

In humans, the most profound effects of toluene are on the central nervous system. Acute

exposure results in reversible depression of the central nervous system, neurological dysfunction, impaired performance and narcosis. Chronic exposure has been reported to result in permanent central nervous system effects such as ataxia, tremors and impaired speech, hearing and vision (ATSDR, 2002). Toluene vapors cause irritation of the upper respiratory tract, mucous membranes and eyes, and may produce cardiac arrhythmias upon chronic exposure (Anderson *et al*., 1982). Reports of effects on the hematological system, liver, kidney, immune system, reproductive organs and the developing fetus are confounded by exposure to multiple solvents (ATSDR, 2002).

Toluene has been demonstrated to produce similar effects in humans and animals. The major target organ following acute or chronic exposure is the central nervous system. Signs of central nervous system damage include impaired motor abilities, narcosis, tremors, alterations in EEG activity, changes in the levels of brain neurotransmitters and morphological effects (ATSDR, 2002). High level inhalation exposure resulted in respiratory irritation and inflammation and pulmonary lesions (NTP, 1989). Toluene does not appear to be directly toxic to the cardiovascular system (Bruckner and Peterson, 1981). Decreased leukocyte counts were observed in dogs following exposure to toluene (Hobara *et al*., 1984). In addition, exposed mice exhibited increased susceptibility to respiratory infection (Aranyi *et al*., 1985). Hepatic effects appear to be relatively mild with reported increases in liver weight and minor ultrastructural changes (Ungvary *et al*., 1982). Renal toxicity has not been observed (NTP, 1989; Bruckner and Peterson, 1981). Studies with animals provide evidence that toluene may be a developmental toxicant. Exposure in utero resulted in skeletal anomalies, retarded skeletal growth and low fetal weights (Ungvary, 1985). No reproductive effects have been reported (API, 1985; NTP, 1989).

Available in vitro studies suggest that toluene is nongenotoxic (ATSDR, 2002). In vivo studies in animals provide additional supportive evidence (API, 1981). A small number of human studies have reported an increased incidence in chromosomal abnormalities, however, these studies are confounded by possible co-exposure to other chemicals (Schmid *et al*., 1985; Bauchinger *et al*., 1982). Other human studies have found no correlation between exposure to toluene and increased frequencies of chromosomal abnormalities (Haglund *et al*., 1980; Maki-Paakkanen *et al*., 1980).

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1,2,4-Trichlorobenzene

1,2,4-Trichlorobenzene usually present in a mixture of three trichlorobenzene isomers and has

been used as a solvent in the manufacturing of chemicals, dyes and intermediates, dielectric fluid, synthetic transformer oils, lubricants, heat-transfer medium, and insecticides (Lewis, 1993). It is also used in degreasing agents, septic tank and drain cleaners, wood preservatives, and abrasive formulations (McNamara *et al.*, 1981).

All three isomers of trichlorobenzene are absorbed from the GI tract, intact skin, and lung (USEPA, 1980). After oral administration of radioactively labeled 1,2,4-trichlorobenzene, the bladder, kidney, fat, skin, liver, and adrenals, showed high 1,2,4-trichlorobenzene activity up to 24 hr post treatment (Chu *et al.*, 1987). Lingg *et al.*, (1980) demonstrated that there is a sharp distinction between the types of conjugates formed by rats and rheusus monkeys. Glucuronide conjugates and unconjugated trichlorophenols comprised the majority of the urinary metabolites after oral and i.v. administration of 1,2,4-trichlorobenzene to rheusus monkeys. Cysteine conjugates and isomers of trichlorothiophenol comprised the majority of the urinary metabolites after oral and i.v. administration of 1,2,4-trichlorobenzene to rats.

There is limited information regarding the human toxicity of 1,2,4-trichlorobenzene. Industrial experience has shown this compound to be a skin, eye and throat irritant. There is the potential for trichlorobenzene induced hepatic toxicity in situations where exposures to high concentrations are encountered (ACGIH, 1992).

Male rats, rabbits and beagle dogs were exposed to 0, 30, or 100 ppm of 1,2,4-trichlorobenzene for 7 hr/day, 5 days/week for 30 exposures in 44 days. In all 3 species there were no significant effects on body weight gain, hematologic and serum biochemical tests or gross and histopathologic appearance of tissues. At 100 ppm 1,2,4-trichlorobenzene, both rats and dogs had increased liver weights, and the rats also had increased relative kidney weight. Urinary excretion of porphyrins increased in rats exposed to 30 or 100 ppm 1,2,4-trichlorobenzene, most likely as a result of hepatic microsome induction (Kociba *et al.*, 1981).

Possible maternal and hepatic reproductive effects of 1,2,4-trichlorobenzene were assessed in rats given 0, 36, 120, 360, and 1200 mg/kg/day on days 9-13 of gestation. Animals were sacrificed on day 14 of pregnancy. Although pretreatment with 360 mg/kg/day did not increase resorptions, embryolethality, or teratogenicity, embryonic development was significantly retarded by all 4 growth criteria used (head length, crown-rump length, somite number, and protein content) (Kitchin and Ebron, 1983). In a multigeneration reproductive study, litters (17-23 litters/dose group) of the F0 generation were randomly reduced to 4 males and 4 females at birth. Male and female progeny were dosed with 0, 25, 100 or 400 ppm of 1,2,4-trichlorobenzene in the drinking water. The study ended when the F2 generation was 32 days old. Fertility (as indexed by conception rate of dams) of the F0 and F1 generation rats was not affected by treatment. A LOAEL was derived from a significant increase (11% in males, 13% in females) in adrenal gland weights observed in the 400-ppm groups of males and females of the F0 and F1 generations (Robinson *et al.*, 1980).

1,2,4-Trichlorobenzene was evaluated for mutagenicity and hepatic enzyme induction potential in

the Salmonella microsomal assay. The compound did not revert strains TA1535, TA1537, TA98, or TA100 when tested with or without metabolic activation at seven or eight concentrations over a three-log dose range (Schoeny *et al.*, 1979; Lawlor *et al.*, 1979).

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Trichloroethene

Absorption of trichloroethene (TCE) from the gastrointestinal tract is virtually complete. Absorption following inhalation exposure is proportional to concentration and duration of exposure (USEPA, 1985). TCE is a CNS depressant following acute and chronic exposures. In humans, single oral doses of 15–25 mL (21–35 grams) have resulted in vomiting and abdominal pain, followed by transient unconsciousness (Stephens, 1945). High-level exposure can result in death due to respiratory and cardiac failure (ATSDR, 2002). Hepatotoxicity has been reported in human and animal studies following acute exposure to TCE (ATSDR, 2002). Industrial use of TCE is often associated with adverse dermatological effects including reddening and skin burns on contact with the liquid form. These effects are usually the result of contact with concentrated solvent. However, no effects have been reported following exposure to TCE in dilute, aqueous solutions (USEPA, 1985).

TCE has caused significant increases in the incidence of hepatocellular carcinomas in mice (NCI, 1976), and renal tubular-cell neoplasms in rats exposed by gavage (NTP, 1983). TCE was mutagenic in *Salmonella typhimurium* and in *E. coli* (strain K-12), utilizing liver microsomes for activation (Greim *et al*., 1977).

USEPA is currently reviewing the carcinogenicity of TCE. The National Center for Environmental Assessment (NCEA) currently classifies TCE as a Group B2/C (Probable/Possible Human Carcinogen) based on inadequate evidence in humans and sufficient evidence of carcinogenicity from animal studies.

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. *Toxicological profile for trichloroethylene.* August 2002.

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Vinyl Chloride

Vinyl chloride, a colorless gas, is a halogenated aliphatic hydrocarbon with the empirical formula of C_2H_3Cl. It is used primarily as an intermediate in the manufacture of polyvinyl chloride (PVC); limited quantities are used as a refrigerant and as an intermediate in the production of chlorinated compounds (ATSDR, 2002).

Vinyl chloride is rapidly absorbed from the gastrointestinal tract. Metabolism of vinyl chloride occurs primarily in the liver via oxidation by hepatic microsomal enzymes to polar compounds which can be conjugated with glutathione and/or cysteine. These covalently bound metabolites are then excreted in the urine (U.S. EPA, 1980, 1985).

For the oral route of exposure, the primary target organ of vinyl chloride toxicity in animals is the liver. Chronic oral administration of 1.7-14.1 mg/kg/day of vinyl chloride induced dose-related increases in nonneoplastic lesions of the liver of rats (Feron *et al*., 1981). Evidence of developmental toxicity was seen in rats exposed to vinyl chloride during the first trimester of gestation (Ungvary *et al*., 1978).

The carcinogenicity of vinyl chloride in humans has been demonstrated in a number of epidemiological studies and case reports, many of which associated occupational exposure to vinyl chloride to the development of angiosarcomas of the liver (U.S. EPA, 1985). Vinyl chloride has been shown to be carcinogenic in numerous animal studies. Oral administration of vinyl chloride induced liver, lung, and kidney tumors in rodents (Feron *et al*., 1981; Maltoni, 1977). EPA has classified vinyl chloride as a Group A chemical, human carcinogen (U.S. EPA, 1985).

Xylenes

Xylenes are colorless liquid organic molecules with a sweet odor and a high degree of lipid solubility. There are three isomers of xylene: meta- ortho- and para-xylene (m-, o- and p-xylene, respectively). The term "total xylenes" is used to designate a mixture of the three possible isomers, in any proportions. They are commonly used as industrial solvents, as components of paints, varnishes, cleaners, degreasers and gasoline and as chemical intermediates in the manufacture of other chemicals, plastics and synthetic fibers. Xylenes are volatile molecules and therefore, evaporate quickly. They are also flammable and may pose a fire hazard if handled

improperly (ATSDR, 2002).

Xylenes are readily absorbed by all routes of exposure. Xylenes are very soluble in blood and therefore are absorbed easily into the systemic circulation during exposure (Astrand, 1982). Following absorption, distribution occurs rapidly to all organs, including fetal tissue, with greatest distribution occurring to organs having a high lipid content, such as adipose tissue, bone marrow and brain (Astrand, 1982; Engstron and Bjurstrom, 1978; Riihimaki *et al*., 1979). In humans, xylenes are primarily metabolized by the mixed function oxidase enzyme system to methylbenzyl alcohols which are further oxidized by alcohol and aldehyde dehydrogenase to yield methyl benzoic acids. The acids are readily conjugated and excreted in urine (Fishbein, 1985). In addition, a small percentage (3-6%) is exhaled unchanged due to the volatile nature of these compounds.

Human data suggests that the three xylene isomers all produce qualitatively similar effects, although the individual isomers are not necessarily equal in potency with regard to a given effect (ATSDR, 2002). Exposure, by any route, results in primarily central nervous system effects that may include headaches, nausea, mental confusion, narcosis, impaired learning and memory, dizziness, tremors, unconsciousness and coma, depending on dose and length of exposure. High doses may result in death. The respiratory system may also be a target of xylene toxicity in humans, producing respiratory tract irritation, pulmonary edema and inflammation after inhalation. Ocular irritation may result following exposure to xylene vapors. Skin irritation, dryness and scaling may result following dermal exposure. Limited data are available concerning effects of exposure on the hepatic, renal, cardiovascular, musculoskeletal or hematological system. Insufficient information is available regarding the developmental and reproductive toxicity of xylenes in humans.

Exposure to xylenes produces similar effects in humans and laboratory animals. The central nervous system is the primary target for both short-term and long-term exposures. Respiratory effects are observed following inhalation exposure. Data from animal studies provide limited evidence that xylene may produce cardiovascular effects (arrhythmias, atrial fibrillation and alterations in blood vessels and blood flow) (Morvai *et al*., 1976, 1987), hepatic effects (enzyme induction, increased liver weight, ultrastructural alterations) (Condie *et al*., 1988; Elovaara *et al*., 1980; Elovaara, 1982) and renal effects (enzyme induction, renal atrophy, tubular alterations) (Condie *et al*., 1988; Elovaara, 1982; Toftgard and Nilsen, 1982). These results suggest that humans might be at increased risk of developing such effects following exposure. Findings in animal studies suggest that xylenes may produce developmental defects including increased fetal death, decreased fetal weight, delayed skeletal development and gross anomalies (Marks *et al*., 1982; Ungvary *et al*., 1980). No animal data exists suggesting effects on reproductive organs, the musculoskeletal system or hematological system.

Xylenes have been tested for genotoxicity in a variety of in vitro and in vivo assays. Results of the various assays indicate that xylenes are nongenotoxic following in vitro and in vivo exposure (ATSDR, 2002). No evidence of carcinogenicity exists in humans or laboratory animals

(ATSDR, 2002).

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SEMIVOLATILE ORGANICS

bis(2-Ethylhexyl)phthalate

Bis(2-ethylhexyl)phthalate, often referred to as Di(2-ethylhexyl)phthalate (DEHP), exists as a colorless, oily liquid at room temperature. It is used industrially as a plasticizer for resins, to make plastic materials more flexible. DEHP is contained in many plastic products such as imitation leather, rainwear, footwear and toys. It is used in the manufacture of tubing and containers used for blood transfusions and kidney dialysis. DEHP is also used in the manufacture of organic pump fluids in electrical capacitors. DEHP may migrate into the environment under improper use/disposal conditions. As a result, exposure could occur via air, water and food. Patients receiving blood transfusions or kidney dialysis can also be exposed to DEHP (ATSDR, 2002; Sittig, 1981).

DEHP is readily absorbed through ingestion and inhalation and poorly absorbed through the skin. DEHP is largely metabolized prior to intestinal absorption, via hydrolysis, to its corresponding monoester metabolite (MEHP), with the release of 2-ethylhexanol. Once absorbed, DEHP and its metabolites are distributed throughout the body, with most of the compounds initially going to the liver. In general, DEHP and its metabolites are converted to more polar derivatives and are then excreted. DEHP is rapidly cleared from the body, with little potential for accumulation. There are differences in the way DEHP is metabolized among species. Although phase I reactions are essentially the same across species except for quantitative differences, phase II reactions differ among species as to the ability to glucuronidate DEHP and its metabolites. The relationship between pharmacokinetics and toxicity is not known due to gaps in knowledge regarding mechanisms of toxic action (ATSDR, 2002).

Acute toxicity from DEHP is relatively low by both inhalation and ingestion. A 1-hr exposure to 23,670 mg/m^3 DEHP did not result in any deaths. The oral LD50 for DEHP ranges from 26,000 to 49,000 mg/kg (ATSDR, 2002). Exposure to DEHP has produced irritation of the eyes, and mucous membranes, nausea and diarrhea (Sittig, 1981). Liver biopsies from dialysis patients showed liver abnormalities (peroxisome proliferation) (ATSDR, 2002). Most of the toxicity data for DEHP originate from animal studies.

Laboratory studies indicate that DEHP targets the liver and the testes. DEHP, administered at high levels, has induced morphological and biochemical liver changes in a number of rodent studies. Both DEHP and MEHP, its metabolite, have also been shown to produce reduced organ

weight and damage to the seminiferous tubules of the testes. DEHP has also produced developmental and reproductive effects in laboratory rodents. Developmental effects include exencephaly and spina bifida. Reproductive effects include reduced fertility and fewer and smaller litters (ATSDR, 2002).

There is a large database on the mutagenicity of DEHP involving a large number of tests conducted in bacterial systems as well as in vivo and in vitro mammalian test systems. In addition, a less extensive database is available on the mutagenicity of the metabolites, MEHP and 2-ethylhexanol. The overall weight of evidence indicates that DEHP is not mutagenic (ATSDR, 2002). A carcinogenic feeding bioassay conducted by the National Toxicology Program (NTP) in B6C3F1 mice and F344 rats found an increased incidence of hepatocellular tumors which increased with increasing dose (NTP, 1982). EPA has designated DEHP as a B2, Probable Human Carcinogen.

Agency for Toxic Substances and Disease Registry (ATSDR) (2002) *Toxicological profile for di(2-ethylhexyl)phthalate.* U.S. Public Health Service.

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<u>2-Chloronaphthalene</u>

2-Chloronaphthalene has: a boiling point of 256 ºC @ 760 mm HG, 132.6 ºC @ 20 mm HG and 119.7 ºC @ 11 mm; a melting point of 59.5 ºC; a molecular weight of 162.61; specific gravity of 1.1938 @ 90 ºC; and a vapor pressure of 7.98×10^{-3} mm Hg at 25 ºC. Based on a water solubility of 11.7 mg/L at 25 ºC, a K_{oc} of 1130 has been calculated using a recommended regression-derived equation. This K_{oc} value indicates 2-chloronaphthalene will have a low mobility in soil, and has the potential to partition from the water column to organic matter contained in sediments and suspended solids.

Chloronaphthalenes can be absorbed through the skin, lung, and gut, and tend to deposit in fat depots. Accumulation occurs in pilosebaceous acini and adipose tissue and to a lesser degree in brain, kidney and other body tissues. Excretion occurs predominantly in urinary metabolites as well as in bile.

The most probable human exposure would be occupational exposure, which may occur through dermal contact or inhalation at places where 2-chloronaphthalene is produced or used. Non-occupational exposures may occur from the ingestion of contaminated drinking water

supplies and fish. When 2-chloronaphthalene is used in poorly ventilated areas and especially when heat is applied, there may be significant systemic absorption of toxic vapors. Target organ is primarily liver, and cases of fatal acute yellow atrophy have been reported

Chlorinated naphthalenes are potent inducers of chloracne which may develop after week or month of cutaneous exposure and commonly appears first lateral to eyebrows, on chin, cheeks, forehead, chest, abdomen, thighs, or buttocks. The lesions are primarily papules and yellowish cysts surrounded by mild erythema.. Pruritis is common. Systemic poisoning from chloronaphthalenes have been reported after absorption through vapor inhalation, with digestive disturbances, irritation of eyes, impotence and hematuria.

The effects of 2- chloronaphthalene on mitochrondrial respiration were studied in homogenate from isolated rat liver. 2- Chloronaphthalene was an inhibitor.

No data were found regarding the genotoxicity of 2-chloronaphthalene.

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Cresols (Methylphenols)

Three types of closely related cresols exist: ortho-cresol (2-methylphenol), meta-cresol (3-methylphenol), and para-cresol (4-methylphenol). Pure cresols are colorless chemicals, but may be found in brown mixtures such as creosote (i.e., a wood preservative). Cresols can be either solid or liquid, depending on purity. Pure cresols are solids while mixtures tend to be liquids. They have a medicinal odor and taste. Cresols do not readily evaporate but may dissolve in water and pass through soil into underground water sources. They are used primarily as disinfectants and deodorizers, and as starting chemicals for making other chemicals.

Cresols can enter the body quickly after ingesting contaminated water or food, breathing air containing cresol vapor or mists, or by allowing skin to contact substances containing cresols. Most cresols are quickly (i.e., within 1 day) transformed into other chemicals which are then eliminated from the body. Direct contact with cresols by mouth can cause burning pain in the mouth and throat and stomach pain. Skin rashes and severe irritation may develop after dermal contact. They can also irritate the eyes. Large doses of cresols in humans have resulted in anemia, kidney problems, and central nervous system depression.

Animals studies have indicated that lower level exposures result in loss of coordination and muscular twitching. Kidney problems and anemia have also been noted in animal studies. Cresols may enhance the ability of other cancer-causing chemicals to produce tumors in laboratory animals even though they have not been shown to directly produce cancer in animals or humans. However, the USEPA has classified cresols as possible human carcinogens. Animals studies do not indicate that cresols produce birth defects or adversely affect reproductive success.

Agency for Toxic Substances and Disease Registry (ATSDR) (2002) *Toxicological profile for cresols.* U.S. Public Health Service.

Chlorophenols

Chlorophenols are a group of chemicals in which chlorine has been added to phenol. Phenol is an aromatic compound derived from benzene by adding a hydroxyl group to a carbon to replace a hydrogen. There are five basic types of chlorophenols which contain one (monochlorophenols), two (dichlorophenols), three (trichlorophenols), four (tetrachlorophenols) or five (pentachlorophenols) chlorine atoms. Common chlorophenols include 2- and 4-chlorophenol, 2,4-dichlorophenol, 2,4,5- and 2,4,6-trichlorophenol, and 2,3,4,5-, 2,3,4,6- and 2,3,5,6-

tetrachlorophenol. All chlorophenols are solids at room temperature except for 2-chlorophenol which exists as a liquid. The chlorophenols have a strong medicinal taste and odor. Chlorophenols are used as pesticides, wood preservatives, and antiseptics. 2,4-Dichlorophenol has been used for mothproofing.

Most chlorophenols released to the environment will go into water. The mono- and dichlorophenols may also enter air due to their volatility. Chlorophenols are quickly absorbed from the gastrointestinal tract, and also rapidly enter the body through the skin and lungs. Once absorbed, monochlorophenols are excreted from the body within 24 hours; other chlorophenols may remain in the body for several days.

Dermal contact with chlorophenols causes severe injury including redness, swelling, scabbing, and scar formation. Severe occular injury may also result after direct corneal exposure. Animal studies indicate that high level oral exposures result in adverse effects to the liver and immune system. Feeding rodents high doses of 2,4-dichlorophenol did not cause cancer. However, long-term treatment with 2,4,6-trichlorophenol did results in an increased incidence of leukemia in rats and liver cancer in mice. Therefore, 2,4,6-trichlorophenol has been determined to be a probable human carcinogen.

Chlorophenols have not been shown to cause birth defects in animals, even at high doses. However, high levels of chlorophenols given orally to pregnant female rats tended to reduce the number of newborn animals and to decrease the weights of the newborns at birth.

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. *Toxicological Profile for Chlorophenols*. U.S. Department of Health and Human Services. Public Health Service.

Naphthalene

Naphthalene is a member of the polycyclic aromatic hydrocarbon family. It is ubiquitous in nature and is both naturally occurring and man-made. Naphthalene is a white solid substance at room temperature. It has a distinct odor of mothballs or tar. Humidity and sunshine cause evaporation into the air within a few hours. When placed in water or soil, bacteria will destroy naphthalene, or will render it airborne within a few hours (ATSDR, 2002). Tobacco smoke is known to release 3 ug of naphthalene per cigarette (U.S. EPA, 1982). The compound is used in the production of dyes, solvents, lubricants, motor fuels (U.S. EPA, 1980) and is a major component of many moth ball preparations.

Humans can absorb naphthalene by dermal, inhalation and oral routes. Metabolism occurs via the P450 mixed function oxidase enzyme system to yield multiple intermediates which are then conjugated. Key metabolites are responsible for each toxicity endpoint following intraperitoneal administration: 2-naphthoquinones --> hemolysis; 1,2-naphthoquinones --> cataracts; 3-GSH adducts --> pulmonary toxicity (Buckpitt *et al*., 1984). Excretion of metabolites occurs via urine

and feces (ATSDR, 2002).

Adults and children exposed to airborne naphthalene experience vomiting, abdominal pain and anemia (ATSDR, 2002). Most of the data is for inhalation of naphthalene from mothballs. The primary site of toxicity is the erythrocyte resulting in hemolytic crisis (hemolytic anemia). Jaundice is seen upon dermal, inhalation, and oral exposures, as are kidney effects (ATSDR, 2002). Near-blindness resulted in male and female subjects with 5 gram ingestion (ATSDR, 2002).

Oral doses in rats have hepatic effects. Dogs (1800 mg/kg) for 5 days of exposure showed signs of lethargy and ataxia, and decreased hemoglobin levels (ATSDR, 2002).

No studies of genotoxic effects in humans or laboratory animals were located. No human epidemiological evidence for cancer. Inconclusive evidence for cancer in rats and mice were found (ATSDR, 2002).

Agency for Toxic Substances and Disease Registry (ATSDR) (2002) *Toxicological profile for naphthalene and 2-methylnapthalene.* U.S. Public Health Service.

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U.S. Environmental Protection Agency (U.S. EPA) (1980) *Ambient water quality criteria for polycyclic aromatic hydrocarbons.* Office of Emergency and Remedial Response. Washington, DC.

Pentachlorophenol

Pentachlorophenol, a man-made organic biocide, is often contaminated with other toxic organic chemicals such as chlorinated phenols, dioxins, and dibenzofurans (Williams, 1982; U.S. Air Force, 1989; ATSDR, 2002).

Pentachlorophenol is readily absorbed following oral or inhalation exposure and is widely and rapidly distributed throughout the body (Wagner *et al*., 1991; ATSDR, 2002; Jorens and Schepens, 1993). Human and animal studies have provided evidence indicating that pentachlorophenol is metabolized to various conjugated metabolites. Both the parent compound and the conjugates are excreted in the urine (Braun *et al*., 1979).

Assessing the potential toxicity of technical (commercial) grade pentachlorophenol is complicated by the presence of the toxic impurities that are usually present, and the effects resulting from

occupational exposure are often difficult to attribute to a specific route of exposure (Jorens and Schepens, 1993). The effects in humans following acute oral exposure include increased heart and respiratory rates, elevated temperature, increased basal metabolic rate, and death (29 and 401 mg/kg) (RTECS, 1989).

Human fatalities and toxic effects including tachycardia, jaundice, and other hematologic alterations have been reported for acute and subchronic occupational (e.g., sawmill workers, herbicide sprayers) inhalation exposures to pentachlorophenol. Upper respiratory tract inflammation and bronchitis were reported for sawmill workers chronically exposed to pentachlorophenol (Baader and Bauer, 1951; Menon *et al*., 1958; ATSDR, 2002). However, dose-terms for these exposures were not available, and concurrent exposures to other chemicals make definitive assessments impossible.

Data regarding the dermal exposure of humans to pentachlorophenol are anecdotal or equivocal, lack dose terms, and are compromised by concurrent exposures to other chemicals including the known contaminants in technical-grade pentachlorophenol. Acute exposure to 0.4% pentachlorophenol produced localized irritation (Bevenue *et al*., 1967), and subchronic exposures have caused chloracne (Baader and Bauer, 1951; O'Malley *et al*., 1990) and possibly renal damage (ATSDR, 2002). Dermal lesions including pemphigus and chronic urticaria have been reported for humans chronically exposed to pentachlorophenol-treated wood (Lambert *et al*., 1986). There currently are no definitive data regarding reproductive toxicity in humans exposed to pentachlorophenol.

Acute oral exposure of animals to pentachlorophenol affects the liver, kidneys, cardiovascular system, and the peripheral and central nervous system. Oral LD_{50} values for laboratory animals range from 27 to 230 mg/kg (Borzelleca *et al*., 1985; U.S. Air Force, 1989; ATSDR, 2002). Definitive data regarding the effects of subchronic or chronic oral exposure of humans to pentachlorophenol are not available. However, subchronic exposure (1 to 8 months) of rats to pentachlorophenol at doses ranging from 5 to 40 mg/kg/day has produced cardiovascular, hematotoxic, renal, hepatic, and immunologic responses (Schwetz *et al*., 1974, 1978; U.S. Air Force, 1989; ATSDR, 2002). Evidence of reproductive/developmental toxicity (increased resorptions, embryolethality, embryotoxicity, and teratogenicity) have also been observed in rats given pentachlorophenol during gestation (Larsen *et al*., 1974, 1976; Schwetz *et al*., 1978).

Because the most significant acute toxic effect of pentachlorophenol is elevated metabolism, a specific target organ or tissue is difficult to identify. However, for subchronic and chronic exposures, toxicity data indicate that the liver, kidney, and cardiovascular system are targets for some of the toxic effects of pentachlorophenol.

Based upon increased incidences of hepatocellular adenomas and carcinomas, adrenal medulla pheochromocytomas, malignant pheochromocytomas, and hemangiosarcomas/hemangiomas in mice, pentachlorophenol is classified by the EPA as a probable human carcinogen (Weight of Evidence Category B2). The potential carcinogenicity of pentachlorophenol following inhalation

exposure has not been evaluated.

ATSDR (Agency for Toxic Substances and Disease Registry). 2002. *Toxicologic Profile for Pentachlorophenol.* U.S. Public Health Service.

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Phenanthrene

Phenanthrene is a member of the polyaromatic hydrocarbons (PAH). PAHs constitute a class of non-polar compounds that contain two or more aromatic rings. They are ubiquitous in nature and are both naturally occurring and man-made. The database on the potential health effects of phenanthrene is limited.

Little data are available regarding the pharmacokinetics of phenanthrene. The intestinal absorption of phenanthrene is less dependent on the presence of bile in the stomach than is the absorption of the larger PAHs (such as benzo(a)pyrene) (Rahman *et al.*, 1986).

Phenanthrene has been shown to be a skin photosensitizer in humans (Sax, 1984). Phenanthrene has a reported LD 50 of 700 mg/kg in mice (Simmon *et al*., 1979). Rats injected intraperitoneally evidenced liver effects (Yoshikawa *et al.*, 1987).

There is equivocal evidence for cancer from dermal application of phenanthrene in rats (IARC, 1983). Phenanthrene is not a complete skin carcinogen (ATSDR, 2002). It is neither an initiator (LaVoie *et al.*, 1981; Roe, 1962) nor a promoter (Roe and Grant, 1964). Higgins and Yang (1962) reported no tumor production within two months after the ingestion of 200 mg of phenanthrene by rats. There are limited data that suggest that phenanthrene is mutagenic (Wood

et al., 1979). However, the majority of tests are negative (ATSDR, 2002).

Agency for Toxic Substances and Disease Registry (ATSDR) (2002) *Toxicological profile for polycyclic aromatic hydrocarbons.* U. S. Public Health Service.

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<u>Polycyclic Aromatic Hydrocarbons (Carcinogenic)</u>

Polycyclic aromatic hydrocarbons (PAHs) occur in the environment as complex mixtures containing numerous PAHs of varying carcinogenic potencies. Only a few components of these mixtures have been adequately characterized, and only limited information is available on the relative potencies of different compounds.

PAH absorption following oral exposure is inferred from the demonstrated toxicity of PAHs following ingestion (USEPA, 1984a). PAHs are also absorbed following dermal exposure (Kao *et al*., 1985). Acute effects from direct contact with PAHs and related materials are limited primarily to phototoxicity; the primary effect is dermatitis (NIOSH, 1977). PAHs have also been shown to cause cytotoxicity in rapidly proliferating cells throughout the body; the hematopoietic system, lymphoid system, and testes are frequent targets (Santodonato *et al*., 1981). Destruction of the sebaceous glands, hyperkeratosis, hyperplasia, and ulceration have been observed in mouse skin following dermal application of the cPAHs (Santodonato *et al*., 1981). Benzo(a)pyrene has also been shown to have an immunosuppressive effect in animals (ATSDR, 2002). Nonneoplastic lesions have been observed in animals exposed to the more potent cPAHs, but only after exposure to levels well above those required to elicit a carcinogenic response. Benzo(a)pyrene has been demonstrated to induce adverse developmental and reproductive effects in experimental animals following oral exposure (ATSDR, 2002). These effects were manifested as reduced pup weights during postnatal development, sterility, reduced fertility, and an increased incidence of stillborns and resorptions (ATSDR, 2002). cPAHs are believed to induce tumors both at the site of application and systemically. Studies in laboratory animals have demonstrated that the cPAHs benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, dibenz(a,h)anthracene and indeno(1,2,3-cd)pyrene have the ability to induce skin tumors following dermal exposure (ATSDR, 2002). Neal and Rigdon (1967) reported that oral administration of 250 ppm benzo(a)pyrene for approximately 110 days led to forestomach tumors in mice.

Benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene are classified by USEPA in Group B2—Probable Human Carcinogen. USEPA has developed an oral slope factor for benzo(a)pyrene. Oral cancer slope factors for the other six cPAHs are derived by applying relative potency factors developed by USEPA (1993) to the oral slope factor for benzo(a)pyrene.

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INORGANICS

Antimony

Antimony is a metal which occurs both in the trivalent and pentavalent oxidation states (USEPA, 1980). Absorption of this metal via oral routes of exposure is low (10% for antimony, tartrate; 1% for all other forms) (ATSDR, 2002). Organic antimony is more toxic than the inorganic compounds due to increased absorption. Humans and animals exposed acutely by oral or inhalation exposures to either the trivalent or pentavalent forms of antimony displayed electrocardiogram (ECG) changes and myocardial lesions (USEPA, 1980). Pneumoconiosis has been observed in humans exposed by acute inhalation and dermatitis has occurred in individuals exposed either orally or dermally. Following acute oral exposure to antimony trioxide or potassium antimony tartrate, both humans and laboratory animals (dogs) manifested nausea and vomiting (ATSDR, 2002). Humans and laboratory animals (i.e., rat and pig) chronically exposed to antimony compounds (antimony trioxide, pentoxide, and trisulfide) via inhalation manifested respiratory effects including macrophage proliferation, fibrosis and pneumonia at LOAELs ranging from 0.046 to 86.3 mg/m^3 (ATSDR, 2002). Chronic oral exposure in rats (0.35 mg/kg-day) resulted in altered blood glucose and blood cholesterol levels and decreased lifespan (Schroeder *et al*., 1970). A single report (Balyeava, 1967) noted an increase in spontaneous abortions, premature births, and gynecological problems in 318 female workers exposed to a mixture of antimony metal, antimony trioxide, and antimony pentasulfide dusts. No change in the incidence of cancer was observed in laboratory animals (i.e., rats, mice) fed 0.262 or 0.35 mg/kg-day antimony as potassium antimony tartrate for a lifetime.

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Arsenic

Arsenic is difficult to characterize as a single analyte because it has complex chemistry. It may be trivalent or pentavalent and is widely distributed in nature (ATSDR, 2002). Both inorganic and organic forms of arsenic are readily absorbed via oral and inhalation routes. Soluble forms are more readily absorbed than insoluble forms (USEPA, 1984). Approximately 95% of soluble inorganic arsenic administered to rats is absorbed from the gastrointestinal tract (Coulson *et al*., 1935; Ray-Bettley and O'Shea, 1975). Approximately 70–80% of arsenic deposited in the respiratory tract of humans has been shown to be absorbed (Holland *et al*., 1959). Dermal absorption of the insoluble forms of arsenic is not significant (USEPA, 1984). At mining sites, arsenic is expected to occur in naturally occurring mineral assemblages with considerably lower bioavailability than expected in soluble inorganic arsenic salts (Davis *et al*., 1992).

Acute exposure in humans by ingestion of metallic arsenic has been associated with gastrointestinal effects, hemolysis, and neuropathy (USEPA, 1984). Chronic human arsenicism (by drinking water ingestion) is associated with increased risk of nonmelanoma, typically nonlethal, skin cancer and a peripheral vascular disorder that results in gangrene of the extremities, especially feet, known as blackfoot disease (Tseng, 1977). Additionally, there is strong evidence to suggest ingested inorganic arsenic causes cancers of the bladder, kidney, lung, and liver, and possibly other sites (Bates *et al*., 1992; Chen *et al*., 1992; Chen *et al*., 1986). It is well known that hyperpigmentation and keratosis are also associated with chronic arsenicism (Neubauer, 1947) and arsenic can produce toxic effects on both the peripheral and CNS, precancerous dermal lesions, and cardiovascular damage (USEPA, 1984; Tseng, 1977). Arsenic is embryotoxic, fetotoxic, and teratogenic in several animal species (USEPA, 1984). No evidence of reproductive toxicity was found (Calabrese and Kenyon, 1991). Epidemiological studies of workers in smelters and in plants manufacturing arsenical pesticides have shown inhalation of arsenic is strongly associated with lung cancer and less so, with hepatic angiosarcoma (USEPA, 1984).

There is substantial evidence that establishes the nutritional essentiality of trace levels of arsenic.

Deficiency has been shown to depress growth and impair reproduction in rats, minipigs, chickens, and goats (USEPA, 1988; NRC, 1989). Methylation of arsenic to less toxic, more rapidly excreted chemical species provides an effective detoxification mechanism *in vivo*. In humans, this system may become saturated at daily oral intake rates greater than 250–1,000 µg/day. For this reason, the dose-response curve for arsenic, for carcinogenicity and systemic toxicity, may have nonlinearities, i.e., a portion of the dose-response curve exists over which increases in dose do not result in comparable increases in physiological response (Petito and Beck, 1990).

USEPA classified arsenic as Group A - Human Carcinogen based on two epidemiological studies (Tseng *et al*., 1968; Tseng, 1977) which indicated an increased incidence of skin cancer in individuals exposed to arsenic in drinking water.

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Barium

The soluble salts of barium, an alkaline earth metal, are toxic in mammalian systems. They are absorbed rapidly from the gastrointestinal tract and are deposited in the muscles, lungs, and bone. Barium is excreted primarily in the feces.

At low doses, barium acts as a muscle stimulant and at higher doses affects the nervous system eventually leading to paralysis. Acute and subchronic oral doses of barium cause vomiting and diarrhea, followed by decreased heart rate and elevated blood pressure. Higher doses result in cardiac irregularities, weakness, tremors, anxiety, and dyspnea. A drop in serum potassium may account for some of the symptoms. Death can occur from cardiac and respiratory failure. Acute doses around 800 milligrams can be fatal to humans.

Subchronic and chronic oral or inhalation exposure primarily affects the cardiovascular system resulting in elevated blood pressure. A lowest-observed-adverse-effect level (LOAEL) of 0.51 mg barium/kg/day based on increased blood pressure was observed in chronic oral rat studies (Perry *et al.*, 1983), whereas human studies identified a no-observed-adverse-effect level (NOAEL) of 0.21 mg barium/kg/day (Wones *et al.*, 1990, Brenniman and Levy 1984). In the Wones *et al.* study, human volunteers were given barium up to 10 mg/L in drinking water for 10 weeks. No clinically significant effects were observed. An epidemiological study was conducted by Brenniman and Levy in which human populations ingesting 2 to 10 mg/L of barium in drinking water were compared to a population ingesting 0 to 0.2 mg/L. No significant individual differences were seen; however, a significantly higher mortality rate from all combined cardiovascular diseases was observed with the higher barium level in the 65+ age group. The

average barium concentration was 7.3 mg/L, which corresponds to a dose of 0.20 mg/kg/day.

Subchronic and chronic inhalation exposure of human populations to barium-containing dust can result in a benign pneumoconiosis called "baritosis." This condition is often accompanied by an elevated blood pressure but does not result in a change in pulmonary function. Exposure to an air concentration of 5.2 mg barium carbonate/m^3 for 4 hours/day for 6 months has been reported to result in elevated blood pressure and decreased body weight gain in rats (Tarasenko *et al*., 1977). Reproduction and developmental effects were also observed. Increased fetal mortality was seen after untreated females were mated with males exposed to 5.2 mg/m^3 of barium carbonate. Similar results were obtained with female rats treated with 13.4 mg barium carbonate/m^3.

Barium has not been evaluated by the USEPA for evidence of human carcinogenic potential

Brenniman, G. R. and P. S. Levy. 1984. High barium levels in public drinking water and its association with elevated blood pressure. In: *Advances in Modern Toxicology IX*, E. J. Calabrese, Ed. Princeton Scientific Publications, Princeton, NJ. pp. 231–249.

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Beryllium

The solubility and speciation of beryllium in air and water media vary, with ambient air characterized by relatively insoluble beryllium compounds such as beryllium oxide and metallic beryllium, and water characterized by more soluble forms. Carcinogenic potency varies according to the form of beryllium present. Human equivalent doses were calculated using a human body weight of 70 kg, an animal weight of 0.325 kg and length of exposure, experiment and life span of 1126 days for treated and control animals.

Human data were used for the inhalation exposure quantitation despite limitations in the study. Humans are most likely to be exposed by inhalation to beryllium oxide, rather than other beryllium salts. Animal studies by inhalation of beryllium oxide have utilized intratracheal instillation, rather than general inhalation exposure.

Effective dose was determined by adjusting for duration of daily (8/24 hours) and annual (240/365 days) exposure, and the fraction of the lifetime at risk (i.e., time from onset of employment to termination of follow-up). The risk estimates were based on the data of Wagoner *et al*. (1980) in which the smoking adjusted, expected lung cancer deaths were found to range from 13.91 to 14.67, in comparison to 20 observed. Relative risk estimates of 1.36 and 1.44 were derived and the 95% confidence limits of these estimates, 1.98 and 2.09, respectively, were used to estimate the lifetime cancer risk. Note that all of the above estimates are based on one data set using a range of estimated exposure and exposure times. Because of uncertainties regarding workplace beryllium concentration and exposure duration, unit risks were derived using two estimates each of concentration, fraction of lifetime exposed and relative risk. The recommended value is the arithmetic mean of the 8 derived unit risks.

Wagoner *et al*. (1980) observed 47 deaths from cancer among 3055 white males employed in beryllium-processing with a median duration of employment of 7.2 months. Among the 2068 followed for 25 years or more, 20 lung cancer deaths were observed. These increased incidences were statistically significant. when lung cancer mortality data became available for 1968-1975, the number of expected deaths was recalculated and the increased incidence was statistically significant only among workers followed 25 years or more (Bayliss, 1980; MacMahon, 1977, 1978). When the number of expected deaths was adjusted for smoking, the increased incidence was no longer significant (U.S. EPA, 1986).

An earlier study of workers from this same beryllium processing plant, and several studies of workers from this plant combined with workers from other beryllium plants, have reported a statistically significant increased incidence of lung cancer (Bayliss and Wagoner, 1977; Mancuso, 1970, 1979, 1980). No adjustment was made for smoking in these studies, and all were limited in their ability to detect a possible increased incidence of lung cancer because of methodological constraints and deficiencies.

Fifty-two weanling Long-Evans rats of each sex received 0 or 5 ppm beryllium (as BeSO4, beryllium sulfate) in drinking water. Exposure was for the lifetime of the animals. At natural death the rats were dissected and gross and microscopic changes were noted in heart, kidney, liver, and spleen. There were no effects of treatment on these organs or on life span, urinalysis, serum glucose, cholesterol, and uric acid, or on numbers of tumors. Male rats experienced decreased growth rates from 2 to 6 months of age.
Similar studies were carried out on Swiss (CD strain) mice in groups of 54/sex at doses of approximately 0.95 mg/kg/day (Schroeder and Mitchner, 1975).Female animals showed decreased body weight compared with untreated mice at 6 of 8 intervals. Male mice exhibited slight increases in body weight. These effects were not considered adverse, therefore, 0.95 mg/kg/day is considered a NOAEL.

No data were found regarding the genotoxicity of beryllium.

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beryllium and tungsten. J. Nutr. 105: 421-427.

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Cadmium

Gastrointestinal absorption of cadmium in humans ranges from 5 to 6% (USEPA, 1985a). Based on a comprehensive model for inhaled cadmium, the deposition rate of particulate airborne cadmium is 5–50% (i.e., 5% of particles greater than 10 microns and up to 50% of particles less than 0.1 microns), and 50–100% of the cadmium deposited was absorbed (Nordberg *et al*., 1985). Cadmium bioaccumulates in humans, particularly in the kidney and liver (USEPA, 1985a,b). Acute oral exposure to cadmium in laboratory animals resulted in systemic, immunological, neurological, developmental, and reproductive effects at doses of 2–138 mg/kg-day (ATSDR, 2002). Chronic oral or inhalation exposure of humans to cadmium has been associated with renal dysfunction, itai-itai disease (bone damage), hypertension, anemia, endocrine alterations, and immunosuppression. Renal toxicity occurs in humans chronically exposed to cadmium in food at LOAEL of 0.0075 mg/kg-day. In laboratory animals (i.e., rat, mouse) chronic oral exposure to cadmium results in increased blood pressure, hematological, and renal effects at LOAELs ranging from 0.014 to 57 mg/kg-day (ATSDR, 2002). Teratogenic and reproductive effects (i.e., deceased fetal and birth weight, delayed ossification, behavioral impairment, and reduced fertility) were reported in laboratory animals (i.e., rat, mice, dogs) subchronically exposed to cadmium in drinking water at LOAELs ranging from 0.04 to 40 mg/kg-day (ATSDR, 2002). Epidemiological studies have demonstrated a strong association between inhalation exposure to cadmium and cancers of the lung, kidney, and prostate (USEPA, 1985b; Thun *et al*., 1985). In experimental animals, cadmium induces injection-site sarcomas and testicular tumors. When administered by inhalation, cadmium chloride is a potent pulmonary carcinogen in rats. Cadmium is a well-documented animal teratogen (USEPA, 1985b).

USEPA classified cadmium as Group B1 - Probable Human Carcinogen by inhalation. This classification applies to agents for which there is limited evidence of carcinogenicity in humans from epidemiologic studies.

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Chromium

Chromium exists in two states, as chromium (III) and as chromium (VI). Following oral exposure, absorption of chromium (III) has been reported to be 0.4% while absorption of chromium (VI) has been observed to be as high as 10% (ATSDR, 2002). However, chromium (VI) is rapidly reduced to chromium (III) after penetration of biological membranes and in the gastric environment (ATSDR, 2002). Chromium is an essential micronutrient and is not toxic in trace quantities (USEPA, 1980).

Alterations in liver enzyme activities were noted in rats administered an oral dose of 13.5 mg/kg-day chromium (VI) for 20 days (Kumar *et al*., 1985). Rats subchronically administered higher concentrations of chromium VI (98 mg/kg-day) have exhibited adverse effects on renal function (Diaz-Mayans *et al*., 1986). No significant changes, however, were detected in the livers or kidneys of rats exposed to 2.7 mg/kg-day or 3.5 mg/kg-day chromium (III) or chromium (VI), respectively, in the drinking water for 1 year (MacKenzie *et al*., 1958; ATSDR, 2002). CNS effects including hypoactivity have been reported in rats when exposed to subchronic levels of 98 mg/kg-day chromium VI in drinking water (Diaz-Mayans *et al*., 1986).

Workers exposed to 2 $\mu g/m^3$ chromic acid vapors (mean duration of 2.5 years), a soluble chromium (VI) compound, exhibited atrophy and ulceration of the nasal mucosa and transient decrease in lung function (Lindberg and Hedenstierna, 1983). There is, however, insufficient scientific evidence that chromium (III) compounds by themselves elicit atrophy of the nasal mucosa or adverse respiratory effects in humans (ATSDR, 2002). Furthermore, epidemiological studies of worker populations have clearly established that inhaled chromium (VI) is a human carcinogen; the respiratory passages and the lungs are the target organs (Mancuso, 1975; USEPA, 1984).

Inhalation of chromium (III) or ingestion of chromium (VI) or (III) has not been associated with

carcinogenicity in humans or experimental animals (USEPA, 1984). Oral exposure of pregnant mice (gestational days, 1 to 19) to 57 mg/kg-day chromium (VI) resulted in embryolethal effects (e.g., increased resorptions and postimplantation loss), reduced ossification and gross anomalies (Trivedi *et al.*, 1989). Chromium (III) does not appear to cause fetotoxic or teratogenic effects in rats (ATSDR, 2002). Reproductive effects in the form of decreased sperm count were noted in mice administered oral doses of 4.6 mg/kg-day chromium (VI) (225 ppm) and 3.5 mg/kg-day chromium (III) (172 ppm) for 7 weeks (Zahid *et al*., 1990).

USEPA classified inhaled chromium (VI) in Group A—Human Carcinogen by the inhalation route. Inhaled chromium (III) and ingested chromium (III) and (VI) have not been classified with respect to carcinogenicity. Because carcinogenicity by the oral route of exposure can not be determined, chromium is classified as Group D for the oral exposure route.

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. *Toxicological profile for chromium.* April 2002.

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Copper

Copper is a reddish metal that occurs naturally in rock, soil, water, sediment, and air. Its average concentration in the earth's crust is about 50 parts copper per million parts soil. Copper also occurs naturally in plants and animals. It is an essential element for all known living organisms including humans and other animals.

Chromosomal aberrations were induced in isolated rat hepatocytes when incubated with copper sulfate (Sina *et al*., 1983). Casto *et al*. (1979) showed enhanced cell transformation in Syrian hamster embryo cells infected with simian adeno virus with the addition of cuprous sulfide and copper sulfate. High concentrations of copper compounds have been reported to induce mitosis in rat ascites cells and recessive lethals in Drosophila melanogaster. Law (1938) reported increases in the percent lethals observed in Drosophila larvae and eggs when exposed to copper by microinjection (0.1% copper sulfate) or immersion (concentrated aqueous copper sulfate), respectively.

Hematological effects in workers employed in a copper processing factory have been reported by Finelli *et al*. (1981). However, interpretation of the study results is limited by the finding of elevated iron, lead, and cadmium in hair samples of exposed workers.

Metal fume fever, has been reported in factory workers exposed to copper dust or fumes (Armstrong *et al*., 1983; Gleason 1968; Stokinger 1981).

Moriya *et al*. (1983) reported no increase in mutations in E. coli and S. typhimurium strains TA98, TA1535, TA1537 and TA1538 incubated with up to 5 mg copper quinolinolate/plate and in S. typhimurium TA98 and TA100 incubated with up to 5 mg copper sulfate/plate.

Demerec *et al*. (1951) reported dose-related mutagenic effects in E. coli with 2 to 10 ppm copper sulfate in a reverse mutation assay. Negative results were obtained with copper sulfate or copper chloride in assays using S. cerevisiae (Singh, 1983) and Bacillus subtilis (Nishioka, 1975, Matsui, 1980, Kanematsu *et al*., 1980). Errors in DNA synthesis from poly(c)templates have been induced in viruses incubated with copper chloride or copper acetate (Sirover and Loeb, 1976).

Bionetics Research Labs (1968) studied the carcinogenicity of a copper-containing compound, copper hydroxyquinoline, in two strains of mice (B6C3F1 and B6AKF1). Groups of 18 male

and 18 female 7-day-old mice were administered 1000 mg copper hydroxyquinoline/kg bw (180.6 mg Cu/kg) suspended in 0.5% gelatin daily until they were 28 days old, after which they were administered 2800 ppm (505.6 ppm Cu) in the feed for 50 additional weeks. No statistically significant increases in tumor incidence were observed in the treated 78-week-old animals. In the same study, Bionetics Research Labs (1968) administered a single subcutaneous injection of gelatin (control) or 1000 mg of copper hydroxyquinoline/kg bw (180.6 mg Cu/kg) suspended in 0.5% gelatin to groups of 28-day-old mice of both strains. After 50 days of observation, the male B6C3F1 had an increased incidence of reticulum cell sarcomas compared with controls. No tumors were observed in the treated male B6AKF1 mice, and a low incidence of reticulum cell sarcomas was observed in the treated female mice of both strains.

Gilman (1962) administered intramuscular injections containing 20 mg of cupric oxide (16 mg Cu), cupric sulfide (13.3 mg Cu), and cuprous sulfide (16 mg Cu) into the left and right thighs of 2- to 3-month-old Wistar rats. After 20 months of observations, no injection-site tumors were observed in any animals, but other tumors were observed at very low incidence in the animals receiving cupric sulfide (2/30) and cuprous sulfide (1/30). As the relevance of the organic copper compound to the observation of sarcoma induction is uncertain and the incidence of tumors in rats treated i.m. with inorganic copper was very low, data are considered inadequate for classification.

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Lead

Lead is used extensively in the manufacture of storage batteries and was used in gasoline and paint. Lead is also a natural constituent of many soils, for which concentrations normally range from 10 to 30 mg lead per kilogram of soil (USEPA, 1980).

Lead can be absorbed by the oral, inhalation or dermal exposure routes (see section on Relative Absorption Factors). Gastrointestinal absorption of lead varies considerably depending upon chemical form, dietary intake, and age (Forbes and Reina, 1974; Barltrop and Meek, 1975). The deposition and absorption of inhaled lead depends upon particle size, chemical form and the rate and depth of breathing (Randall *et al*., 1975; Nozaki, 1966; Chamberlain *et al*., 1975). Once absorbed, lead is distributed to the various organs of the body, with most distribution occurring into mineralized tissues (ATSDR, 2002). Placental transfer to the developing fetus is possible (Bellinger *et al*., 1987). Inorganic lead is not known to be biotransformed within the body. Absorbed lead is excreted via the urinary or fecal routes (ATSDR, 2002)

Cases of acute lead poisoning in humans are not common and have not been studied in experimental animals as thoroughly as chronic lead poisoning. Symptoms of acute lead poisoning from deliberate ingestion by humans may include vomiting, abdominal pain, hemolysis, liver damage, and reversible tubular necrosis (USEPA, 1984). Subacute exposures in humans reportedly may produce a variety of neurological effects including dullness, restlessness, irritability, poor attention span, headaches, muscular tremor, hallucinations, and loss of memory. Nortier *et al*., (1980) report encephalopathy and renal damage to be the most serious complications of chronic toxicity in man and the hematopoietic system to be the most sensitive. For this reason, most data on the effects of lead exposure in humans are based upon blood lead levels. The effects of lead on the formation of hemoglobin and other hemoproteins, causing decreased levels, are reportedly detectable at lower levels of lead exposure than in any other organ system (Betts *et al*., 1973). Peripheral nerve dysfunction is observed in adults at levels of 30 to 50 mg/dL-blood. Children's nervous systems are reported to be affected at levels of 15 mg/dL-blood and higher (Benignus *et al*., 1981). In high doses, lead compounds may potentially cause abortions, premature delivery, and early membrane rupture (Rom, 1976).

Acute oral lethal doses of lead in animals depend upon chemical form, but generally range from 500 to 30,000 mg/kg. Several reproduction studies on the effects of subchronic oral exposure to lead in rats have been conducted (Kimmel *et al*., 1976; Grant *et al*., 1980; Fowler *et al*., 1980). These studies report that lead acetate administered in drinking water at various concentrations caused depressed body weights at 50 and 250 mg-Pb/L water, histological changes in the kidneys of offspring, cytokaryomegaly of the tubular epithelial cells of the inner cortex at concentrations greater than or equal to 25 mg/L and postnatal developmental delays at 50 to 250 mg/L. Higher oral doses of lead may result in decreased fertility and fetotoxic effects in a variety of species (Hilderbrand *et al*., 1973). A reduction in the number of offspring of rats and mice exposed to 25 mg Pb/L drinking water with a chromium deficient diet was reported by Schroeder *et al*. (1970). Chronic oral exposure of female Long-Evans rats to lead (5 mg/PB/L-water) reportedly resulted in slight effects on tissue excitability, systolic blood pressure, and cardiac ATP concentrations (Kopp *et al*., 1980a,b).

Results of *in vitro* studies with human lymphocyte cultures using lead acetate were nearly equally positive and negative. Results of in vivo tests are also contradictory but suggest that lead may have an effect on chromosomes (sister chromatid exchange). Results for gene mutations, DNA modification, and recombinations in various microorganisms using lead acetate, lead nitrate and lead chloride were consistently negative with or without metabolic activation. Lead chloride has been reported to inhibit both DNA and RNA synthesis. In *in vitro* mammalian test systems, lead acetate gave conflicting results.

No epidemiological data regarding the oral carcinogenic potential of lead could be located in the available literature. Chronic inhalation may result in a statistically significant increase in deaths due to tumors in the digestive organs and respiratory systems in lead smelter workers and battery plant workers (Kang *et al*., 1980). Several studies have reported tumor formation in experimental animals orally administered specific lead salts, not normally ingested by humans (Zawirska and

Medras, 1972; Boyland *et al*., 1962; Ito, 1973). The carcinogenicity of inhaled lead in experimental animals could not be located in the available literature. The USEPA has classified lead and lead compounds as Group B2 - Probable Human Carcinogens. Because the carcinogenic potential of lead appears to be weak, USEPA bases risk management decisions for this compound on neurodevelopmental effects rather than carcinogenicity.

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Manganese

Manganese is considered to be among the least toxic of the trace metals and, in fact, is considered to be an essential element (NRC, 1989). The oral absorption of dietary manganese ranges from 3

to 10%. However, manganese is absorbed to a greater extent following inhalation exposures. The National Research Council has established a provisional recommended dietary allowance for adults of 2 to 5 mg/day (NRC, 1989).

The effects following acute exposure to manganese are unknown. Chronic occupational exposure to manganese dust (0.02–2.6 mg/m^3) has been associated with respiratory symptoms and pneumonitis (Chandra *et al*., 1981) and higher levels have been associated with a condition known as manganism, a progressive neurological disease characterized by speech disturbances, tremors, and difficulties in walking. For example, male workers exposed to manganese dioxide, tetroxide and various salts (TWA of total airborne manganese dust ranged from 0.07 to 8.61 mg/m^3) experienced an increased incidence of psychomotor disturbances (e.g., reaction time, hand-eye coordination and hand steadiness) (Roels *et al*., 1987). Other effects observed in humans occupationally exposed to manganese dust include hematological (Chandra *et al*., 1981; Flinn *et al*., 1941; Kesic and Hausler, 1954), cardiovascular (Saric and Hrustic, 1975) and reproductive effects (Cook *et al*., 1974; Emara *et al*., 1971; Lauwerys *et al*., 1985; Rodier, 1955).
In adults, a safe intake of manganese from dietary sources ranges from 2 to 10 mg/day (10 mg/day = 0.14 mg/kg-day) (WHO, 1973; NRC, 1989; Schroeder *et al*., 1966). Individuals who chronically ingested drinking water from natural wells containing manganese concentrations of 1,600–2,300 Wg/L (0.06 mg/kg-day), showed a statistically significant increase in minor neurologic effects (neurologic exam scores) (Kondakis *et al*., 1989). The dietary intake of manganese was unaccounted for in this study, and therefore, USEPA withdrew its previous assessment that used this study to determine a quantitative dose-response relationship for manganese in drinking water. Higher concentrations in drinking water (0.8 mg/kg-day) have resulted in symptoms including lethargy, increased muscle tonus, tremor and mental disturbances (Kawamura *et al*., 1941).

Chronic oral exposure of rats to manganese chloride can also result in CNS dysfunction (Leung *et al*., 1981; Lai *et al*., 1982). Chronic inhalation exposure of experimental animals (monkeys, rats, mice, hamsters) has resulted in respiratory effects; however, other studies have demonstrated that these effects may be immunological in origin (ATSDR, 2002). Manganese has not been reported to be teratogenic; however, this metal has been observed to cause depressed reproductive performance and reduced fertility in humans and experimental animals (USEPA, 1984a).

Certain manganese compounds have been shown to be mutagenic in a variety of bacterial tests. Manganese chloride and potassium permanganate can cause chromosomal aberrations in mouse mammary carcinoma cells. Manganese was moderately effective in enhancing viral transformation of Syrian hamster embryo cells (USEPA, 1984a,b). USEPA established a weight-of-evidence classification for manganese of D (not classifiable as to human carcinogenicity).

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Mercury

In humans, inorganic mercury is absorbed following inhalation and oral exposure; however, only 7–15% of administered inorganic mercury is absorbed following oral exposure (USEPA, 1984; Rahola *et al*., 1971; Task Group on Metal Accumulation, 1973; ATSDR, 2002). Organic mercury is almost completely absorbed from the gastrointestinal tract and is assumed to be well absorbed via inhalation in humans (USEPA, 1984).

A primary target organ for inorganic compounds is the kidney. Acute and chronic exposures of humans to inorganic mercury compounds have been associated with anuria, polyuria, proteinuria, and renal lesions (Goyer, 1996). Chronic occupational exposure of workers to elemental mercury vapors (0.026–0.2 mg/m^3) has been associated with mental disturbances, tremors, and gingivitis (USEPA, 1984; ATSDR, 2002). Animals exposed to inorganic mercury for 12 weeks have exhibited proteinuria, nephrotic syndrome and renal disease (Druet *et al*., 1978). Rats chronically administered inorganic mercury (as mercuric acetate) in their diet for 2 years exhibited a dose-related increase in glomerular nephritis at concentrations as low as 1.27 mg/kg-day (Fitzhugh *et al*., 1950).

The CNS is a major target for organic mercury compounds. Adverse effects in humans, resulting from subchronic and chronic oral exposures to organic mercury compounds, have included destruction of cortical cerebral neurons, damage to Purkinje cells, and lesions of the cerebellum. Clinical symptoms following exposure to organic mercury compounds have included paresthesia, loss of sensation in extremities, ataxia, and hearing and visual impairment (WHO, 1976; ATSDR, 2002). Adverse kidney effects are also prominent in animals following chronic ingestion of

organic mercury (0.5 ppm phenyl mercuric acetate or 0.015 mg Hg/kg-day) (Fitzhugh *et al*., 1950). Embryotoxic and teratogenic effects, including malformations of the skeletal and genitourinary systems, have been observed in animals exposed orally to organic mercury (USEPA, 1984).

Both organic and inorganic compounds are reported to be genotoxic in eukaryotic systems (Leonard *et al*., 1984). Elevated incidence of fetal resorption was observed in hamsters exposed to 31.4 mg/kg-day inorganic mercury (Gale, 1974). There is evidence to suggest methylmercury chloride induces renal tumors, mostly adenocarcinomas in two strains of male mice (ICR and B6C3F1) (Hirano *et al*., 1986; Mitsumori *et al*., 1981, 1990). However, monkeys, cats and rats chronically administered methyl mercury in the diet did not develop an elevated tumor incidence (Ikeda *et al*., 1973; Charbonneau *et al*., 1976; Vershuuren *et al*., 1976). Furthermore, elevated cancer incidence has not been reported in humans who ingested methylmercury-contaminated fish in the Minamata area of Japan (Katsuna, 1968) or in humans who ingested methylmercury fungicide-treated grains in Iraq and were followed for 13 years (Greenwood, 1985).

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Nickel

Nickel in the ambient atmosphere typically exists as a constituent of suspended particulate matter (U.S. EPA, 1985). The greatest volume of nickel emitted into the atmosphere is the result of fossil fuel combustion. Other sources of nickel emissions are primary production, incinerators, metallurgy, chemical manufacturing, cement manufacturing, coke ovens, nickel recovery, asbestos mining/milling and cooling towers.

Studies of nickel absorption have shown that it is absorbed by all routes of exposure to varying degrees, primarily dependent on the chemical form (see section on Relative Absorption Factors). Absorbed nickel is bound to serum components and distributed to body organs, reaching highest concentrations in kidney and lung tissue (Whanger, 1973). Nickel is not known to be biotransformed. Excretion of absorbed nickel is primarily through urine, with minor excretory routes through hair and sweat (ATSDR, 2002).

Nickel carbonyl $Ni(CO)_4$ is a particularly toxic form of nickel upon inhalation and causes chest pain, dry coughing, hyperpnea, cyanosis, occasional gastrointestinal symptoms, sweating, visual disturbances and severe weakness. This is often followed by pulmonary hemorrhage, edema and cellular derangement. Survivors may be left with pulmonary fibrosis. In the workplace, nickel dermatitis may result at high nickel concentrations. At lower concentrations some susceptible individuals develop eczema-like lesions. The threshold for these health effects is much greater than exposures which occur in the ambient environment. The major adverse effects of nickel in man are dermatitis, chemical pneumonitis, and lung and nasal cancers.

Deaths occurred in rats and mice at concentrations greater than 3.3 and 1.7 mg/m^3 nickel, respectively, upon extended inhalation exposure to $NiSO_4$ (Dunnick *et al*., 1987). Mice exposed to Ni_3S_2 died due to necrotizing pneumonia at 7.3 mg/m^3 nickel (Benson *et al*., 1987). Prolonged exposure of hamsters to nickel oxide at 41.7 mg/m^3 resulted in decreased survival due to emphysema (Wehner *et al*., 1975). Oral LD_{50}s in rats vary depending upon the nickel-containing compound to which the rats were exposed. These range from 355 mg compound/kg (118 mg Ni/kg) for nickel acetate (Haro, 1968) to greater than 5000 mg compound/kg for nickel oxide, nickel sulfide, and nickel subsulfide (Mastromatteo, 1986). Rats fed diets containing nickel sulfate hexahydrate at 0, 250, 500 and 1000 ppm nickel showed no adverse effects over three generations in fertility, gestation, viability or lactation.

Weak evidence exists for the mutagenicity of nickel in bacterial and mammalian cells. Nickel appears to induce chromosomal aberrations in cultured mammalian cells (Larramendy *et al*., 1981), but not in vivo (Waksvik and Boysen, 1982). Occupational studies of human exposure indicate that certain nickel compounds appear to be carcinogenic via inhalation. However, there is no evidence of carcinogenicity in mammals through ingestion or dermal exposure (U.S. EPA,

1985). Nickel subsulfide has been found to be carcinogenic via the inhalation route in rats (Ottolenghi *et al*., 1974). Studies on nickel exposure via the oral route are inadequate to reach conclusions on carcinogenicity (ATSDR, 2002).

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Selenium

Human and animal data suggest that many chemical forms of selenium produce similar effects. Selenium is known to be an essential micronutrient for humans and animals; therefore, inadequate as well as excessive selenium intake can cause negative health effects (ATSDR, 2002). One proposed mechanism of intermediate and chronic toxicity for selenium compounds is that under conditions of excess body levels of selenium, selenium atoms begin to replace the sulfur atoms in structural and enzymatic proteins (Shamberger, 1970), destroying the protein structural and functional integrity. This mechanism of action is unlikely to be organ specific; therefore, under this proposed mechanism, toxic levels of selenium would be expected to affect multiple organ systems. Furthermore, differential sensitivities of the various organ systems to selenium exposure would be expected on the basis of differential accumulation or retention of selenium compounds (Goyer, 1996).

The primary target organ in humans and in animals upon acute exposure to high concentrations of selenium by inhalation or oral routes is the lung, with cardiovascular, hepatic, and renal systems also affected. Lesser effects are observed in all other organ systems except the musculoskeletal system. The liver is the primary target organ for the oral toxicity of sodium selenite, sodium selenate, and organic forms of selenium in animals following intermediate and chronic exposure. In humans, liver cirrhosis or dysfunction are the result of chronic selenosis (ATSDR, 2002). Endocrine effects were found following intermediate oral exposure. Following chronic oral exposure to selenium compounds, the primary effects in humans are dermal and neurological. As evidenced by populations in China, chronic exposure to high selenium levels in the diet can cause diseased nails and skin as well as hair loss. Higher levels can cause neurological problems including unsteady gait and paralysis. However, studies of populations living in areas of naturally occuring high selenium concentrations in the United States have not revealed adverse health effects in those populations (Yang *et al*., 1989a,b). Following intermediate and chronic oral exposure to selenium compounds, the primary effects in livestock exposed to naturally occuring selenium in range plants are also dermal and neurological. Studies in animals with high selenium concentrations demonstrate that many organ systems retain selenium and are affected. The primary effects in laboratory animals exposed to inorganic selenium salts or to selenium-containing amino acids are cardiovascular, gastrointestinal, hematological, hepatic, dermal, immunological, neurological, and reproductive (ATSDR, 2002). Selenium is a teratogen in birds. However, studies of Chinese populations and laboratory animals have not found evidence of teratogenic effects in mammals (ATSDR, 2002).

USEPA has determined that selenium is not classifiable as to human carcingenicity (Class D).

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Thallium

Thallium and its salts are readily and rapidly absorbed through the skin, lungs, and mucous membranes of the mouth and gastrointestinal tract (ATSDR, 2002). Percutaneous absorption has also been reported to occur through rubber gloves (Rumack, 1986).

Thallium is acutely toxic to humans regardless of the chemical form of the compound or route of administration. Hundreds of cases of thallotoxicosis due to ingestion of thallium-based pesticides have been reported (ACGIH, 1986). Children poisoned by thallium ingestion have exhibited neurological abnormalities including mental retardation and psychoses (ACGIH, 1986). The effects of thallium toxicity are similar in humans and animals. The most commonly noted response to thallium exposure is alopecia, but neurological and gastrointestinal findings are frequently found. Such effects include ataxia, lethargy, painful extremities, peripheral neuropathies, convulsions, endocrine disorders, psychoses, nausea, vomiting, and abdominal pains (Bank, 1980). It has been noted that the degree and duration of exposure to thallium and its salts can influence the clinical picture of thallium intoxication. Subchronic feeding studies conducted with rats observed marked growth depression and a nearly complete loss of hair (USEPA, 1986; Clayton and Clayton, 1981).

Exposure to thallium salts during critical developmental stages in chicks and rats has been reported to be associated with the induction of adverse developmental outcomes (Karnofsky *et al*., 1950). Pre- and postnatally exposed rat pups have exhibited hydronephrosis, fetal weight reduction and growth retardation (Clayton and Clayton, 1981; Gibson and Becker, 1970). Thallium has also been shown to cross the placenta and, presumably, enter the fetal blood system (Clayton and Clayton, 1981).

Thallium has not been demonstrated to be carcinogenic in humans or experimental animals and

may have some antitumor activity (Clayton and Clayton, 1981).

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Vanadium

The absorption of vanadium through the gastrointestinal tract of animals is low (2.6% for vanadium pentoxide in rats) (Conklin *et al.*, 1982). Soluble vanadium compounds that are inhaled and deposited are readily absorbed (50–100%) (ATSDR, 2002). Because vanadium has low solubility, its absorption through skin is thought to be quite low, although no specific studies were located regarding dermal absorption (ATSDR, 2002).

Pentavalent vanadium compounds are generally considered to be more toxic than other valence states. Many incidents of short-term and long-term occupational exposures to vanadium, mainly

vanadium pentoxide dust, have been reported. Inhalation causes respiratory tract irritation, coughing, wheezing, labored breathing, bronchitis, chest pains, eye and skin irritation and discoloration of the tongue (NIOSH, 1977; NAS, 1974). Humans subchronically exposed to vanadium pentoxide (0.1 mg/m^3) via inhalation experienced respiratory irritation (Zenz and Berg, 1967). Experimental animals (i.e., rats, monkeys) subchronically exposed to vanadium compounds (vanadium pentoxide, bismuth orthovanadate) manifested alveolar proteinosis and increased pulmonary resistance at concentrations of 2.5–4.7 mg/m^3 (Lee and Gillies, 1986; Knecht *et al*., 1985). Effects seen in experimental animals following chronic inhalation exposure include fatty degeneration of the liver and kidneys, hemorrhage, and bone marrow changes (Browning, 1969).

Humans subchronically exposed to ammonium vanadyl tartrate (1.3 mg/kg-day) via capsules did not manifest any adverse effects (Dimond *et al*., 1963). However, experimental animals (i.e., rats, mice) orally exposed to vanadium compounds (sodium metavanadate, sodium orthovanadate, ammonium metavanadate) exhibited mild systemic effects (decreased weight gain, vascular infiltration, spleen hypertrophy and increased ventricular pressure) at doses as low as 0.57 mg/kg-day (ATSDR, 2002). Rats chronically administered 0.77 mg/kg-day (5 ppm) vanadium in their drinking water showed no adverse effects (Schroeder *et al*., 1970). Pre- and postnatally exposed rat pups have exhibited reduced pup weight and length and facial hemorrhage (ATSDR, 2002). Vanadium has not been demonstrated to be carcinogenic in humans or experimental animals.

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Zinc

Zinc is absorbed in humans following oral exposure (approximately 20–30%) (ATSDR, 2002); however, insufficient data are available to evaluate absorption following inhalation exposure (USEPA, 1984). Zinc is an essential trace element that is necessary for normal health and metabolism and therefore is nontoxic in trace quantities (Goyer, 1996). The National Research Council (NRC) recommends a dietary allowance of 10–15 mg/day for adults (NRC, 1989).

Exposure to zinc at concentrations that exceed recommended levels, however, has been associated with a variety of adverse effects. In humans, acute inhalation exposure to relatively high levels of zinc has been associated with gastrointestinal disturbances, dermatitis, and metal fume fever, a condition characterized by chest pain, cough, and dyspnea, as well as impaired pulmonary function characterized by reduced lung volumes (ATSDR, 2002).

Eighteen healthy women given supplements of zinc gluconate (1 mg/kg-day) for 10 weeks developed slight alterations in blood chemistry (decreased enzyme levels) (Yadrick *et al*., 1989). Chronic oral exposure of humans to zinc (2 mg/kg-day) may cause decreased red blood cell count (Hale *et al*., 1988). Experimental animals (rats, rabbits, mice) administered zinc in the diet (68–1,110 mg/kg-day) for durations up to 1 year manifested blood, liver, renal, and reproductive effects (ATSDR, 2002). An increased incidence of fetal resorption was noted in pregnant rats administered 200 mg/kg-day (Schlicker and Cox, 1968). In addition, increased preimplantation loss was observed in rats fed the same concentration for 18 days (Pal and Pal, 1987). There is no evidence that zinc is carcinogenic (ATSDR, 2002).

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TABLE 6J-1. ABSOLUTE ORAL BIOAVAILABILITY FACTORS

Chemical	Absolute Oral Bioavailability Factor	Reference
Antimony	0.15	USEPA, 2004
Barium	0.07	USEPA, 2004
Beryllium	0.007	USEPA, 2004
Cadmium (food)	0.025	USEPA, 2004
Cadmium (water)	0.05	USEPA, 2004
Chromium III	0.013	USEPA, 2004
Chromium VI	0.025	USEPA, 2004
Manganese	0.04	USEPA, 2004
Mercury (inorganic)	0.07	USEPA, 2004
Nickel	0.04	USEPA, 2004
Vanadium	0.026	USEPA, 2004

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APPENDIX 6K

RELATIVE BIOAVAILABILITY OF ARSENIC IN SEDIMENTS FROM THE ABERJONA RIVER

RELATIVE BIOAVAILABILITY OF ARSENIC IN SEDIMENTS FROM THE ABERJONA RIVER

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ACKNOWLEDGEMENTS

The work described in this report is the product of a team effort involving a number of people. In particular, the authors would like to acknowledge the efforts and support of the following:

- Margaret E. Dunsmore, BS, helped with all aspects of animal handling and dosing, as well as urine collection and sample preparation.

- Dr. John Drexler at the University of Colorado, Boulder, performed the characterization of the sediment samples and test materials, including *in vitro* testing of bioaccessibility and electron microprobe and particle size analyses of the test materials.

- Dr. Edward Hinderberger of L.E.T., Inc., Columbia, Missouri, provided prompt and reliable chemical analysis of all of the samples for total arsenic concentrations.

EXECUTIVE SUMMARY

The gastrointestinal absorption of arsenic from two composite sediment samples collected from the banks of the Aberjona River was measured using young swine. Groups of animals (four animals per dose group) were given oral doses of a reference material (sodium arsenate) or site sediment twice a day for 12 days. Urine excreted by each animal was collected on days 6/7, 8/9 and 10/11. The urinary excretion fraction (UEF) (the ratio of the amount excreted per 48 hours divided by the dose given per 48 hours) was calculated for sodium arsenate and each test material using linear regression analysis. The relative bioavailability (RBA) of arsenic in a test material compared to that in sodium arsenate was calculated as:

$$RBA = \frac{UEF(test\ material)}{UEF(sodium\ arsenate)}$$

The results are summarized below:

Test Material	Description	Arsenic Conc. (ppm)	Relative Bioavailability	
			Best Est.	90% CI
TM1	Composite sample of three sediments with arsenic concentrations greater than 500 ppm	676	37%	32% – 41%
TM2	Composite sample of three sediments with arsenic concentrations of 180-460 ppm	313	51%	46% – 56%

These data indicate that arsenic in site sediments is absorbed less extensively than arsenic in drinking water. Use of these site-specific data is likely to improve the accuracy of risk estimates for humans who may be exposed to the sediments.

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RELATIVE BIOAVAILABILITY OF ARSENIC IN ABERJONA RIVER SEDIMENTS

1.0 INTRODUCTION

Accurate assessment of the health risks resulting from oral exposure to any chemical frequently requires knowledge of the amount of the chemical absorbed from the gastrointestinal tract into the body. This information on absorption may be described either in absolute or relative terms:

> Absolute Bioavailability (ABA) is the ratio of the amount of chemical absorbed compared to the amount of chemical ingested:
>
> $$ABA = \frac{Absorbed\ \ Dose}{Ingested\ \ Dose}$$
>
> This ratio is also referred to as the oral absorption fraction (AF_0).
>
> Relative Bioavailability (RBA) is the ratio of the absolute bioavailability of some test material compared to the absolute bioavailability of some appropriate reference material, usually the chemical dissolved in water or some fully soluble form that completely dissolves when ingested:
>
> $$RBA = \frac{ABA\ (test\ material)}{ABA\ (reference\ material)}$$

For example, if 100 ug of arsenic dissolved in drinking water were ingested and a total of 90 ug entered the body, the ABA would be 0.90 (90%). Likewise, if 100 ug of arsenic contained in soil were ingested and 30 ug entered the body, the ABA for soil would be 0.30 (30%). If the arsenic dissolved in water was used as the reference substance for describing the relative amount of arsenic absorbed from soil, the RBA would be 0.30/0.90 = 0.33 (33%).

Using Relative Bioavailability Data to Improve Risk Calculations for Arsenic

When reliable data are available on the relative bioavailability of arsenic in a site medium (e.g., soil, sediment), this information can be used to improve the accuracy of exposure and risk calculations for that medium at that site as follows:

$$RfD(adjusted) = \frac{RfD\ (IRIS)}{RBA}$$

$$SF(adjusted) = SF(IRIS) \cdot RBA$$

Alternatively, it is also acceptable to adjust the dose (rather than the toxicity factors) as follows:

$$Dose(adjusted) = Dose(default) \cdot RBA$$

This adjustment in dose is mathematically equivalent to adjusting the toxicity factors as described above.

Purpose of This Study

USEPA Region 1 is currently investigating potential human health risks from arsenic in sediment samples from along the Aberjona River and associated wetlands and floodplain areas. This study was performed to obtain site-specific data on the relative bioavailability of arsenic in sediment samples from the site in order to improve accuracy and decrease uncertainty in human health risk evaluations.

2.0 STUDY DESIGN

This investigation of arsenic relative bioavailability was performed according to the basic design presented in Table 2-1. As shown, the study investigated arsenic absorption from sodium arsenate (the reference material) and from two site-specific sediments, each administered to groups of animals at three different dose levels for 12 days. All doses were administered orally.

2.1 Test Materials

2.1.1 Preliminary Characterization of Site Sediment Samples

Preparation of the two test materials for this study began by collecting 12 sediment samples from multiple locations along the Aberjona River. Each of these samples was characterized in order to support decisions as to which samples should be selected for use as dose material in the animal study, as well as to answer questions about how the dose material should be prepared and administered. Figure 2-1 is a flow chart that summarizes this characterization process.

Sample Description

The sampling locations of the 12 sediment samples span four basic regions of the Aberjona River. Sediment samples 1-3 were collected from the Halls Brook Holding Area, samples 4-6 were collected from the Wells G&H 38-acre Wetland, samples 7-9 were collected from the Cranberry Bog, and samples 10-12 were from Davidson Park. Samples were selected to cover a range of arsenic concentrations in sediments, and were also selected to provide reasonable spatial representativeness across the site.

Sample Preparation

One portion of each of the 12 samples was coarse-sieved through a 1 cm screen to remove large debris (sticks, leaf matter, stones, etc.). This screening was performed on the moist (un-dried) samples. A portion of this coarse-sieved material was removed for arsenic analysis, and a second portion was removed for *in vitro* bioaccessibility analysis (see below). The remaining portion was air dried and fine-sieved (using a 2 mm screen). This step was performed because it is considered probable that the fine-grained portion of the sediment is more likely to adhere to skin and be ingested by humans than the coarse-grained fraction.

Arsenic Concentration

The concentration of arsenic was measured in both the coarse- and fine-sieved samples by inductively coupled plasma atomic absorption spectrometry (ICP-AES). The results from these analyses are shown below:

River Segment	Sample	Arsenic Concentration (ppm)	
		Fine-sieved	Coarse-sieved
Halls Brook Holding Area	1	459	583
	2	527	590
	3	144	269
Wells G&H Wetland	4	145	411
	5	775	605
	6	176	156
Cranberry Bog	7	301	315
	8	832	560
	9	407	388
Davidson Park	10	43.4	37.0
	11	64.0	91.8
	12	67.1	74.9

As seen, the concentration of arsenic in the sediment samples is quite variable, both within a segment of river and between segments. In general, the concentration of arsenic in coarse-sieved and fine-sieved material tends to be similar (Figure 2-2). Thus, RBA results based on tests using fine-sieved material can be extrapolated to samples for which only bulk sample results are available.

In Vitro Bioaccessibility

In vivo absorption of arsenic from a solid medium such as sediment depends on the rate and extent to which arsenic dissolves from the solid medium into the fluids of the gastrointestinal tract. Dr. John Drexler at the University of Colorado has developed a standard procedure to measure the amount of arsenic that dissolves from a test material into a fluid that is similar to the gastric fluid of humans. The amount of arsenic that solubilizes in this test after a specified period of time (usually one hour) is referred to as the *in vitro* bioaccessibility (IVBA), and this value may be used as a preliminary qualitative indicator of potential *in vivo* RBA.

Figure 2-3 shows the IVBA for each of the 12 dried and fine-sieved sediment samples from the site. As seen, there is a range of values, and the IVBA appears to be inversely correlated with concentration (i.e., the most concentrated samples tend to have the lowest *in vitro* bioaccessibility, while the least concentrated samples tend to have the highest *in vitro* bioaccessibility). The basis for this apparent relationship is not known.

Effect of Drying

Each of the sediment samples collected in the field contained considerable moisture content. *A priori*, it was considered possible that drying the samples might alter (increase) the binding of

arsenic to the sediment particles, potentially resulting in a change (decrease) in bioavailability. In order to investigate this possibility, the IVBA of the dried and un-dried samples were compared. Because the moist, un-dried material could not be effectively sieved through the 2mm screen, the moist sample was selected manually to include as few coarse particles as possible. The results are shown in the following table and in Figure 2-4:

River Segment	Sample	*In Vitro* Bioaccessibility of Arsenic (%)	
		Dry	Moist (Un-dried)
Halls Brook Holding Area	1	40	2
	2	31	5
	3	70	5
Wells G&H Wetland	4	40	26
	5	12	16
	6	55	9
Cranberry Bog	7	37	12
	8	13	12
	9	15	13
Davidson Park	10	39	53
	11	49	53
	12	59	9
Average		38	18

As seen, drying the moist material does not appear to significantly influence the IVBA for some samples, and tends to increase rather than decrease the IVBA for other samples. The basis for this apparent change in IVBA is not known, but the results suggest that dried sediment will be as bioavailable or more bioavailable than un-dried sediments. On this basis, it was decided that the *in vivo* test of RBA would be performed using the dried materials.

Evaluation of Methyl Arsenic

Studies at other sites (e.g., Sanders et al. 1994) have revealed that arsenic in sediments may become methylated by microbial action at times when the oxygen tension in the sediments is low. Because methylated forms of arsenic might have different bioavailability (and different toxicity) than the inorganic forms, aliquots of the dried fine-sieved samples were analyzed for organic methyl arsenic. Samples were sent to West Coast Analytical Services, where they were extracted with carbonate buffer and analyzed for As+3, As+5, MMA, and DMA by ion chromatography-ICPMS. The results are summarized below:

Sample	Total Arsenic (ppm)		Extracted Arsenic (WCAS) (ppm)			
	WCAS	Drexler	As+3	DMA	MMA	As+5
1	630	459	ND	ND	ND	20
2	600	527	ND	ND	ND	ND
3	168	144	ND	ND	ND	ND
4	169	145	ND	ND	ND	ND
5	670	775	ND	ND	ND	ND
6	167	176	ND	ND	ND	ND
7	292	301	ND	ND	ND	ND
8	520	832	ND	ND	ND	ND
9	296	407	ND	ND	ND	ND
10	51	43.4	ND	ND	ND	ND
11	87	64	ND	ND	ND	10
12	83	67.1	ND	ND	ND	11
Detection Limit (ppm)	1		5	5	5	5

WCAS = West Coast Analytical Services

As seen, very low levels were observed for each analyte. Recovery of matrix spikes for As+3 and As+5 was poor, suggesting that recoveries of these species may be low. However, recovery of matrix spikes of MMA and DMA were high (89%). These results indicate that if MMA or DMA are present in the samples, they constitute only a very small fraction of the total arsenic.

Mineral Phase Speciation

Each of the 12 dried fine-sieved samples was characterized by electron microprobe analysis (EMPA) in order to provide preliminary data on the identity and relative abundance of the different mineral forms of arsenic present in the samples. The results are summarized in Table 2-2. As seen, these data suggest that arsenic exists mainly in association with particles of iron oxide, iron sulfate, and zinc-iron sulfate. The preliminary data are too limited to draw firm conclusions, but suggest that the presence of iron oxide is associated with higher arsenic concentrations and lower *in vitro* bioaccessibility, and that the presence of the iron-zinc sulfate complexes is associated with lower arsenic concentrations and higher *in vitro* bioaccessibility.

2.1.2 Test Material Selection and Preparation

Test materials for use in the *in vivo* study were selected by considering the results of the preliminary characterization of 12 site sediment samples (Section 2.1.1, above). Specifically, factors that were considered included the concentration level of arsenic in a sample and the degree to which different samples appear to be similar or dissimilar based on speciation and *in vitro* bioaccessibility testing. Based on the conclusion that the only clear pattern of difference among samples is the *in vitro* bioaccessibility (inversely related to concentration), three test materials were prepared by compositing samples with similar arsenic concentrations, as described below.

Test Material 1

Test Material 1 was prepared by compositing equal masses of dried fine-sieved material from samples 2, 5, and 8. These three samples were selected because they have the highest measured arsenic concentration values (all >500 ppm) and they tend to have low bioaccessibility (average = 19%). In addition, the three samples represent each of the three reaches of river (excluding the Davidson Park area), providing good spatial representativeness. These samples tend to be relatively enriched in the iron oxide form of arsenic.

Test Material 2

Test Material 2 was prepared by compositing equal masses of dried fine-sieved material from samples 1, 6, and 7. These three samples were selected because they have intermediate arsenic concentration values (180-460 ppm), intermediate bioaccessibility values (average = 44%), and represent each of the three upstream reaches of the river. These samples tend to be relatively enriched in the zinc-iron sulfate form of arsenic.

Test Material 3

Test Material 3 was prepared by compositing equal masses of all samples with an arsenic concentration less than 150 ppm (samples 3, 4, 10, 11, and 12). These are the samples with the highest apparent bioaccessibility (average = 51%), but the arsenic levels are too low (average = 93 ppm) to permit effective testing in animals. Although Test Material 3 was not used in the *in vivo* portion of the study, it underwent all of the same detailed characterization efforts as Test Materials 1 and 2.

Test Material Preparation

Each test material was prepared by combining equal masses of the appropriate sediment samples, as indicated above. The samples for a given test material were composited using a stainless steel bowl and mixing spoon, and characterized as detailed below.

2.1.3 Detailed Characterization of Test Materials

Arsenic Concentration

After compositing, the concentration of arsenic in each test material was measured by ICP/AES and by ICP/MS. The results are shown below:

Analytical Method	Arsenic Concentration (mg/kg)		
	TM1	TM2	TM3
ICP/MS	590	290	80
ICP/MS	652	318	93.6
ICP/AES	733	319	--
ICP/AES	730	324	--
Average	676.3	312.8	86.8
Standard Deviation	68.6	15.4	9.6

-- = Not measured

Concentration of Other Inorganics, Organic Carbon, and Sulfide

Each sample was analyzed for EPA's Target Analyte List (TAL) of inorganic chemicals, as well as for total organic content (TOC) and total sulfide content. Results are shown in Table 2-3.

Particle Speciation, Size, and Matrix Association

Each test material was characterized by electron microprobe analysis (EMPA) in order to identify the different mineral forms of arsenic that were present in the sample and to estimate how much of the total arsenic was present in each form. In addition, the size distribution of the particles was characterized along with the matrix association of each particle. The detailed data are presented in Appendix A and the results are summarized below.

Arsenic Phases

Speciation of the three test materials indicated that the arsenic in these samples is associated with four different types of mineral phase: iron oxide, iron pyrite, iron sulfate, and zinc sulfate. Estimates of the relative arsenic mass (an approximation of the fraction of the total arsenic present in each phase) are presented below:

Arsenic Speciation Data

Test Material	Number of Particles Counted	Relative Arsenic Mass			
		Iron Oxide	Pyrite	Iron Sulfate	Zinc Sulfate
TM1	186	69%	0%	29%	2%
TM2	123	16%	2%	27%	55%
TM3	57	24%	1%	59%	16%

As seen, arsenic in primarily associated with iron oxide in TM1, with zinc sulfate in TM2, and iron sulfate in TM3. These differences in mineral phase may influence the RBA of the arsenic in the materials.

It is important to note that these quantitative estimates of relative arsenic mass are based on examination of a limited number of arsenic-bearing particles in each sample (N = 57 to 186). Consequently, the quantitative values reported should not be considered to be highly precise, and apparent differences between samples may be partly due to random variation in the analysis rather than authentic differences in composition.

Particle Size Distribution

Particle size is a potentially important contributor to RBA because the fraction of a particle that undergoes dissolution in gastrointestinal fluids is likely related to the surface area to volume ratio (this ratio is larger for small particles than large particles). The distribution of particle sizes for arsenic-bearing grains in these test materials is summarized below:

Particle Size Distribution

Test Material	Percent of Particles by Size Class		
	≤25 um	26-100 um	>100 um
TM1	79%	15%	6%
TM2	85%	14%	2%
TM3	72%	26%	2%

As seen above, in these test materials, a large majority of all arsenic-containing particles are small: an average of 79% of all particles are 25 um or less in size. This predominance of small particles may tend to increase the RBA compared to what would be expected for larger particles of similar composition.

Matrix Association

Arsenic-containing particles may be characterized according to their association with other particles into four types, as follows:

Matrix Association	Description
Liberated	A grain of arsenic-containing material that is not attached to or contained within any other particle
Rimming	Arsenic is present on the outer surface of a particle, usually as a consequence of adsorption or precipitation
Cemented	The arsenic-containing particle is loosely bound to or associated with other particles or phases that do not contain arsenic
Included	The arsenic-containing particle is entirely contained within another particle

In the first three types of matrix association, the arsenic is exposed at the surface of some or all of the particle, and hence the arsenic is available to be dissolved by gastrointestinal fluids. Particles that are fully included in other particles are not exposed to external fluids and are not likely to have high bioavailability. The distribution of matrix associations for arsenic-bearing particles in the test materials from this site is summarized below:

Particle Matrix Associations

Test Material	Percent of Particles by Matrix Class			
	Liberated	Rimming	Cemented	Included
TM1	27%	2%	67%	4%
TM2	22%	0%	78%	0%
TM3	37%	11%	53%	0%

As seen, relative few particles are fully included, and 96-100% of the particles are entirely or partially exposed to external fluids. This suggests that the RBA of the arsenic is likely to be determined primarily by mineral phase and/or particle size rather than by matrix association.

In Vitro Bioaccessibility

The details of the method used to measure the *in vitro* bioaccessibility of arsenic are described in USEPA (1999). In brief, 1.00 g of test substrate is placed into a 125-mL wide-mouth HDPE bottle. To this is added 100 mL of the extraction fluid (0.4 M glycine, pH 1.5). Each bottle is placed into a heated water bath (water temperature = 37°C) and rotated end-over-end. After a specified period of time (1, 2 or 4 hours), the bottles are removed, dried, and placed upright on the bench top to allow the soil to settle to the bottom. A 15-mL sample of supernatant fluid is removed directly from the extraction bottle into a disposable 20-cc syringe. After withdrawal of the sample into the syringe, a Luer-Lok attachment fitted with a 0.45-µm cellulose acetate disk filter (25 mm diameter) is attached, and the 15 mL aliquot of fluid is filtered through the attachment to remove any particulate matter. This filtered sample of extraction fluid is then analyzed for arsenic. The fraction of arsenic originally present in the sample that occurs in the dissolved phase at the end of the extraction procedure is the *in vitro* bioaccessibility (IVBA). IVBA results for the three test materials in this study are summarized below:

Test Material	Concentration (ppm)	IVBA		
		1 hr.	2 hr.	4 hr.
TM1	676	14%	16%	19%
TM2	313	35%	47%	51%
TM3	86.8	49%	57%	66%

As seen, IVBA values tend to increase slowly as a function of extraction time. In all cases, an inverse relationship is observed between IVBA and arsenic concentration in the sediment

sample, similar to the pattern that was observed previously during the preliminary characterization of the 12 site sediments samples (see Section 2.1, above).

2.2 Experimental Animals

Young swine were selected for use in these studies because they are considered to be a good physiological model for gastrointestinal absorption in children (Weis and LaVelle 1991). The animals were intact males of the Pig Improvement Corporation (PIC) genetically defined Line 26, and were purchased from Chinn Farms, Clarence, MO.

The animals were housed in individual stainless steel cages. All animals were held for several days prior to beginning exposure to test materials in order to allow them to adapt to their new environment and to ensure that all of the animals were healthy. Animals were assigned to dose groups at random. When exposure began (day zero), the animals were about 6 weeks old and weighed an average of about 12.1 kg. Animals were weighed every three days during the course of the study. On average, animals gained about 0.4 kg/day and the rate of weight gain was comparable in all groups, ranging from 0.38 to 0.46 kg/day. These body weight data are summarized in Figure 2-5.

2.3 Diet

Animals provided by the supplier were weaned onto standard pig chow purchased from MFA Inc., Columbia, MO. In order to minimize arsenic exposure from the diet, the animals were gradually transitioned from the MFA feed to a special feed (Zeigler Brothers, Inc., Gardners, PA) over the time interval from day -7 to day -3, and this feed was then maintained for the duration of the study. The feed was nutritionally complete and met all requirements of the National Institutes of Health-National Research Council. The typical nutritional components and chemical analysis of the feed is presented in Table 2-4. Each day every animal was given an amount of feed equal to 5% of the mean body weight of all animals on study. Feed was administered in two equal portions of 2.5% of the mean body weight at each feeding. Feed was provided at 11:00 AM and 5:00 PM daily. Previous analysis of feed samples indicated the arsenic level was generally below the detection limit (0.1 ppm), which corresponds to a dose contribution from food of less than 5 ug/kg-day (less than 50 ug/day).

Drinking water was provided *ad libitum* via self-activated watering nozzles within each cage. Previous analysis of samples from randomly selected drinking water nozzles indicated the arsenic concentration was less than the quantitation limit (about 1 ug/L). Assuming water intake of about 0.1 L/kg-day, this corresponds to a dose contribution from water of less than 0.1 ug/kg-day (1 ug/day).

2.4 Dosing

Animals were exposed to sodium arsenate (abbreviated in this report as "NaAs") or a test material (site sediment) for 12 days, with the dose for each day being administered in two equal portions given at 9:00 AM and 3:00 PM (two hours before feeding). Dose material was placed in the

center of a small portion (about 5 grams) of moistened feed (this is referred to as a "doughball"), and this was administered to the animals by hand.

The dose levels administered were based on the arsenic content of the test material, with target doses of 300, 600, and 900 ug/day for NaAs and each test material. The mass of each test material needed to provide these doses of arsenic were calculated based on a preliminary estimation of the arsenic concentration in the test materials. Actual administered arsenic doses were re-calculated after the study was completed using the mean of two ICP-AES measurements and two ICP-MS measurements. These actual administered doses are presented in Appendix B.

2.5 Collection and Preparation of Samples

Urine

Samples of urine were collected from each animal for three consecutive 48-hour periods, on days 6/7, 8/9 and 10/11 of the study. Collection began at 9AM and ended 48 hours later. The urine was collected in a stainless steel pan placed beneath each cage, which drained into a plastic storage bottle. Each collection pan was fitted with a nylon screen to minimize contamination with feces, spilled food, or other debris. Plastic diverters were used to minimize urine dilution with drinking water spilled by the animals from the watering nozzle into the collection pan, although this was not always effective in preventing dilution of the urine with water. Due to the length of the collection period, collection containers were emptied at least twice daily into a separate holding container. This ensured that there was no loss of sample due to overflow.

At the end of each collection period, the urine volume was measured and 60-mL portions were removed for analysis. A separate 250-mL aliquot was retained as an archive sample. Each sample was acidified by the addition of concentrated nitric acid. The samples were stored refrigerated until arsenic analysis.

2.6 Arsenic Analysis

Urine samples were assigned random sample numbers and submitted to the laboratory for analysis in a blind fashion. Details of urine sample preparation and analysis are provided in USEPA (1999). In brief, 25 mL samples of urine were digested by refluxing and then heating to dryness in the presence of magnesium nitrate and concentrated nitric acid. Following magnesium nitrate digestion, samples were transferred to a muffle furnace and ashed at 500°C. The digested and ashed residue was dissolved in hydrochloric acid and analyzed by the hydride generation technique using a Perkin-Elmer 3100 atomic absorption spectrometer. Preliminary tests of this method established that each of the different forms of arsenic that may occur in urine, including trivalent inorganic arsenic (As+3), pentavalent inorganic arsenic (As+5), monomethyl arsenic (MMA) and dimethyl arsenic (DMA), are all recovered with high efficiency.

Laboratory Quality Assurance

A number of quality assurance steps were taken during this project to evaluate the accuracy of the analytical procedures. Steps performed by the analytical laboratory included:

Spike Recovery

Randomly selected samples were spiked with known amounts of arsenic (usually 40 ug, as sodium arsenate) and the recovery of the added arsenic was measured. Recovery for individual samples ranged from 95% to 110%, with an average across all analyses of 103 ± 4.5% (N = 7).

Duplicate Analysis

Random samples were selected for duplicate analysis by the laboratory analyst. Duplicate results had a relative percent difference (RPD) of 0-17%, with an average of 2.6 ± 5.0% (N = 13).

Laboratory Control Standards

Four different types of laboratory control standards (LCS) were tested periodically during the analysis. These are samples for which a certified concentration of arsenic has been established. Results for these four types of LCS are summarized below:

LCS Type	Certified Value	Average Recovery	SEM	N
E.R.A. P081 - Metals WasteWatR	366 ng/mL	97%	1.7%	42
N.R.C.C. Dolt-2 Dogfish Liver	16.6 +/- 1.1 ug/g dry wt	84%	0.0%	2
N.R.C.C. Tort-2 Lobster	21.6 +/- 1.8 ug/g dry wt	99%	3.3%	3
N.I.S.T. Oyster 1566b	7.65 +/- 0.65 ug/g dry wt	97%	0.8%	3

As seen, recovery of arsenic from these standards was good in all cases, and no samples were outside the acceptance criteria specified by the suppliers.

Blanks

Blank samples run along with each batch of samples never yielded a measurable level of arsenic, with all values being reported as less than 0.03 ug of arsenic.

Blind Quality Assurance Samples

In addition to these laboratory-sponsored QA samples, an additional series of QA samples were submitted to the laboratory in a blind fashion. This included a number of Performance Evaluation (PE) samples (urines of known arsenic concentration) and a number of blind duplicates.

The results for the PE samples are shown in Figure 2-6. As seen, the PE samples included several different concentrations each of four different types of arsenic (As+3, As+5, MMA, and DMA). In all cases, there was good recovery of the arsenic.

The results for blind duplicates are shown in Figure 2-7. As seen, there was good agreement between results for the duplicate pairs.

Based on the results of all of the quality assurance samples and steps described above, it is concluded that the analytical results for samples of urine are of high quality and are suitable for derivation of reliable estimates of arsenic absorption from test materials.

3.0 DATA ANALYSIS

Figure 3-1 shows a conceptual model for the toxicokinetic fate of ingested arsenic. Key points of this model are as follows:

- In most animals (including humans), absorbed arsenic is excreted mainly in the urine over the course of several days. Thus, the urinary excretion fraction (UEF), defined as the amount excreted in the urine divided by the amount given, is usually a reasonable approximation of the oral absorption fraction or ABA. However, this ratio will underestimate total absorption, because some absorbed arsenic is excreted in the feces via the bile, and some absorbed arsenic enters tissue compartments (e.g., skin, hair) from which it is cleared very slowly or not at all. Thus the urinary excretion fraction should not be equated with the absolute absorption fraction.

- The relative bioavailability (RBA) of two orally administered materials (i.e., test material and reference material) can be calculated from the ratio of the urinary excretion fraction of the two materials. This calculation is independent of the extent of tissue binding and of biliary excretion:

$$RBA(test\ vs\ ref) = \frac{AF_o(test)}{AF_o(ref)} = \frac{D \cdot AF_o(test) \cdot K_u}{D \cdot AF_o(ref) \cdot K_u} = \frac{UEF(test)}{UEF(ref)}$$

Based on the conceptual model above, raw data from this study were reduced and analyzed as follows:

- The amount of arsenic excreted in urine by each animal over each collection period was calculated by multiplying the urine volume by the urine concentration:

  Excreted (ug/48hr) = Concentration (ug/L) · Volume (L/48hr)

- For each test material, the amount of arsenic excreted by each animal was plotted as a function of the amount administered (ug/48 hours), and the best fit straight line (calculated by linear regression) through the data (ug excreted per ug administered) was used as the best estimate of the urinary excretion fraction (UEF).

- The relative bioavailability of arsenic in a test material was calculated as:

  RBA = UEF(test) / UEF(NaAs)

  where sodium arsenate (NaAs) is used as the frame of reference.

- As noted above, each RBA value is calculated as the ratio of two slopes (UEFs), each of which is estimated by linear regression through a set of data points. Because of the variability in the data, there is uncertainty in the estimated slope (UEF) for each material. This uncertainty in the slope is described by the standard

error of the mean (SEM) for the slope parameter. Given the best estimate and the SEM for each slope, the uncertainty in the ratio may be calculated using Monte Carlo simulation. The probability density function describing the confidence around each slope (UEF) term was assumed to be characterized by a t-distribution with n-2 degrees of freedom :

$$\frac{UEF(measured) - UEF(true)}{SEM} \sim t_{n-2}$$

For convenience, this PDF is abbreviated T(slope, sem, n), where slope = best estimate of the slope derived by linear regression, sem = standard deviation in the best estimate of the slope, and n = number of data points upon which the regression analysis was performed. Thus, the confidence distribution around each ratio was simulated as:

$$PDF(RBA) = \frac{T(slope, sem, n)_{test}}{T(slope, sem, n)_{ref}}$$

Using this equation, a Monte Carlo simulation was run for each RBA calculation. The 5th and 95th percentile values from the simulated distribution of RBA values were then taken to be the 90% confidence interval for the RBA.

4.0 RESULTS

4.1 Clinical Signs

The doses of arsenic administered in this study are below a level that is expected to cause toxicological responses in swine, and no clinical signs of arsenic-induced toxicity were noted in any of the animals used in the study.

4.2 Urinary Excretion Fractions

Detailed results from the study are presented in Appendix B. The results for urinary excretion of arsenic are summarized in Figures 4-1 to 4-3. Although there is variability in the data, most dose-response curves are approximately linear, with the slope of the best-fit straight line being equal to the best estimate of the urinary excretion fraction (UEF). The following table summarizes the best fit slopes (urinary excretion fractions) for sodium arsenate and each of the test materials.

Summary of UEF Values

Test Material	Slope (UEF) ± SEM
NaAs	0.892 ± 0.033
TM1	0.326 ± 0.021
TM2	0.456 ± 0.021

4.3 Calculation of Relative Bioavailability

As discussed above, the relative bioavailability of arsenic in a specific test material is calculated as follows:

RBA(test *vs*. NaAs) = UEF(test) / UEF(NaAs)

The results are summarized below:

Test Material	Relative Bioavailability	
	Best Estimate	90% Confidence Interval
TM1	37%	32% - 41%
TM2	51%	46% - 56%

5.0 DISCUSSION AND RECOMMENDATIONS

The *in vivo* RBA results for two composite sediments collected from the Aberjona River study area range from 37% to 51%. These results clearly indicate that arsenic in Aberjona River site sediments is not as well absorbed as soluble arsenic, and it is appropriate to take this into account when evaluating potential risks to humans from incidental ingestion of sediments. Because each sediment sample tested during this study is a composite of three sub-samples collected from differing locations along the Aberjona River, each test material represents a fairly large spatial area, and the results for these two samples may be assumed to be generally applicable to the entire site.

Although RBA values can be applied in the site risk assessment process without any understanding of what factors are responsible for the observed RBA values, it is a matter of some interest to investigate the degree to which the RBA value is correlated with other factors. The following table compares the measured values for RBA with the arsenic concentration in the sample, the IVBA, and the primary mineral phase present in each test material:

Test Material	Concentration (ppm)	RBA	IVBA		Primary Form
			1 hr	4 hrs	
TM1	676	37%	14%	19%	Iron oxide
TM2	313	51%	35%	51%	Zinc sulfate
TM3	86.8	--	49%	66%	Iron sulfate

As seen, both RBA and IVBA show an inverse correlation with concentration in the sediment. This is plotted graphically in Figure 5-1. The basis of this apparent relationship is not known. Absolute values of IVBA at one hour tend to be lower than the measured RBA values, but the difference between RBA and IVBA tends to decrease after longer extraction times. Although the values for TM2 at 4 hours happen to be equal, the values for TM1 are not equivalent. These data suggest that IVBA is a good screen to evaluate the relative *in vivo* bioavailability of arsenic at different locations, but that it should not be used as a quantitative surrogate for *in vivo* RBA at this site. The data are not sufficient to establish an empiric relationship between mineral form and RBA, but the results suggest that arsenic in association with iron oxide is likely to be less bioavailable that other forms.

6.0 REFERENCES

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TABLE 2-1 STUDY DESIGN

Group	Number of Animals	Material Administered	Target Dose (ug As/day)
1	3	Control	0
2	4	Sodium Arsenate	300
3	4	Sodium Arsenate	600
4	4	Sodium Arsenate	900
5	4	Test Material 1	300
6	4	Test Material 1	600
7	4	Test Material 1	900
8	4	Test Material 2	300
9	4	Test Material 2	600
10	4	Test Material 2	900

TABLE 2-2 PRELIMINARY (SEMI-QUANTITATIVE) SPECIATION RESULTS

Sample	Arsenic Concentration (ppm)	Bioaccesibility (%)	PARTICLE FREQUENCY* Phase						PARTICLE SIZE (um) Phase					
			Iron sulfide	Iron oxide	Iron sulfate	Zinc-Iron Sulfate	Tin oxide	Sodium sulfate	Iron sulfide	Iron oxide	Iron sulfate	Zinc-Iron Sulfate	Tin oxide	Sodium sulfate
1	459	40	3	2		2			2-8	20		5-80		
2	527	31	Tr	2	3	2		Tr		4-100	8-110	12-25		
3	144	70	3	1	2	Tr				1-8		8-30		
4	145	40	1	3	2	1			1-40	8-150	15-125	7-35		
5	775	12	Tr	3		Tr	Tr			8-250				
6	176	55	3		Tr	2			3-7			12-40		
7	301	37	3	1	2	2		2	2-10		3-22	4-80		8-35
8	832	13	Tr	3		2				35-220		15		
9	407	15		3		2				30-225		7-30		
10	43.4	39	2	1	Tr				3-7					
11	64.0	49	1	1	Tr				2-10	15-35				
12	67.1	59	1	1		Tr			1-15	14				

* Code: 3 = Most Common
2 = Common
1 = Relatively Infrequent
Tr = Trace
= Majority of arsenic in probably in this phase

TABLE 2-3 COMPOSITION OF TEST MATERIALS

Analyte	Concentration (mg/kg)[a]		
	TM1	TM2	TM3
Aluminum	15000	11000	11000
Antimony	4.3	3.7	<1
Arsenic	676.3	312.8	86.8
Barium	75	98	60
Beryllium	0.96	0.62	0.54
Cadmium	15	16	1.9
Calcium	9100	10000	4100
Chromium	680	620	140
Cobalt	32	46	14
Copper	840	540	150
Iron	73000	38000	22000
Lead	410	350	130
Magnesium	2000	2600	4300
Manganese	510	610	430
Mercury	2.9	1.1	0.61
Nickel	28	35	22
Potassium	690	770	1300
Selenium	5.8	3.8	1.6
Silver	0.88	1.1	<1
Sodium	ND	<500	ND
Sulfides, Total	5.9	63	7.2
Thallium	1.7	4.4	1.4
Total Organic Carbon	210 g/kg	220 g/kg	120 g/kg
Vanadium	49	43	35
Zinc	3300	4500	830

ND = Not detected

[a] All values are in units of mg/kg except where noted otherwise. All metals except mercury were measured by USEPA method 6010B. Mercury was measured by USEPA method 7471A, total sulfides were measured by USEPA method 9030B/9034, and total organic carbon was measured by USEPA method 9060. All data are based on single measurements except arsenic, which is based on the average of duplicate analysis by ICP-MS and duplicate analysis by ICP-AES.

Table 2-4 Typical Feed Composition

Nutrient Name	Amount	Nutrient Name	Amount
Protein	20.1021%	Chlorine	0.1911%
Arginine	1.2070%	Magnesium	0.0533%
Lysine	1.4690%	Sulfur	0.0339%
Methionine	0.8370%	Manganese	20.4719 ppm
Met+Cys	0.5876%	Zinc	118.0608 ppm
Tryptophan	0.2770%	Iron	135.3710 ppm
Histidine	0.5580%	Copper	8.1062 ppm
Leucine	1.8160%	Cobalt	0.0110 ppm
Isoleucine	1.1310%	Iodine	0.2075 ppm
Phenylalanine	1.1050%	Selenium	0.3196 ppm
Phe+Tyr	2.0500%	Nitrogen Free Extract	60.2340%
Threonine	0.8200%	Vitamin A	5.1892 kIU/kg
Valine	1.1910%	Vitamin D3	0.6486 kIU/kg
Fat	4.4440%	Vitamin E	87.2080 IU/kg
Saturated Fat	0.5590%	Vitamin K	0.9089 ppm
Unsaturated Fat	3.7410%	Thiamine	9.1681 ppm
Linoleic 18:2:6	1.9350%	Riboflavin	10.2290 ppm
Linoleic 18:3:3	0.0430%	Niacin	30.1147 ppm
Crude Fiber	3.8035%	Pantothenic Acid	19.1250 ppm
Ash	4.3347%	Choline	1019.8600 ppm
Calcium	0.8675%	Pyridoxine	8.2302 ppm
Phos Total	0.7736%	Folacin	2.0476 ppm
Available Phosphorous	0.7005%	Biotin	0.2038 ppm
Sodium	0.2448%	Vitamin B12	23.4416 ppm
Potassium	0.3733%		

Feed obtained from and nutritional values provided by Zeigler Bros., Inc

FIGURE 2-1 SAMPLE CHARACTERIZATION AND PREPARATION FLOW CHART

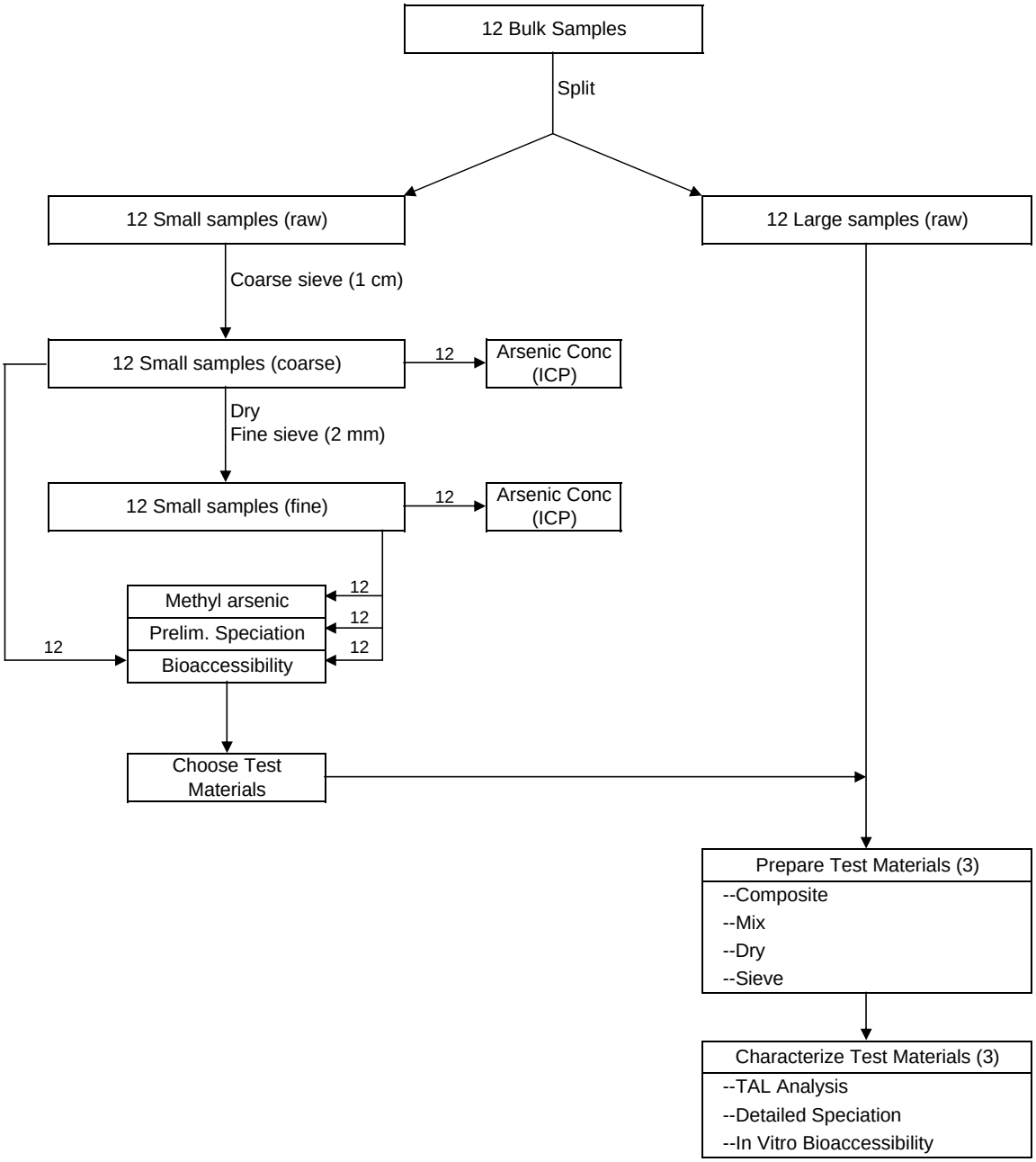
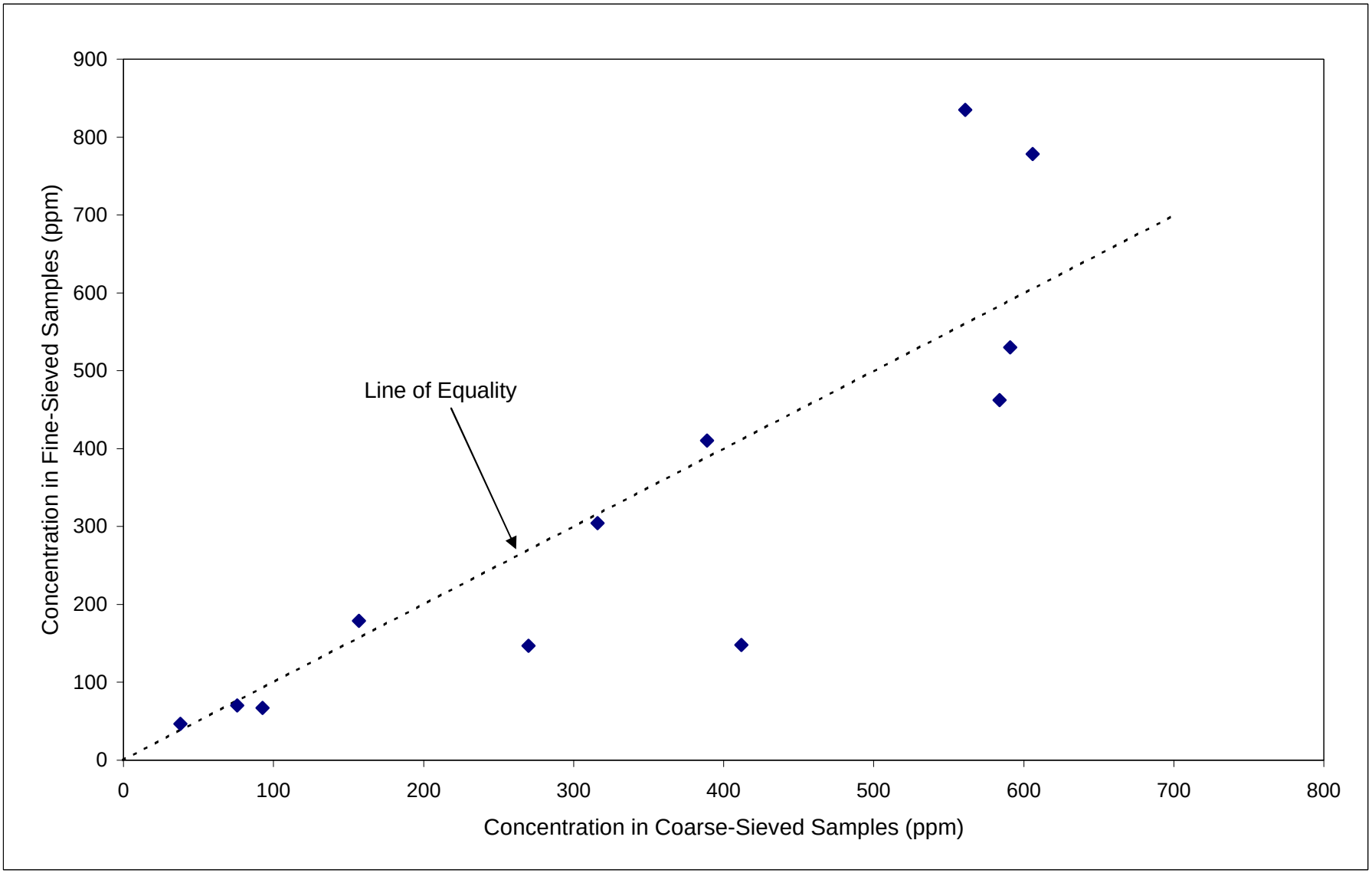
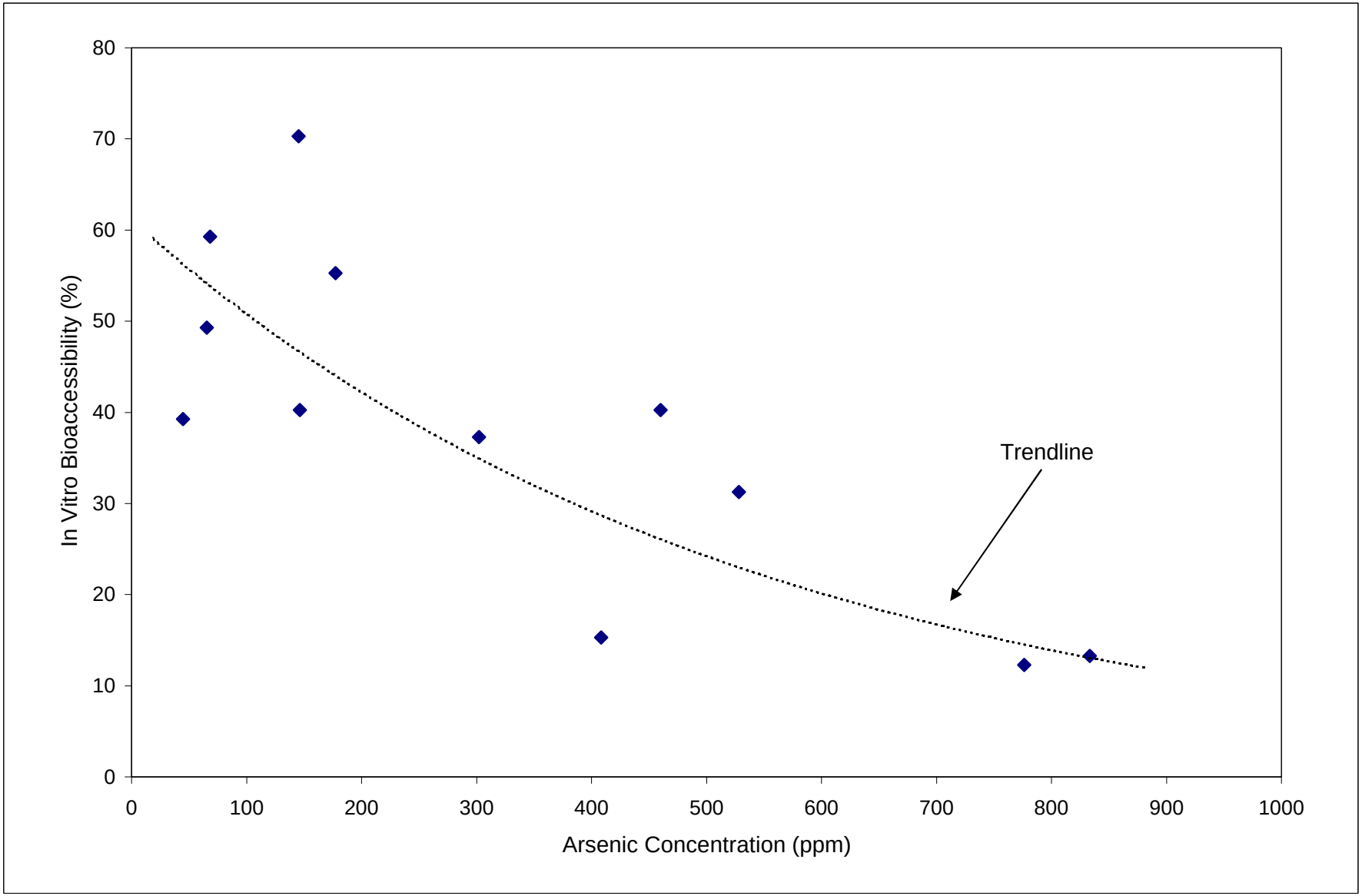


FIGURE 2-2 COMPARISON OF ARSENIC CONCENTRATIONS IN COARSE- AND FINE-SIEVED SAMPLES



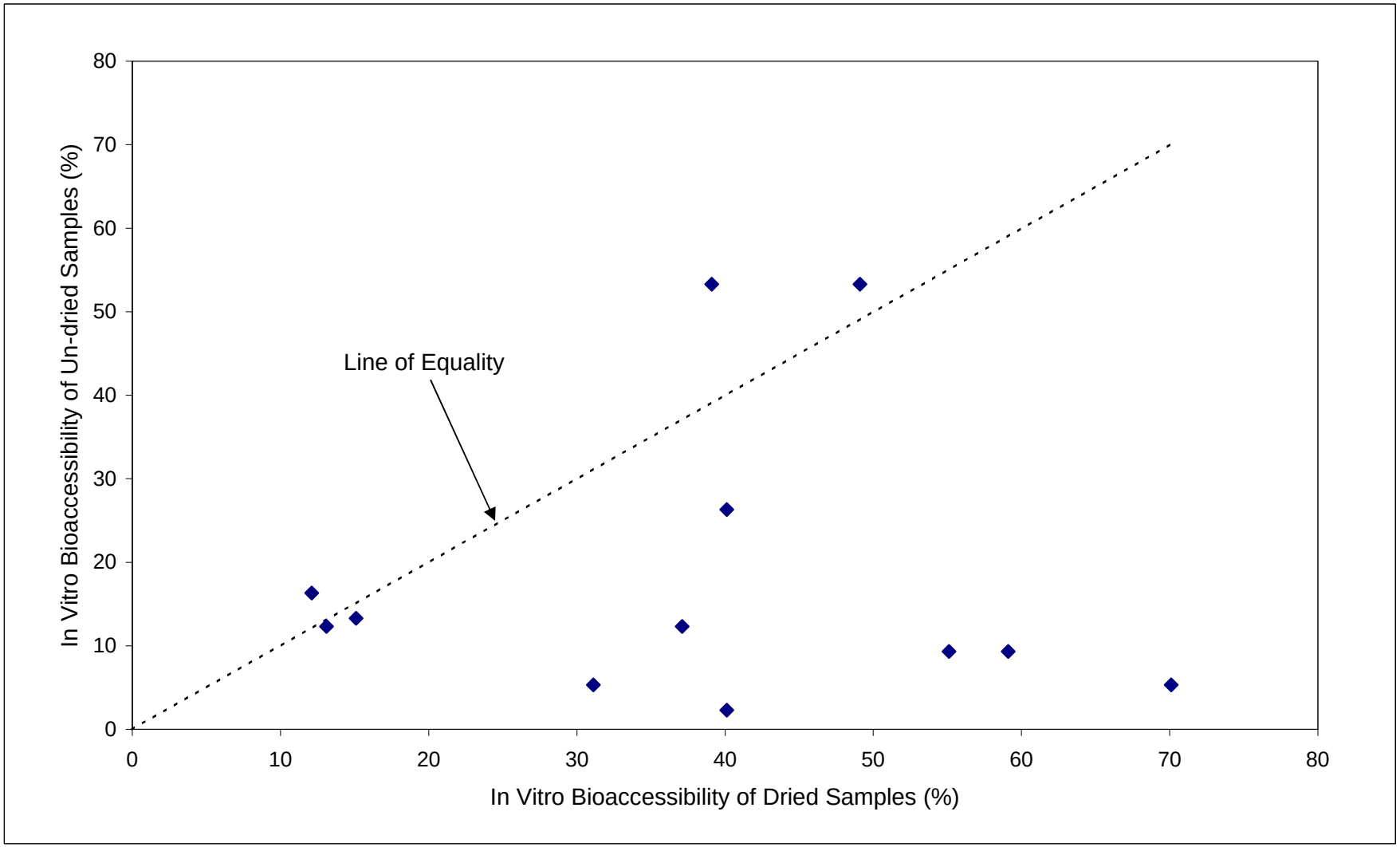
Prelim Char_tbls & figs.xls (Fig2-2_coarse-fine)

FIGURE 2-3 IN VITRO BIOACCESSIBILITY OF DRIED FINE-SIEVED SAMPLES



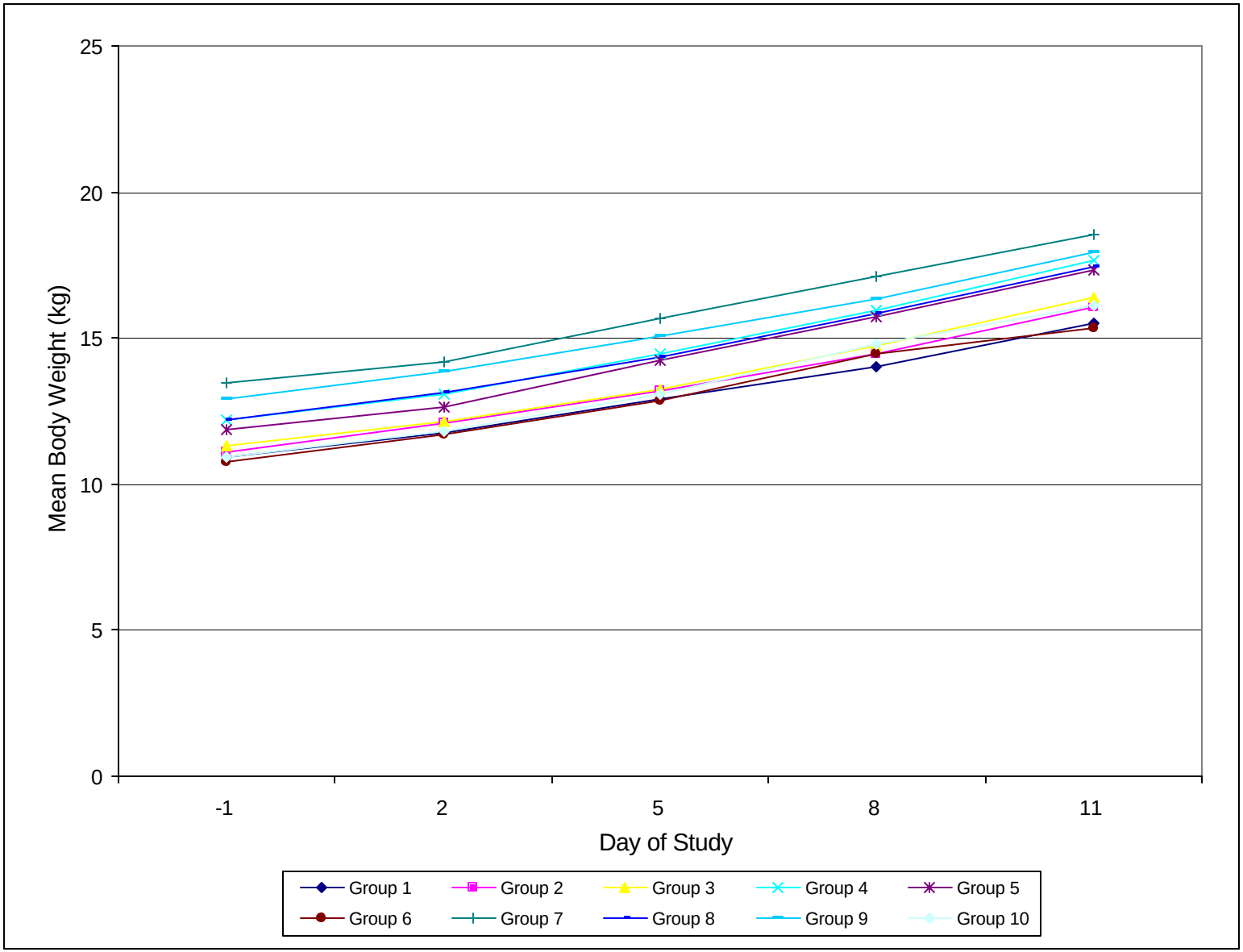
Prelim Char_tbls & figs.xls (Fig2-3_In Vitro)

FIGURE 2-4 COMPARISON OF IN VITRO BIOACCESSIBILITY OF DRIED AND UN-DRIED FINE-SIEVED SAMPLES



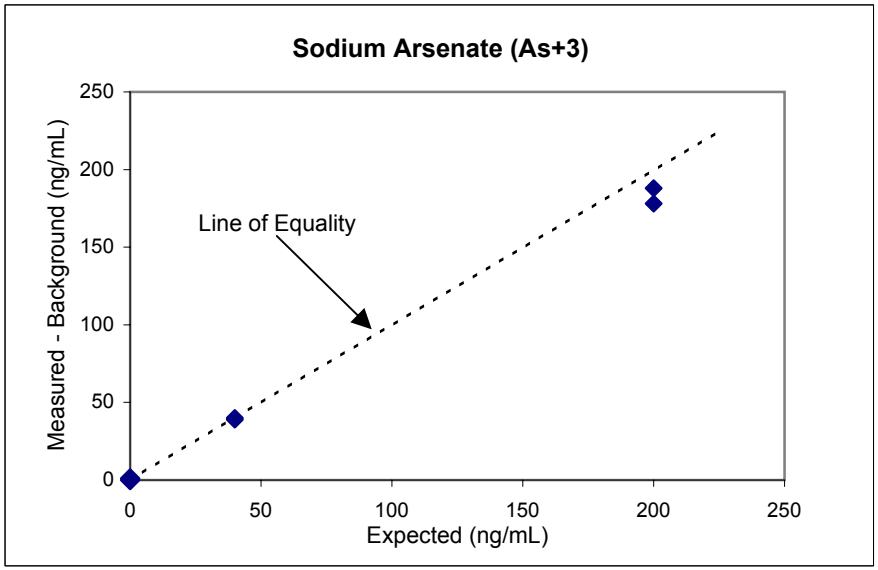
Prelim Char_tbls & figs.xls (Fig2-4_Dry-Wet)

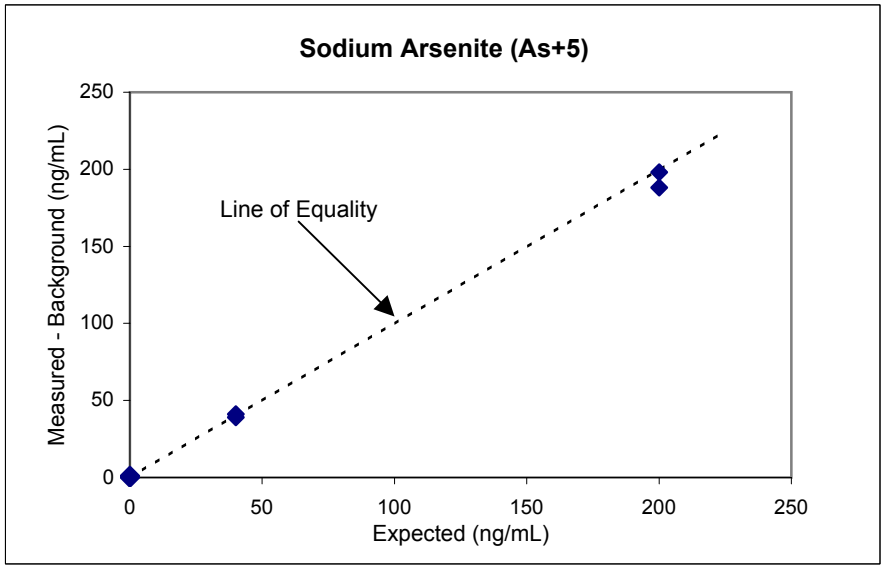
FIGURE 2-5 BODY WEIGHT GAIN

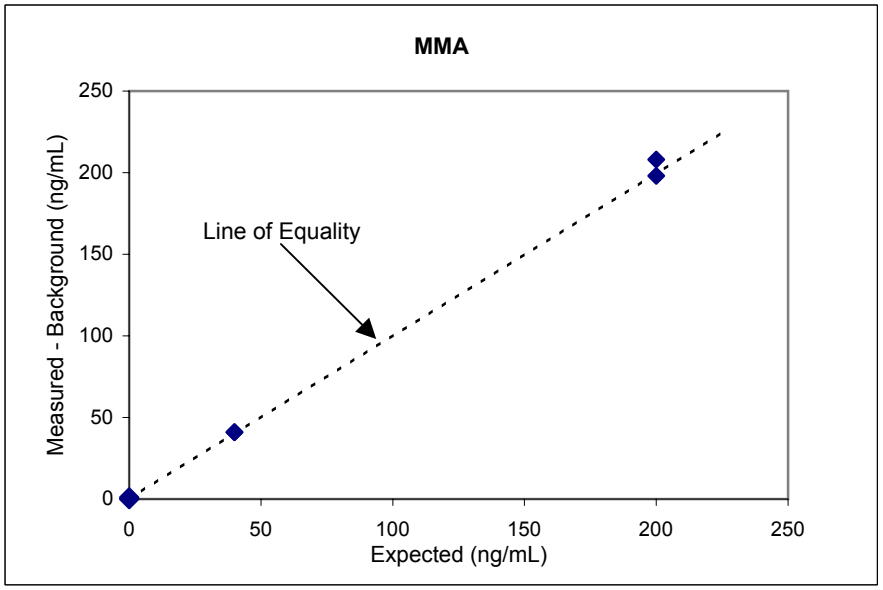


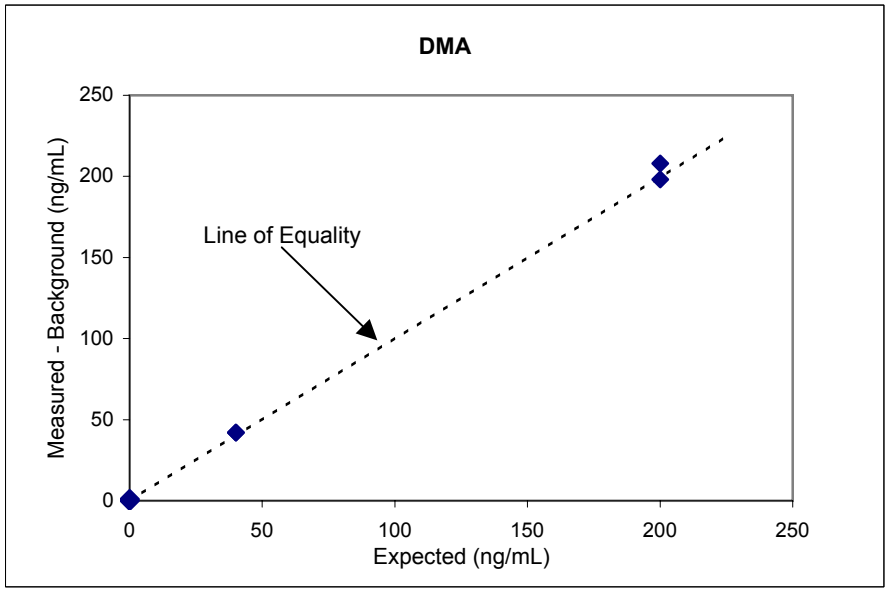
weights.xls (Fig2-5_group weights)

FIGURE 2-6 PERFORMANCE EVALUATION SAMPLES



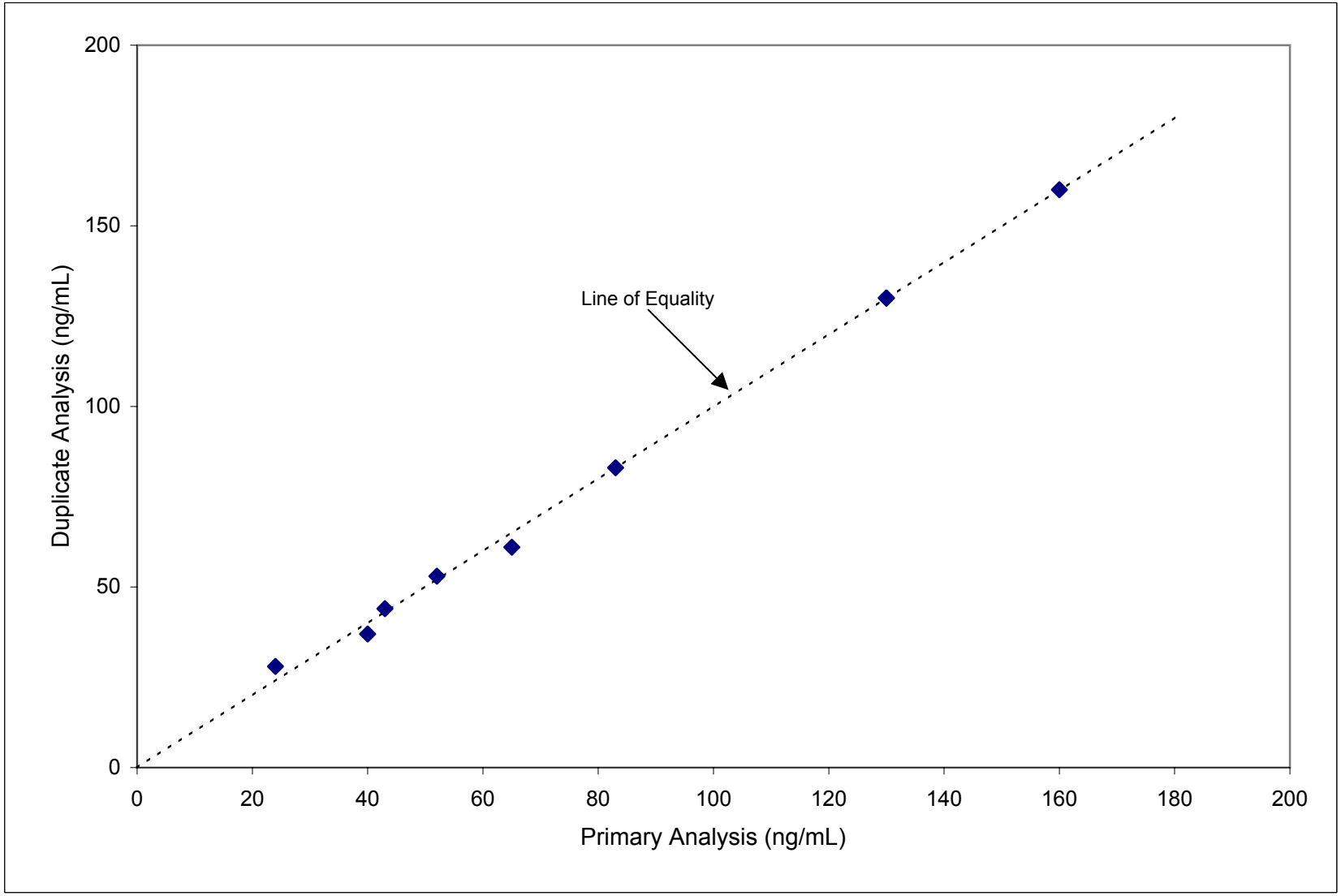






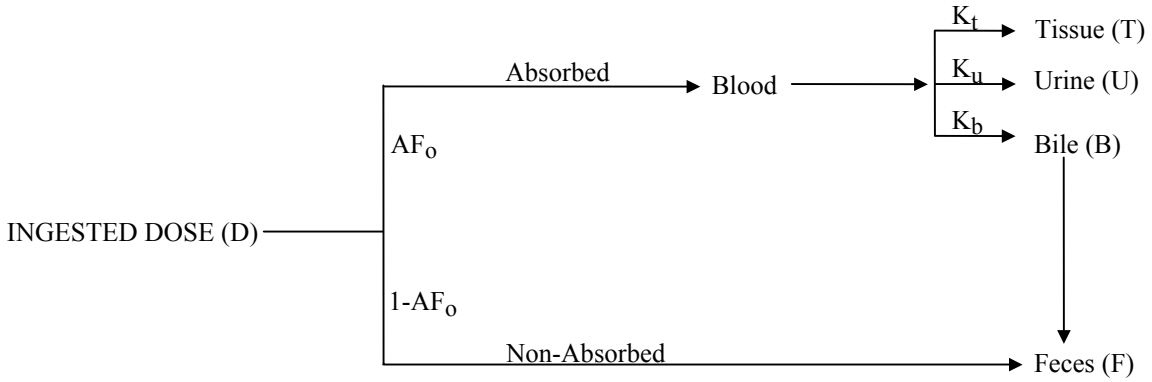
Blind QC analysis.xls (Fig2-6_PE)

FIGURE 2-7 BLIND DUPLICATE SAMPLES



Blind QC analysis.xls (Fig2-7_Dup)

Figure 3-1. Conceptual Model for Arsenic Toxicokinetics



where:

D = Ingested dose (ug)

AF_o = Oral Absorption Fraction

K_t = Fraction of absorbed arsenic which is retained in tissues

K_u = Fraction of absorbed arsenic which is excreted in urine

K_b = Fraction of absorbed arsenic which is excreted in the bile

BASIC EQUATIONS:

Amount Absorbed (ug) $= D \cdot AF_o$

Amount Excreted (ug) $=$ Amount absorbed $\cdot K_u$

$= D \cdot AF_o \cdot K_u$

Urinary Excretion Fraction (UEF) $=$ Amount excreted / Amount ingested

$= (D \cdot AF_o \cdot K_u) / D$

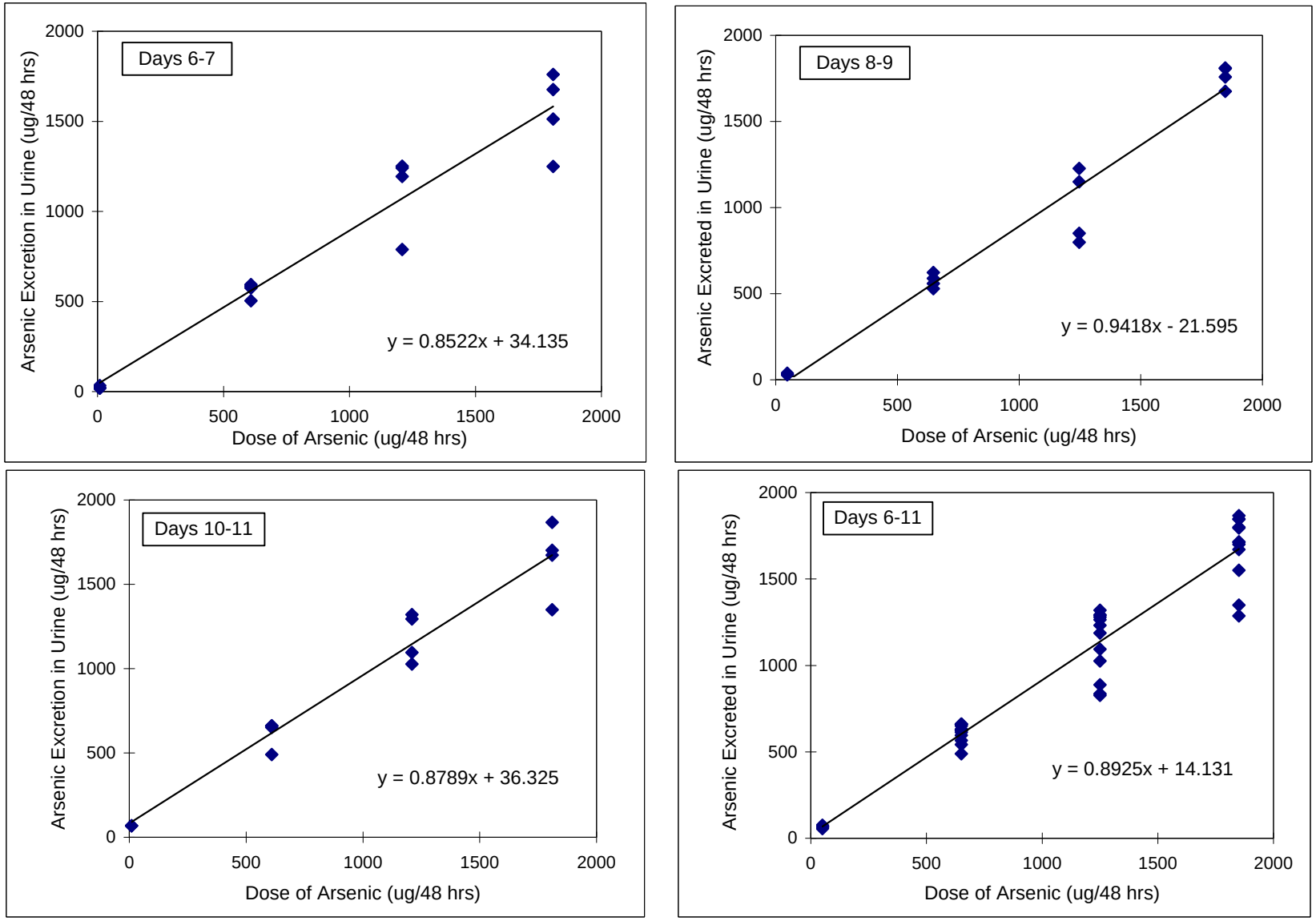
$= AF_o \cdot K_u$

Relative Bioavailability (x vs. y) $= UEF(x) / UEF(y)$

$= (AF_o(x) \cdot K_u) / (AF_o(y) \cdot K_u)$

$= AF_o(x) / AF_o(y)$

FIGURE 4-1 URINARY EXCRETION OF ARSENIC FROM SODIUM ARSENATE



R1 UEF analysis.xls (NaAs)
12/16/2002

FIGURE 4-2 URINARY EXCRETION OF ARSENIC FROM TEST MATERIAL 1

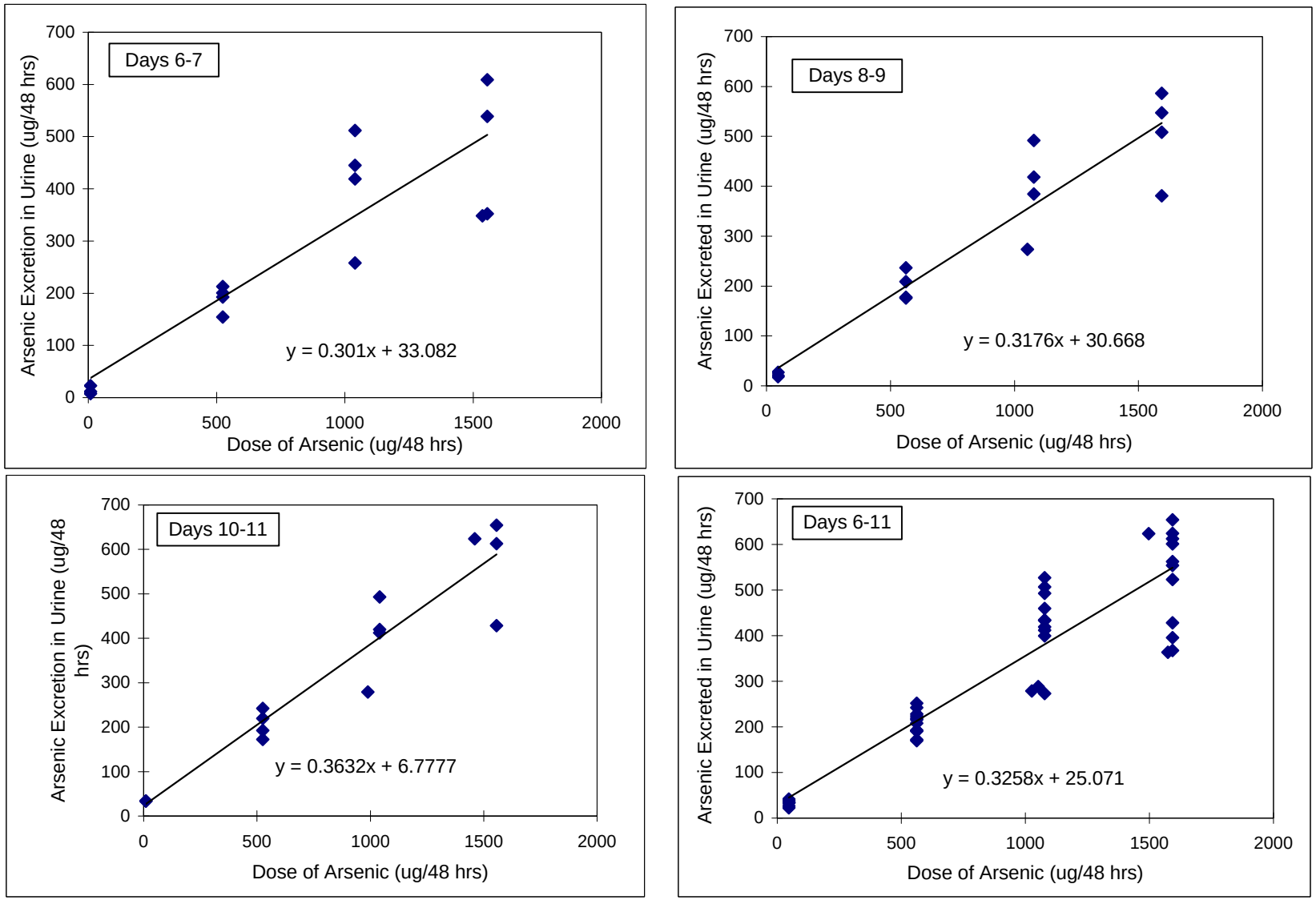
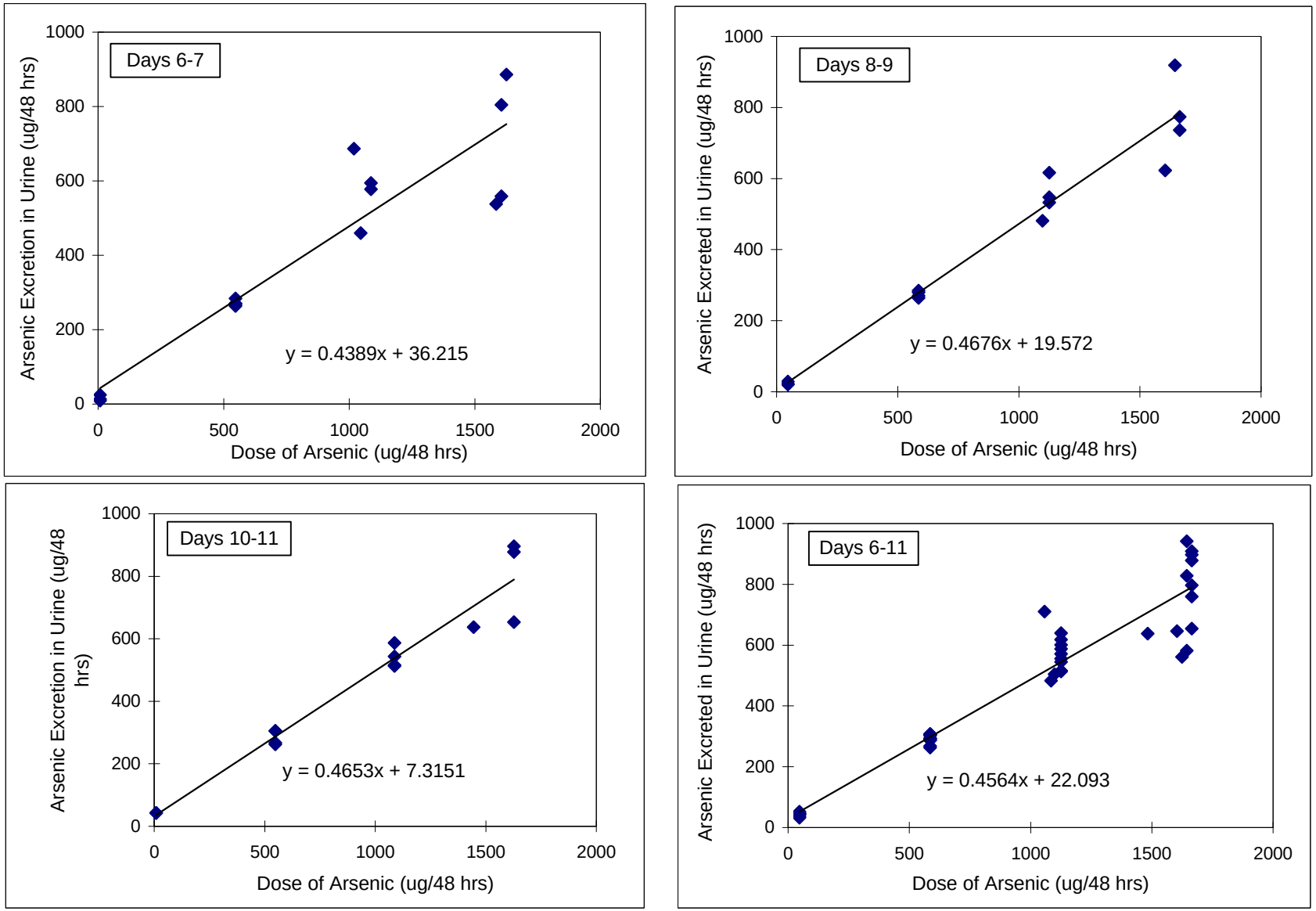
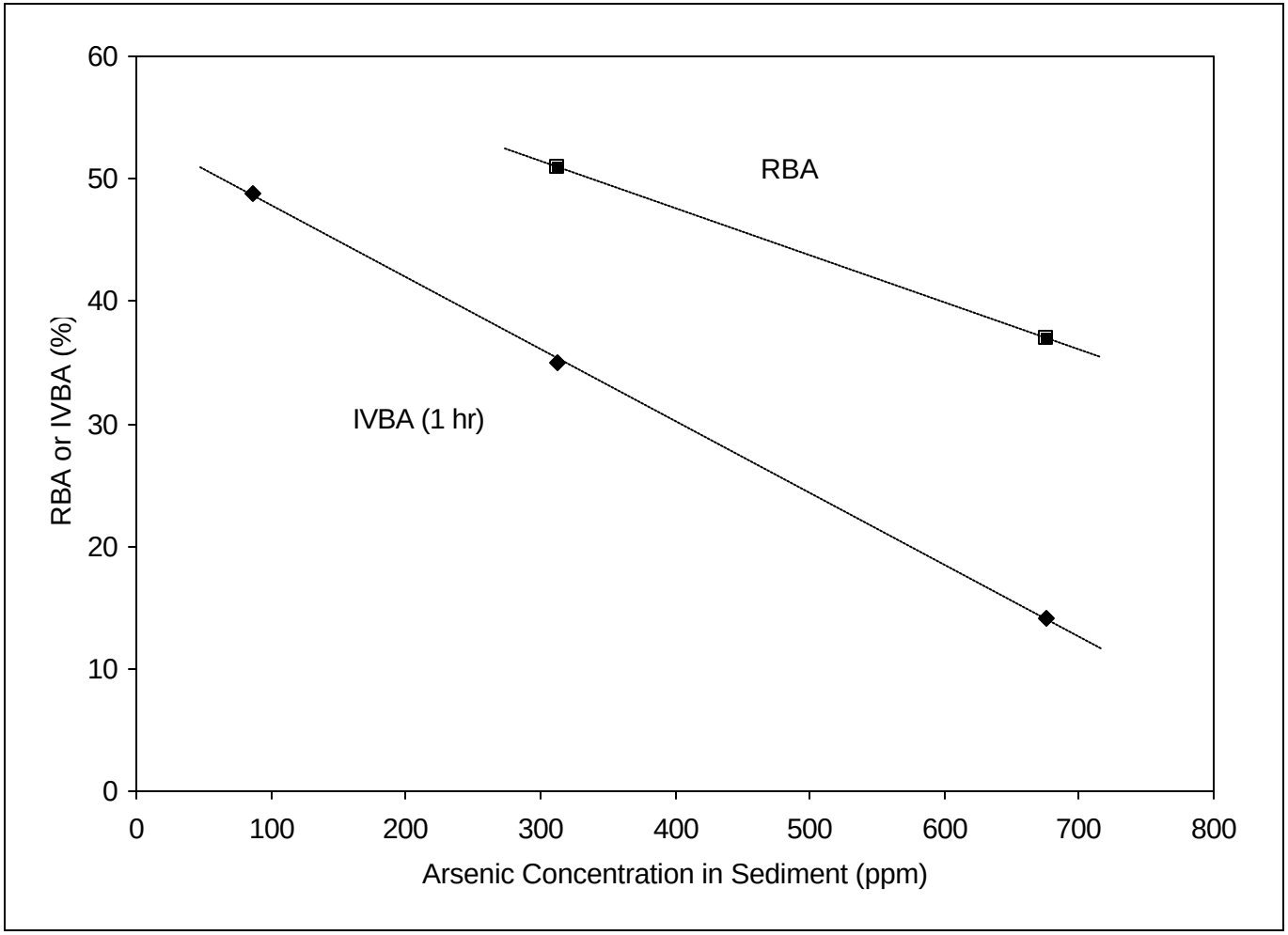


FIGURE 4-3 URINARY EXCRETION OF ARSENIC FROM TEST MATERIAL 2



R1 UEF analysis.xls (TM2)
12/16/2002

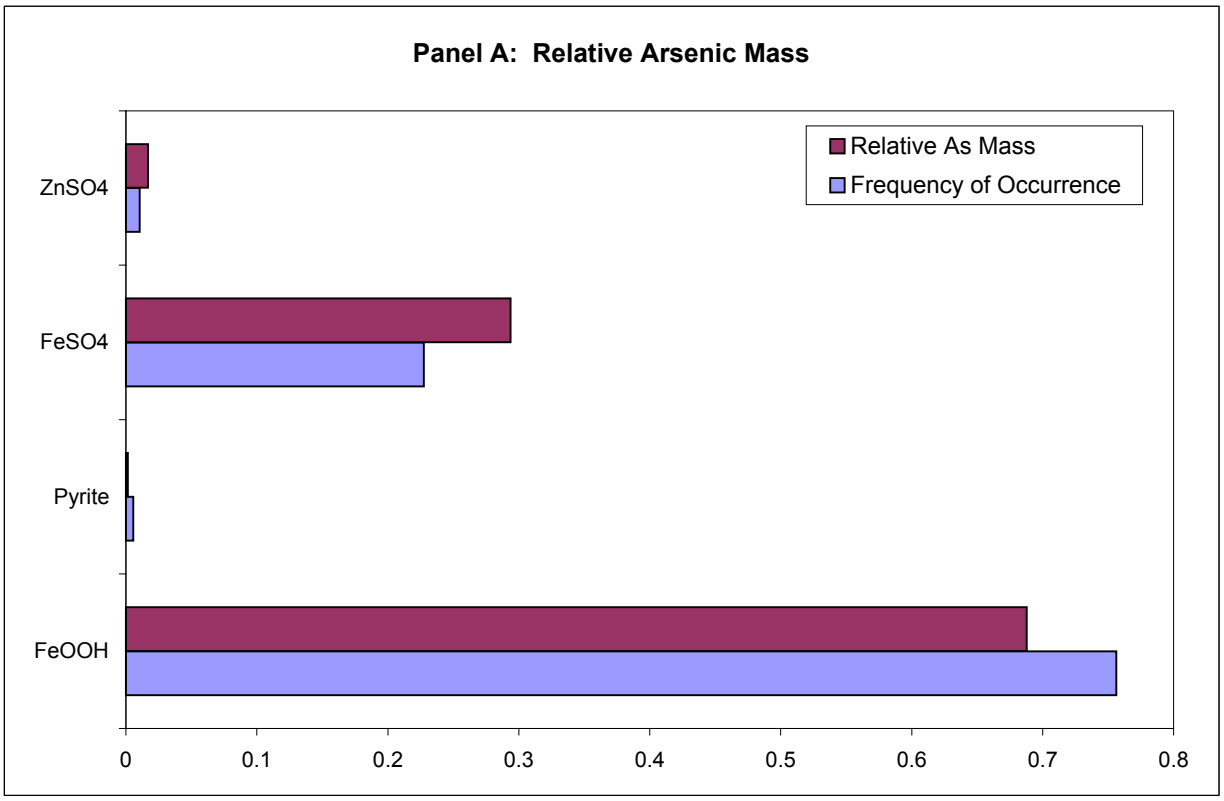
Figure 5-1. RBA and IVBA as a Function of Sediment Concentration

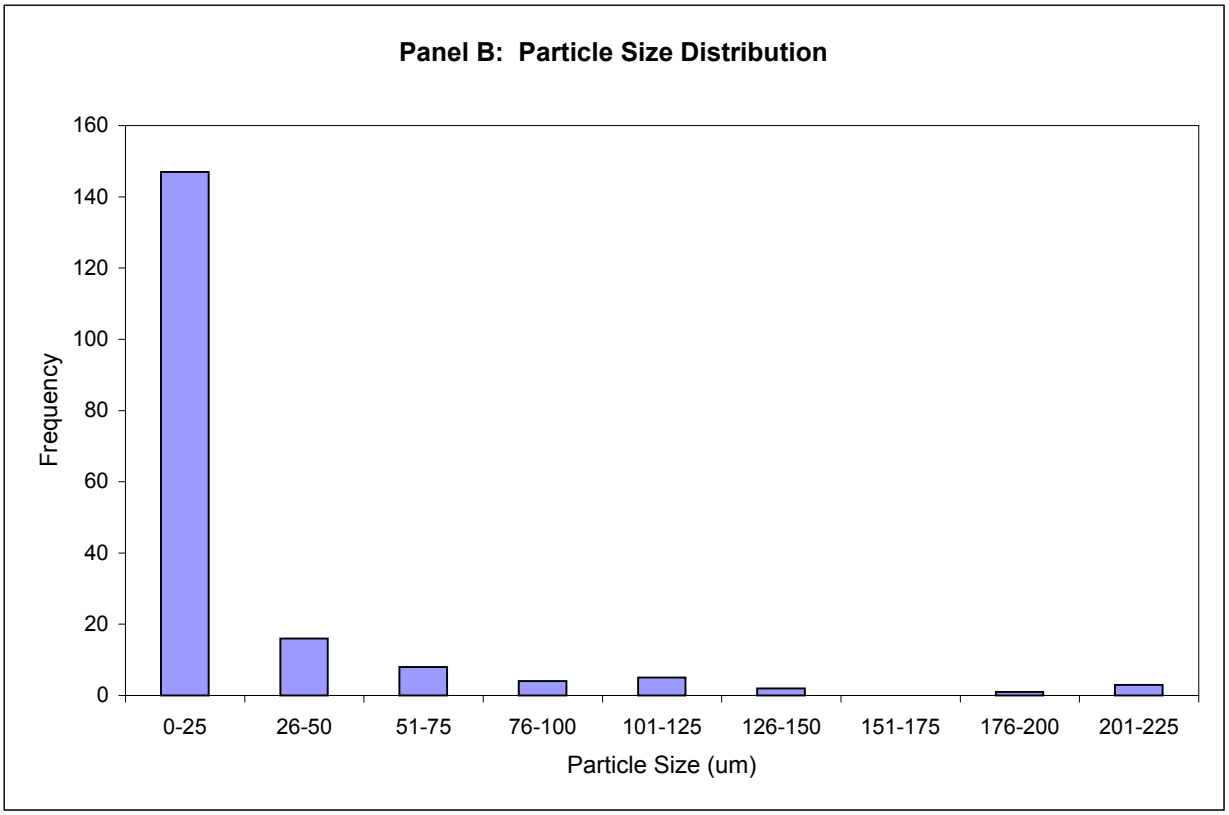


APPENDIX A

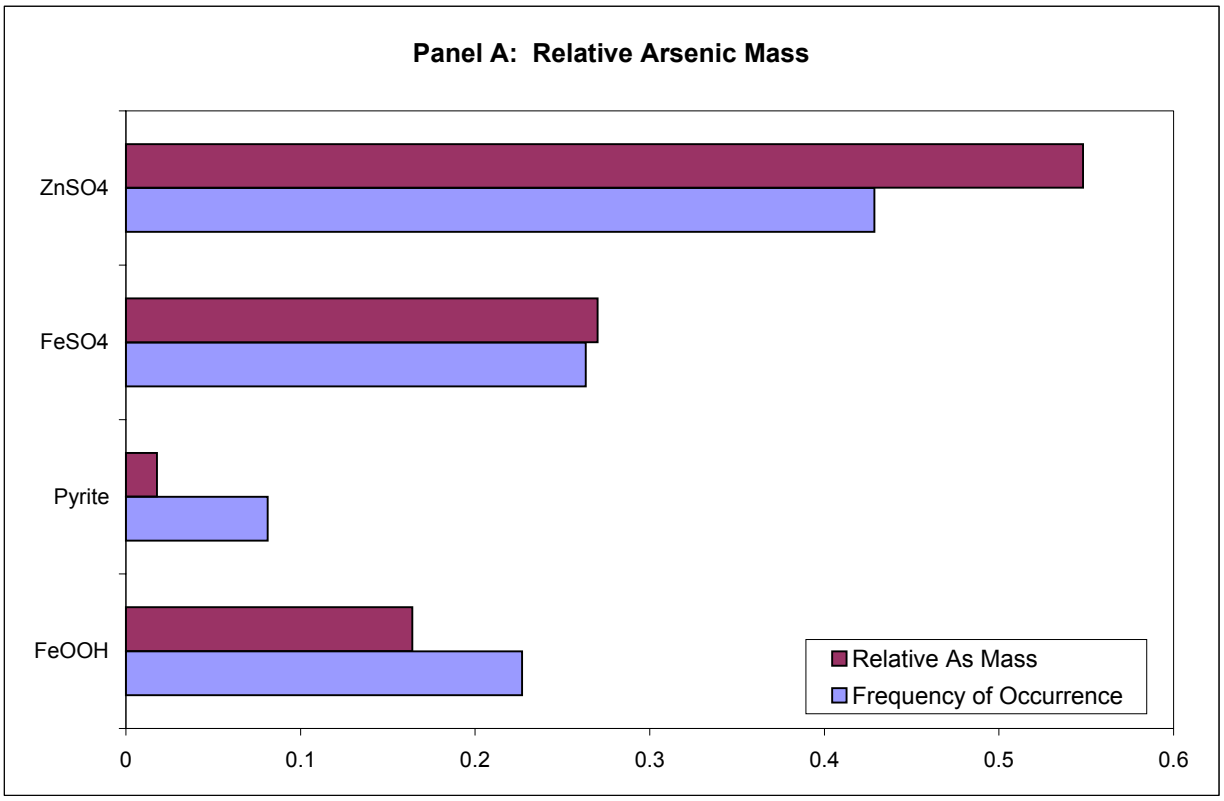
DETAILED ARSENIC SPECIATION RESULTS

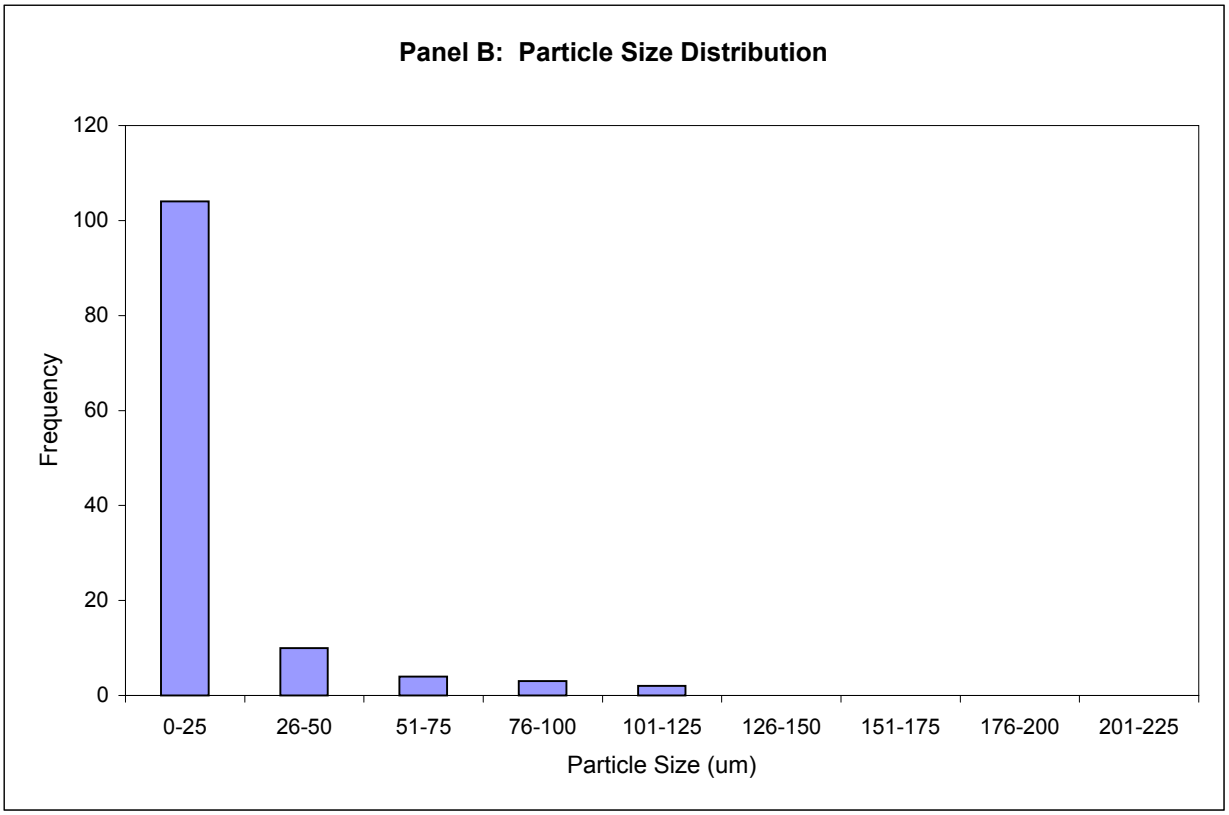
TEST MATERIAL 1 - SPECIATION AND PARTICLE SIZE DATA



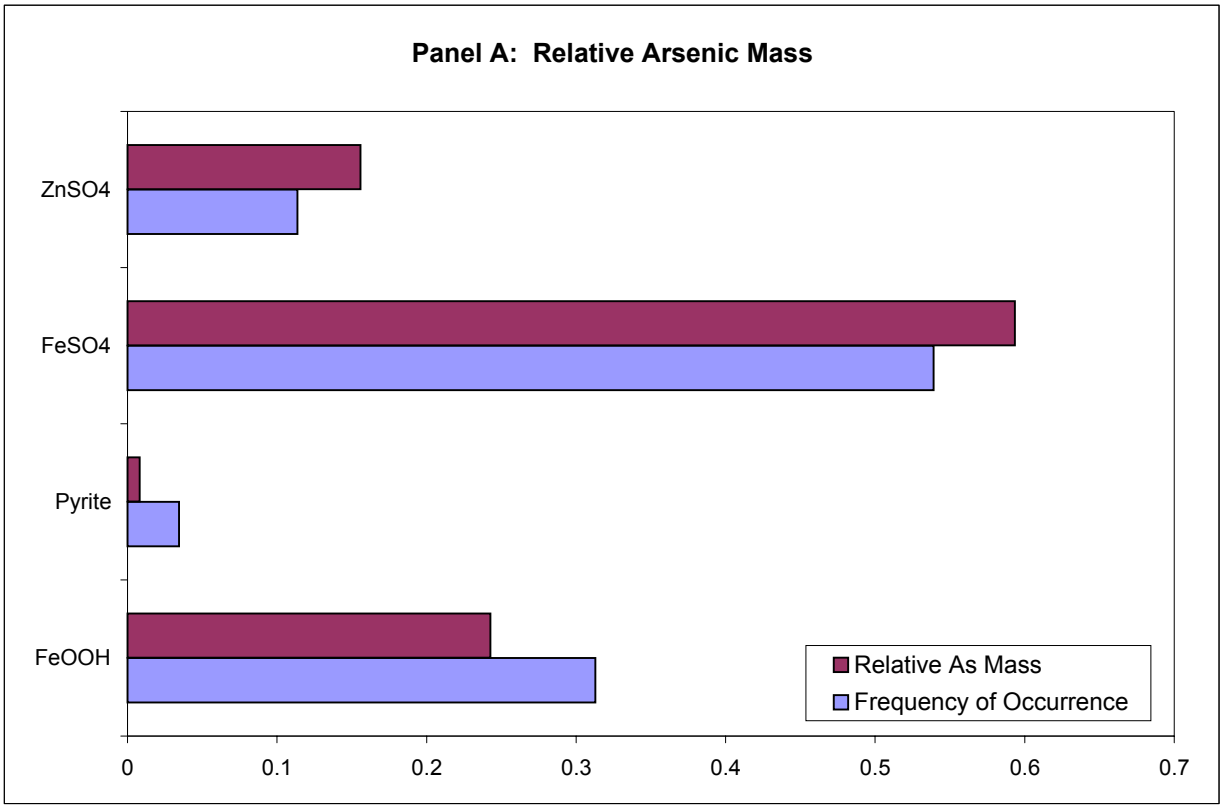


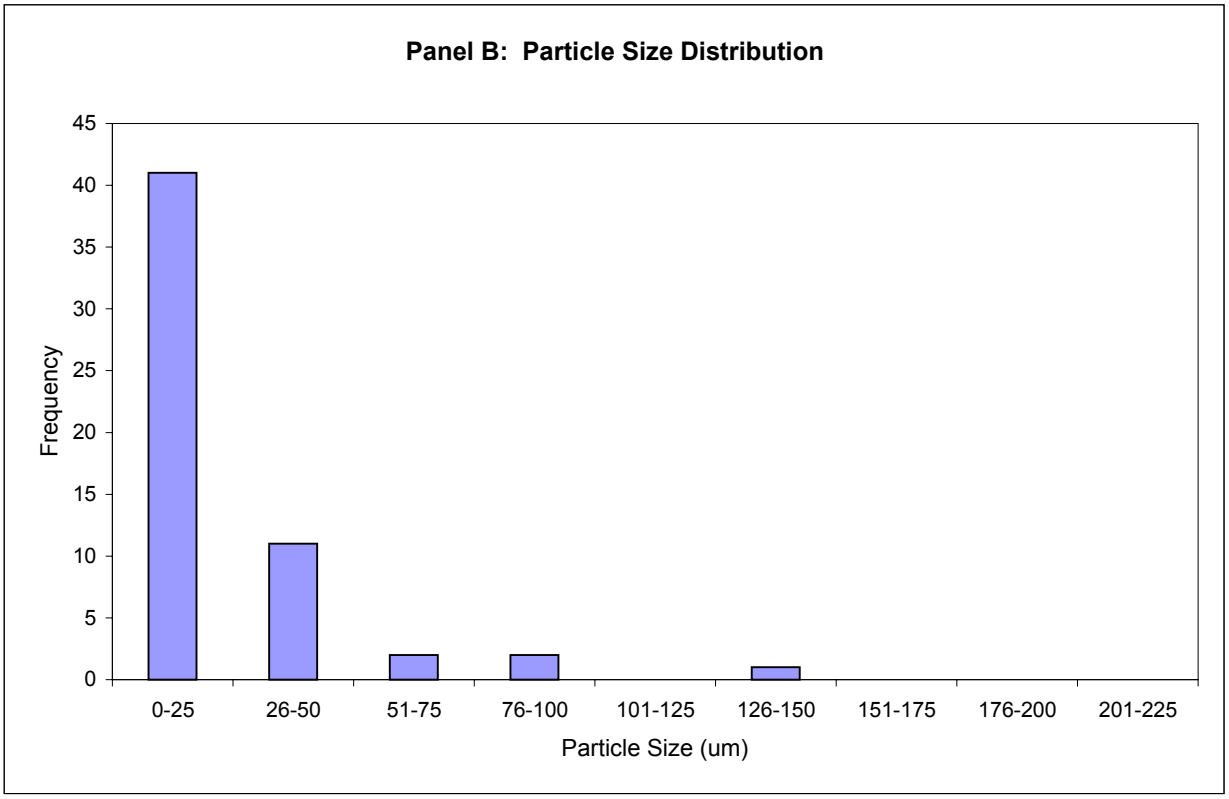
TEST MATERIAL 2 - SPECIATION AND PARTICLE SIZE DATA





TEST MATERIAL 3 - SPECIATION AND PARTICLE SIZE DATA





APPENDIX B

DETAILED RESULTS

TABLE B-1 SCHEDULE

Study Day	Day	Date	Dose Administration	Feed Special Diet	Weigh	Dose Prep	Cull Pigs/ Assign Dose Group	48 hr Urine Collection	Sacrifice
-8	Tuesday	8/27/02							
-7	Wednesday	8/28/02			X		X		
-6	Thursday	8/29/02							
-5	Friday	8/30/02							
-4	Saturday	8/31/02			X				
-3	Sunday	9/1/02							
-2	Monday	9/2/02		X					
-1	Tuesday	9/3/02	X	X	X	X			
0	Wednesday	9/4/02	X	X					
1	Thursday	9/5/02	X	X					
2	Friday	9/6/02	X	X	X	X			
3	Saturday	9/7/02	X	X					
4	Sunday	9/8/02	X	X					
5	Monday	9/9/02	X	X	X	X			
6	Tuesday	9/10/02	X	X				↕	
7	Wednesday	9/11/02	X	X				↕	
8	Thursday	9/12/02	X	X	X	X		↕	
9	Friday	9/13/02	X	X				↕	
10	Saturday	9/14/02	X	X				↕	
11	Sunday	9/15/02	X	X	X			↕	
12	Monday	9/16/02							X

TABLE B-2 GROUP ASSIGNMENTS

Pig Number	Dose Group	Material Administered	Target Dose of Arsenic (ug/day)
324 338 349	1	Control	0
326 330 339 350	2	NaAs	300
310 316 322 340	3	NaAs	600
303 315 329 341	4	NaAs	900
301 318 344 347	5	TM1	300
309 327 343 346	6	TM1	600
306 308 317 331	7	TM1	900
304 311 314 321	8	TM2	300
307 313 325 332	9	TM2	600
328 337 342 348	10	TM2	900

TABLE B-3 BODY WEIGHTS AND ADMINISTERED DOSES, BY DAY

Body weights were measured on days -7, -4, -1, 2, 5, 8, and 11. Weights for other days are estimated, based on linear interpolation between measured values.

Group	Pig #	Day -7		Day -4		Day -1		Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7		Day 8		Day 9		Day 10		Day 11	
		BW kg	ugAs per day	BW kg	ugAs per day	BW kg	ugAs per day	BW kg	ugAs per day	BW kg	ugAs per day	BW kg	ugAs per day	BW kg	ugAs per day	BW kg	ugAs per day	BW kg	ugAs per day	BW kg	ugAs per day	BW kg	ugAs per day	BW kg	ugAs per day	BW kg	ugAs per day	BW kg	ugAs per day	BW kg	ugAs per day
1	324	10.15	0	10.25	0	11.15	0	11.48	0	11.82	0	12.15	0	12.57	0	12.98	0	13.40	0	13.75	0	14.10	0	14.45	0	14.87	0	15.28	0	15.70	0
1	338	8.9	0	9.45	0	10.9	0	11.0	0	11.2	0	11.3	0	11.7	0	12.1	0	12.45	0	12.8	0	13.1	0	13.45	0	14.1	0	14.8	0	15.4	0
1	349	10	0	9.45	0	10.75	0	11.1	0	11.4	0	11.75	0	12.1	0	12.5	0	12.85	0	13.3	0	13.8	0	14.2	0	14.6	0	15.0	0	15.4	0
2	326	11.05	300	11.2	300	11.9	300	12.3	300	12.6	300	13	300	13.3	300	13.7	300	14	300	14.4	300	14.8	300	15.25	300	15.8	300	16.4	300	16.9	300
2	330	9.65	300	10.3	300	11.35	300	11.5	300	11.7	300	11.85	300	12.3	300	12.7	300	13.15	300	13.5	300	13.9	300	14.25	300	14.8	300	15.4	300	16	300
2	339	8.2	300	9	300	9.85	300	10.3	300	10.8	300	11.2	300	11.5	300	11.8	300	12.15	300	12.6	300	13.0	300	13.45	300	14.0	300	14.5	300	15.05	300
2	350	10.55	300	10.45	300	11.25	300	11.6	300	12.0	300	12.3	300	12.7	300	13.1	300	13.45	300	13.9	300	14.4	300	14.9	300	15.4	300	15.9	300	16.35	300
3	310	11.55	600	11.65	600	12.65	600	12.8	600	13.0	600	13.2	600	13.5	600	13.9	600	14.2	600	14.8	600	15.5	600	16.1	600	16.5	600	16.9	600	17.3	600
3	316	9.65	600	10.2	600	11.7	600	12.0	600	12.3	600	12.55	600	12.9	600	13.3	600	13.65	600	14.0	600	14.4	600	14.75	600	15.4	600	16.1	600	16.7	600
3	322	10.45	600	10.95	600	11.8	600	12.2	600	12.5	600	12.9	600	13.3	600	13.8	600	14.2	600	14.9	600	15.6	600	16.25	600	16.9	600	17.6	600	18.3	600
3	340	7.8	600	8.2	600	9.05	600	9.3	600	9.6	600	9.85	600	10.2	600	10.5	600	10.85	600	11.2	600	11.5	600	11.75	600	12.2	600	12.7	600	13.2	600
4	303	11.35	900	11.25	900	12.5	900	12.70	900	12.9	900	13.1	900	13.6	900	14.1	900	14.65	900	15.2	900	15.8	900	16.4	900	16.9	900	17.4	900	17.85	900
4	315	10.45	900	10.75	900	11.95	900	12.2	900	12.5	900	12.75	900	13.2	900	13.7	900	14.2	900	14.6	900	14.9	900	15.25	900	15.8	900	16.4	900	16.95	900
4	329	11.05	900	11.8	900	12.9	900	13.4	900	13.8	900	14.25	900	14.7	900	15.2	900	15.6	900	16.0	900	16.5	900	16.9	900	17.4	900	18.0	900	18.5	900
4	341	8.85	900	9.95	900	11.45	900	11.7	900	12.0	900	12.3	900	12.7	900	13.0	900	13.4	900	14.0	900	14.6	900	15.15	900	15.9	900	16.7	900	17.45	900
5	301	13.1	257.802	13.45	257.802	14.65	257.802	15.0	258	15.3	258	15.6	257.802	16.2	258	16.9	258	17.5	257.802	18.2	258	18.8	258	19.45	257.802	20.0	258	20.6	258	21.1	257.802
5	318	11.2	257.802	11.3	257.802	12.35	257.802	12.5	258	12.7	258	12.9	257.802	13.4	258	13.9	258	14.45	257.802	15.0	258	15.6	258	16.1	257.802	16.6	258	17.2	258	17.7	257.802
5	344	10.6	257.802	10.25	257.802	11.1	257.802	11.3	258	11.5	258	11.75	257.802	12.3	258	12.8	258	13.3	257.802	13.8	258	14.2	258	14.7	257.802	15.2	258	15.6	258	16.1	257.802
5	347	8.35	257.802	8.4	257.802	9.45	257.802	9.8	258	10.1	258	10.4	257.802	10.8	258	11.3	258	11.7	257.802	12.0	258	12.4	258	12.7	257.802	13.3	258	13.8	258	14.35	257.802
6	309	8.7	515.604	9.9	515.604	10.8	515.604	11.0	516	11.3	516	11.5	515.604	11.8	516	12.2	516	12.5	515.604	13.1	516	13.7	516	14.3	515.604	14.7	516	15.1	516	15.5	515.604
6	327	9.85	515.604	10.15	515.604	11.25	515.604	11.6	516	11.9	516	12.15	515.604	12.6	516	13.1	516	13.6	515.604	14.2	516	14.8	516	15.4	515.604	15.7	516	15.9	516	16.2	515.604
6	343	9.4	515.604	9.1	515.604	10.1	515.604	10.4	516	10.7	516	10.95	515.604	11.4	516	11.8	516	12.15	515.604	12.6	516	13.0	516	13.4	489.823	13.6	516	13.8	516	14.05	464.043
6	346	9.4	515.604	9.9	515.604	11	515.604	11.4	516	11.8	516	12.25	515.604	12.6	516	12.9	516	13.25	515.604	13.7	516	14.2	516	14.7	515.604	15.0	516	15.4	516	15.7	515.604
7	306	9.7	773.405	13.6	773.405	14.8	773.405	15.0	773	15.2	773	15.45	773.405	16.1	773	16.7	773	17.25	773.405	17.7	773	18.1	773	18.45	773.405	19.0	773	19.6	773	20.15	773.405
7	308	11.15	773.405	11.95	773.405	12.7	773.405	12.9	773	13.1	773	13.3	773.405	13.7	773	14.1	773	14.45	773.405	15.0	773	15.5	773	15.95	773.405	16.4	773	16.8	773	17.2	773.405
7	317	12.75	773.405	12.25	773.405	12.6	773.405	12.9	773	13.1	773	13.4	773.405	13.9	773	14.4	773	14.95	773.405	15.4	773	15.8	773	16.25	773.405	16.8	773	17.3	773	17.75	773.405
7	331	12.85	773.405	12.85	773.405	13.8	773.405	14.1	773	14.3	773	14.6	773.405	15.1	735	15.6	773	16.15	773.405	16.7	754	17.2	773	17.7	773.405	18.1	773	18.6	754	19	696.065
8	304	10.1	269.655	10.8	269.655	12.1	269.655	12.4	270	12.7	270	13.05	269.655	13.4	270	13.7	270	14	269.655	14.3	270	14.7	270	15	269.655	15.7	270	16.3	270	17	269.655
8	311	11.4	269.655	11.95	269.655	12.75	269.655	13.0	270	13.3	270	13.5	269.655	13.9	270	14.4	270	14.8	269.655	15.3	270	15.8	270	16.3	269.655	16.9	270	17.6	270	18.2	269.655
8	314	10.45	269.655	10.8	269.655	11.5	269.655	11.9	270	12.3	270	12.65	269.655	13.0	270	13.4	270	13.8	269.655	14.5	270	15.1	270	15.8	269.655	16.2	270	16.5	270	16.9	269.655
8	321	11.95	269.655	12.1	269.655	12.45	269.655	12.8	270	13.1	270	13.4	269.655	13.9	270	14.3	270	14.75	269.655	15.2	270	15.7	270	16.15	269.655	16.7	270	17.2	270	17.65	269.655
9	307	13.7	539.31	13	539.31	13.6	539.31	14.0	539	14.3	539	14.65	539.31	14.9	539	15.2	539	15.5	525.828	15.8	539	16.1	472	16.45	539.31	16.9	539	17.4	539	17.85	539.31
9	313	12.55	539.31	12.9	539.31	13.4	539.31	13.8	526	14.2	539	14.6	512.345	15.0	539	15.4	539	15.85	539.31	16.1	539	16.4	539	16.6	539.31	17.4	539	18.2	539	19	539.31
9	325	11.45	539.31	11.7	539.31	12.25	539.31	12.5	539	12.7	539	12.95	539.31	13.4	539	13.9	539	14.35	539.31	15.0	512	15.6	526	16.2	525.828	16.8	526	17.4	539	17.95	539.31
9	332	11.95	539.31	11.5	539.31	12.4	539.31	12.7	539	12.9	539	13.2	539.31	13.7	539	14.2	539	14.65	539.31	15.2	539	15.7	539	16.15	539.31	16.4	539	16.7	539	16.9	539.31
10	328	11.05	808.966	11.25	808.966	12.1	808.966	12.5	809	12.8	809	13.15	808.966	13.6	809	14.1	809	14.5	808.966	15.1	809	15.7	809	16.35	788.741	16.8	809	17.3	809	17.75	808.966
10	337	8.5	808.966	9.1	808.966	9.75	808.966	10.1	789	10.4	809	10.75	788.741	11.2	809	11.7	769	12.1	808.966	12.5	769	13.0	809	13.4	768.517	13.9	789	14.3	667	14.75	768.517
10	342	10.9	808.966	11.15	808.966	11.8	808.966	12.1	809	12.4	809	12.75	808.966	13.1	809	13.4	809	13.75	808.966	14.5	809	15.2	789	15.9	808.966	16.3	809	16.6	809	16.95	808.966
10	348	9.05	808.966	9.2	808.966	10.1	808.966	10.3	809	10.5	809	10.65	808.966	11.1	789	11.6	809	12.05	808.966	12.6	789	13.1	809	13.55	808.966	14.0	809	14.5	809	15	808.966

Missed Doses:

Day 0 - Pig 313 did not eat entire afternoon dose (ate approximately 95%). Daily dose adjusted to 97.5%.
Day 0 - Pig 337 did not eat entire afternoon dose (ate approximately 95%). Daily dose adjusted to 97.5%.
Day 2 - Pig 313 did not eat entire afternoon dose (ate approximately 90%). Daily dose adjusted to 95%.
Day 2 - Pig 337 did not eat entire morning dose (ate approximately 95%). Daily dose adjusted to 97.5%.
Day 3 - Pig 331 did not eat entire afternoon dose (ate approximately 90%). Daily dose adjusted to 95%.
Day 3 - Pig 348 did not eat entire afternoon dose (ate approximately 95%). Daily dose adjusted to 97.5%.
Day 4 - Pig 337 did not eat entire afternoon dose (ate approximately 90%). Daily dose adjusted to 95%.
Day 5 - Pig 307 did not eat entire morning dose (ate approximately 95%). Daily dose adjusted to 97.5%.
Day 6 - Pig 331 did not eat entire morning dose (ate approximately 95%). Daily dose adjusted to 97.5%.
Day 6 - Pig 325 did not eat entire afternoon dose (ate approximately 90%). Daily dose adjusted to 95%.
Day 6 - Pig 337 did not eat entire morning dose (ate approximately 90%). Daily dose adjusted to 95%.
Day 6 - Pig 348 did not eat entire afternoon dose (ate approximately 95%). Daily dose adjusted to 97.5%.
Day 7 - Pig 307 did not eat entire afternoon dose (ate approximately 75%). Daily dose adjusted to 87.5%.
Day 7 - Pig 325 did not eat entire morning dose (ate approximately 95%). Daily dose adjusted to 97.5%.
Day 7 - Pig 342 did not eat entire morning dose (ate approximately 95%). Daily dose adjusted to 97.5%.
Day 8 - Pig 343 did not eat entire morning dose (ate approximately 90%). Daily dose adjusted to 95%.
Day 8 - Pig 325 did not eat entire morning dose (ate approximately 95%). Daily dose adjusted to 97.5%.
Day 8 - Pig 328 did not eat entire morning dose (ate approximately 95%). Daily dose adjusted to 97.5%.
Day 8 - Pig 337 did not eat entire afternoon dose (ate approximately 90%). Daily dose adjusted to 95%.
Day 9 - Pig 325 did not eat entire afternoon dose (ate approximately 95%). Daily dose adjusted to 97.5%.
Day 9 - Pig 337 did not eat entire afternoon dose (ate approximately 95%). Daily dose adjusted to 97.5%.
Day 10 - Pig 331 did not eat entire afternoon dose (ate approximately 95%). Daily dose adjusted to 97.5%.
Day 10 - Pig 337 did not eat entire morning or afternoon dose (ate approximately 70% and 95%, respectively). Daily dose adjusted to 82.5%.
Day 11 - Pig 343 did not eat entire afternoon dose (ate approximately 80%). Daily dose adjusted to 90%.
Day 11 - Pig 331 did not eat entire afternoon dose (ate approximately 80%). Daily dose adjusted to 90%.
Day 11 - Pig 337 did not eat entire afternoon dose (ate approximately 90%). Daily dose adjusted to 95%.

TABLE B-4 URINE VOLUMES - 48 HOUR COLLECTIONS

Units of Volume: mls

Group	Pig ID	Day		
		6-7	**8-9**	**10-11**
		9/10-9/11	9/12-9/13	9/14-9/15
1	324	5400	6780	11620
	338	6960	7280	13800
	349	6100	4340	4460
2	326	6870	7640	14940
	330	3060	1900	3350
	339	19330	8320	18380
	350	12850	7640	10100
3	310	11150	3260	14060
	316	24060	50480	40840
	322	16940	8720	12400
	340	4840	3480	8100
4	303	10270	12800	13490
	315	12220	23700	16150
	329	21400	21620	26660
	341	5540	7260	8990
5	301	3360	2240	2020
	318	4960	4830	3440
	344	3440	4380	4010
	347	10700	10740	11690
6	309	18340	16790	19700
	327	6280	6360	9800
	343	7040	4480	9240
	346	22050	15820	16650
7	306	8220	8220	11620
	308	15500	11400	12200
	317	2520	2350	2150
	331	8180	8680	11180
8	304	5660	6600	4440
	311	23820	23920	29080
	314	6000	5250	4660
	321	10300	14600	7440
9	307	17000	21760	18000
	313	24830	16420	14660
	325	4360	4840	4050
	332	8910	6760	4290
10	328	15700	14470	21760
	337	3320	1400	3800
	342	14000	14200	33350
	348	3680	3840	4800

Volume measured by:	TE, CL, HH	HH, BL	HH,TN
Date:	9/12/02-9/13/02	9/14/02	9/16/02

TABLE B-5 URINE ANALYTICAL RESULTS

Tag Number	Pig Number	Group	Day	Material Administered	Target Dose (ug/d)	Q	Arsenic Conc in Urine	DL	Units
R1-01-0194	324	1	6/7	Control	0	<	1	1	ng/mL
R1-01-0265	338	1	6/7	Control	0		1	1	ng/mL
R1-01-0173	349	1	6/7	Control	0		3	1	ng/mL
R1-01-0163	326	2	6/7	NaAs	300		83	1	ng/mL
R1-01-0200	330	2	6/7	NaAs	300		160	2	ng/mL
R1-01-0191	339	2	6/7	NaAs	300		29	1	ng/mL
R1-01-0228	350	2	6/7	NaAs	300		45	1	ng/mL
R1-01-0232	310	3	6/7	NaAs	600		110	2	ng/mL
R1-01-0199	316	3	6/7	NaAs	600		49	1	ng/mL
R1-01-0112	322	3	6/7	NaAs	600		73	1	ng/mL
R1-01-0250	340	3	6/7	NaAs	600		160	2	ng/mL
R1-01-0167	303	4	6/7	NaAs	900		170	2	ng/mL
R1-01-0220	315	4	6/7	NaAs	900		101	1	ng/mL
R1-01-0263	329	4	6/7	NaAs	900		70	1	ng/mL
R1-01-0233	341	4	6/7	NaAs	900		300	4	ng/mL
R1-01-0136	301	5	6/7	TM1	300		56	1	ng/mL
R1-01-0261	318	5	6/7	TM1	300		42	1	ng/mL
R1-01-0260	344	5	6/7	TM1	300		57	1	ng/mL
R1-01-0159	347	5	6/7	TM1	300		14	1	ng/mL
R1-01-0148	309	6	6/7	TM1	600		24	1	ng/mL
R1-01-0187	327	6	6/7	TM1	600		66	1	ng/mL
R1-01-0156	343	6	6/7	TM1	600		36	1	ng/mL
R1-01-0208	346	6	6/7	TM1	600		23	1	ng/mL
R1-01-0121	306	7	6/7	TM1	900		65	1	ng/mL
R1-01-0165	308	7	6/7	TM1	900		39	1	ng/mL
R1-01-0193	317	7	6/7	TM1	900		138	1	ng/mL
R1-01-0171	331	7	6/7	TM1	900		42	1	ng/mL
R1-01-0225	304	8	6/7	TM2	300		49	1	ng/mL
R1-01-0183	311	8	6/7	TM2	300		11	1	ng/mL
R1-01-0117	314	8	6/7	TM2	300		44	1	ng/mL
R1-01-0118	321	8	6/7	TM2	300		25	1	ng/mL
R1-01-0177	307	9	6/7	TM2	600		40	1	ng/mL
R1-01-0152	313	9	6/7	TM2	600		23	1	ng/mL
R1-01-0234	325	9	6/7	TM2	600		104	1	ng/mL
R1-01-0172	332	9	6/7	TM2	600		66	1	ng/mL
R1-01-0114	328	10	6/7	TM2	900		56	1	ng/mL
R1-01-0164	337	10	6/7	TM2	900		160	2	ng/mL
R1-01-0147	342	10	6/7	TM2	900		57	1	ng/mL
R1-01-0186	348	10	6/7	TM2	900		150	2	ng/mL
R1-01-0120	324	1	8/9	Control	0		2	1	ng/mL
R1-01-0237	338	1	8/9	Control	0		3	1	ng/mL
R1-01-0123	349	1	8/9	Control	0		3.6	1	ng/mL
R1-01-0139	326	2	8/9	NaAs	300		75	1	ng/mL
R1-01-0221	330	2	8/9	NaAs	300		270	5	ng/mL
R1-01-0107	339	2	8/9	NaAs	300		73	1	ng/mL
R1-01-0243	350	2	8/9	NaAs	300		71	1	ng/mL
R1-01-0189	310	3	8/9	NaAs	600		240	5	ng/mL
R1-01-0213	316	3	8/9	NaAs	600		24	1	ng/mL
R1-01-0111	322	3	8/9	NaAs	600		130	2	ng/mL

Tag Number	Pig Number	Group	Day	Material Administered	Target Dose (ug/d)	Q	Arsenic Conc in Urine	DL	Units
R1-01-0145	340	3	8/9	NaAs	600		240	5	ng/mL
R1-01-0132	303	4	8/9	NaAs	900		140	2	ng/mL
R1-01-0257	315	4	8/9	NaAs	900		70	1	ng/mL
R1-01-0240	329	4	8/9	NaAs	900		83	1	ng/mL
R1-01-0188	341	4	8/9	NaAs	900		240	5	ng/mL
R1-01-0215	301	5	8/9	TM1	300		77	1	ng/mL
R1-01-0133	318	5	8/9	TM1	300		48	1	ng/mL
R1-01-0218	344	5	8/9	TM1	300		39	1	ng/mL
R1-01-0255	347	5	8/9	TM1	300		19	1	ng/mL
R1-01-0138	309	6	8/9	TM1	600		29	1	ng/mL
R1-01-0170	327	6	8/9	TM1	600		65	1	ng/mL
R1-01-0251	343	6	8/9	TM1	600		60	1	ng/mL
R1-01-0141	346	6	8/9	TM1	600		24	1	ng/mL
R1-01-0127	306	7	8/9	TM1	900		66	1	ng/mL
R1-01-0258	308	7	8/9	TM1	900		51	1	ng/mL
R1-01-0205	317	7	8/9	TM1	900		160	5	ng/mL
R1-01-0161	331	7	8/9	TM1	900		58	1	ng/mL
R1-01-0242	304	8	8/9	TM2	300		39	1	ng/mL
R1-01-0253	311	8	8/9	TM2	300		11	1	ng/mL
R1-01-0166	314	8	8/9	TM2	300		52	1	ng/mL
R1-01-0262	321	8	8/9	TM2	300		19	1	ng/mL
R1-01-0105	307	9	8/9	TM2	600		28	1	ng/mL
R1-01-0134	313	9	8/9	TM2	600		32	1	ng/mL
R1-01-0185	325	9	8/9	TM2	600		98	1	ng/mL
R1-01-0113	332	9	8/9	TM2	600		80	1	ng/mL
R1-01-0144	328	10	8/9	TM2	900		63	1	ng/mL
R1-01-0101	337	10	8/9	TM2	900		440	10	ng/mL
R1-01-0210	342	10	8/9	TM2	900		54	1	ng/mL
R1-01-0196	348	10	8/9	TM2	900		190	5	ng/mL
R1-01-0202	324	1	10/11	Control	0	<	1	1	ng/mL
R1-01-0239	338	1	10/11	Control	0		1	1	ng/mL
R1-01-0142	349	1	10/11	Control	0		3	1	ng/mL
R1-01-0192	326	2	10/11	NaAs	300		40	1	ng/mL
R1-01-0224	330	2	10/11	NaAs	300		130	2	ng/mL
R1-01-0229	339	2	10/11	NaAs	300		33	1	ng/mL
R1-01-0108	350	2	10/11	NaAs	300		60	1	ng/mL
R1-01-0209	310	3	10/11	NaAs	600		74	1	ng/mL
R1-01-0207	316	3	10/11	NaAs	600		31	1	ng/mL
R1-01-0131	322	3	10/11	NaAs	600		100	1	ng/mL
R1-01-0219	340	3	10/11	NaAs	600		120	2	ng/mL
R1-01-0254	303	4	10/11	NaAs	900		96	1	ng/mL
R1-01-0125	315	4	10/11	NaAs	900		102	1	ng/mL
R1-01-0236	329	4	10/11	NaAs	900		68	1	ng/mL
R1-01-0264	341	4	10/11	NaAs	900		180	5	ng/mL
R1-01-0109	301	5	10/11	TM1	300		110	2	ng/mL
R1-01-0231	318	5	10/11	TM1	300		58	1	ng/mL
R1-01-0176	344	5	10/11	TM1	300		43	1	ng/mL
R1-01-0128	347	5	10/11	TM1	300		13	1	ng/mL
R1-01-0227	309	6	10/11	TM1	600		24	1	ng/mL
R1-01-0129	327	6	10/11	TM1	600		40	1	ng/mL
R1-01-0115	343	6	10/11	TM1	600		28	1	ng/mL
R1-01-0204	346	6	10/11	TM1	600		24	1	ng/mL

Tag Number	Pig Number	Group	Day	Material Administered	Target Dose (ug/d)	Q	Arsenic Conc in Urine	DL	Units
R1-01-0160	306	7	10/11	TM1	900		51	1	ng/mL
R1-01-0150	308	7	10/11	TM1	900		52	1	ng/mL
R1-01-0143	317	7	10/11	TM1	900		190	5	ng/mL
R1-01-0248	331	7	10/11	TM1	900		54	1	ng/mL
R1-01-0238	304	8	10/11	TM2	300		62	1	ng/mL
R1-01-0178	311	8	10/11	TM2	300		9.5	1	ng/mL
R1-01-0217	314	8	10/11	TM2	300		50	1	ng/mL
R1-01-0214	321	8	10/11	TM2	300		32	1	ng/mL
R1-01-0252	307	9	10/11	TM2	600		31	1	ng/mL
R1-01-0245	313	9	10/11	TM2	600		33	1	ng/mL
R1-01-0256	325	9	10/11	TM2	600		120	2	ng/mL
R1-01-0216	332	9	10/11	TM2	600		120	2	ng/mL
R1-01-0149	328	10	10/11	TM2	900		39	1	ng/mL
R1-01-0246	337	10	10/11	TM2	900		160	5	ng/mL
R1-01-0174	342	10	10/11	TM2	900		26	1	ng/mL
R1-01-0103	348	10	10/11	TM2	900		130	2	ng/mL
R1-01-0222	2340	3	6/7	NaAs	600		160	2	ng/mL
R1-01-0180	2306	7	6/7	TM1	900		61	1	ng/mL
R1-01-0244	2307	9	6/7	TM2	600		37	1	ng/mL
R1-01-0104	2329	4	8/9	NaAs	900		83	1	ng/mL
R1-01-0247	2346	6	8/9	TM1	600		28	1	ng/mL
R1-01-0110	2314	8	8/9	TM2	300		53	1	ng/mL
R1-01-0212	2330	2	10/11	NaAs	300		130	2	ng/mL
R1-01-0182	2344	5	10/11	TM1	300		44	1	ng/mL
R1-01-0151	2348	10	10/11	TM2	900		130	2	ng/mL
R1-01-0157	AsCtrl	PE		Control	0		3	1	ng/mL
R1-01-0206	AsCtrl	PE		Control	0		2	1	ng/mL
R1-01-0119	AsIA200	PE		Sodium arsenate	200		180	4	ng/mL
R1-01-0124	AsIA200	PE		Sodium arsenate	200		190	5	ng/mL
R1-01-0198	AsIA40	PE		Sodium arsenate	40		42	1	ng/mL
R1-01-0158	AsIA40	PE		Sodium arsenate	40		41	1	ng/mL
R1-01-0122	AsIB200	PE		Sodium arsenite	200		190	4	ng/mL
R1-01-0175	AsIB200	PE		Sodium arsenite	200		200	5	ng/mL
R1-01-0106	AsIB40	PE		Sodium arsenite	40		43	1	ng/mL
R1-01-0230	AsIB40	PE		Sodium arsenite	40		41	1	ng/mL
R1-01-0241	AsOA200	PE		MMA	200		200	4	ng/mL
R1-01-0130	AsOA200	PE		MMA	200		210	5	ng/mL
R1-01-0135	AsOA40	PE		MMA	40		43	1	ng/mL
R1-01-0169	AsOA40	PE		MMA	40		43	1	ng/mL
R1-01-0116	AsOB200	PE		DMA	200		200	4	ng/mL
R1-01-0203	AsOB200	PE		DMA	200		210	5	ng/mL
R1-01-0249	AsOB40	PE		DMA	40		44	1	ng/mL
R1-01-0154	AsOB40	PE		DMA	40		44	1	ng/mL